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Permanent hemodialysis catheters inserted with traditional (blind) technique: 10 years experience

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ABSTRACT

Aims: In this study, complications and patency rates of permanent hemodialysis catheters, all inserted with traditional (blind) techniques in our clinic, were evaluated.

Methods: Between June 2012 and June 2022, with the traditional (blind) technique, 627 patients were inserted with permanent hemodialysis catheters. These 627 patients were included in this study. Demographic characteristics of the patients, catheter insertion location and techniques, reasons for removal, duration of use, and catheter-related complications were recorded.

Results: Between June 2012 and June 2022, 720 permanent hemodialysis catheters were inserted into 627 patients in our clinic. 350 patient's male, and 277 patients were female. The mean age was 45.35±15.9 (16-82 years). 610 catheters were inserted into the right jugular vein (84.7%), 90 catheters were inserted (12.5%) into the right femoral vein, 11 catheters (1.52%) were inserted into the left femoral vein, and 9 catheters (1.25%) were inserted into the left jugular vein. The need for re-catheter insertion developed in 93 patients. The reasons for re-catheter insertion were infection in 20 patients, intracatheter thrombosis in 63 patients, catheter malposition in 5 patients, and other causes in 5 patients.

Conclusion: The permanent hemodialysis catheter placement method depends on the clinician's experience. Complication rates for permanent hemodialysis catheters inserted with the traditional (blind) technique are similar to other methods.

Keywords: Hemodialysis, catheter, complication

INTRODUCTION

End-stage renal disease (ESRD) is a chronic disease with high morbidity and mortality and high treatment costs worldwide.[1] Kidney transplantation is the first preferred treatment method in these patients. However, most patients are still dependent on hemodialysis.[2] Arteriovenous fistulas (AVF) or hemodialysis catheters (HD) are usually used for hemodialysis.[3]

Hemodialysis catheters are vital for these patients. They are helpful methods that can provide vascular access in a short time. There are two types of hemodialysis catheters: permanent and temporary. Permanent HD catheters should be preferred for use longer than 3-4 weeks. Emergency HD is the most critical indication for temporary or permanent HD catheters.[4] Permanent HD catheters are also ideal for long-term use in patients who cannot use AVF or have a short life expectancy.[5]

Placement of these catheters is an invasive procedure. Therefore, these procedures have some mortality and morbidity rates. Different imaging techniques are offered to reduce these rates. However, in this article, we have discussed the permanent catheters we place without imaging. We evaluated 627 patients whose permanent HD catheters were inserted with blind technique between 2012 and 2022. In this retrospective study, we identified the complications that developed during permanent catheterization with the blind technique. We calculated the reinsertion rates of the catheters and compared them with imaging-guided interventions in the literature.

METHODS

This study was carried out between June 2012 and June 2022. Our analysis is retrospective and descriptive. Before the start of the study, approval was obtained from the Kastamonu University Clinical Researches Ethics Committee (Date: 14.12.2022, Decision No: 2022-KAEK-118). The study was conducted in accordance with the principles of the Declaration of Helsinki. A total of 627 patients whose permanent tunneled catheters were inserted blindly were studied. The age and gender of the patients, insertion sites and techniques of the catheters, reasons for removal, duration of use, and catheter-related complications were recorded.

Complication rates of patients with a permanent HD catheter inserted between 2012 and 2022 were investigated. The

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obtained results are discussed by comparing them with other techniques in the literature.

Between June 2012 and June 2022, 720 permanent hemodialysis catheters were inserted in 627 patients in our clinic. Three hundred fifty patients were male, and 277 were female; the mean age was 45.35±15.9 (16-82 years). Only patients who had to continue hemodialysis through a permanent catheter were included in the study.

Of the catheters, 610 (84.7%) were inserted in the right jugular vein, 90 (12.5%) in the right femoral vein, 11 (1.52%) in the left femoral vein, and 9 (1.25%) in the left jugular vein.

The need for re-catheter insertion developed for various reasons in 93 patients with a catheter. Catheters had to be changed due to infection in 20 patients, intracatheter thrombosis in 63 patients, catheter malposition in 5 patients, and other reasons in 5 patients.

A double lumen 14-15 F permanent HD catheter was inserted into all patients. Catheter lengths ranged from 19 to 23 centimetres. There was a Dacron cuff, which provides permanence by making fibrosis in the part of the catheters inside the tunnel and has a protective barrier against infection. The first preferred route was access to the right internal jugular vein by anterior approach (84.7%). The catheter was inserted into the femoral vein in patients with orthopneic or bleeding diathesis. The femoral vein was also used in patients who could not enter the jugular vein. Permanent catheters were inserted in the right femoral vein in 90 patients (12.5%) and the left femoral vein in 11 patients (1.52%). Subclavian access was not performed in any of the patients. All catheters were inserted in the operating room under sterile conditions under local anesthesia and using the Seldinger method. No imaging technique was used during catheter insertion in any of the patients. All catheter insertion procedures were performed using the traditional blind technique. After each insertion procedure, ten cc of saline was administered to the catheter lumens. Then, approximately two cc of heparin was helped into the catheter lumens. Chest X-rays were not routinely taken, except for the patients who were thought to have complications.

Statistical Analysis

The patients' data were obtained retrospectively from the hospital database. IBM SPSS v.22 program was used in the data analysis. Descriptive statistics were used to calculate the mean and median values of the patient's demographic data.

RESULTS

Between 2012 and 2022, 720 permanent tunnelled catheters were inserted in 627 patients using the blind technique. All catheter patients were end-stage renal disease patients referred from the nephrology outpatient clinic. Of the catheters, 610 (84.7%) were placed in the right jugular vein, 90 (12.5%) in the right femoral vein, 11 (1.52%) in the left femoral vein, and 9 (1.25%) in the left jugular vein (Table 1).

The need for re-catheter insertion developed for various reasons in 93 patients with a catheter. Infection in 20 patients, intracatheter thrombosis in 63 patients, catheter malposition in 5 patients, and other reasons in 5 patients were replaced with a new permanent catheter (Table 2).

Of the 93 patients requiring catheter replacement, 70 had a femoral catheter, and 23 had jugular catheters. Catheter revision was performed by sending a guide wire through the catheter in 60 patients who required catheter replacement. In the other 33, a new catheter was inserted using the Seldinger method from a new route.

Table 1. Where permanent tunneled catheters are inserted

Catheter insertion site	n	%
Right jugular vein	610	84.7
Right femoral vein	90	12.5
Left femoral vein	11	1.52
Left jugular vein	9	1.25
Total	720	100

Table 2. Reasons for catheter reinsertion

Indication	n	%
Thrombosis	63	67.74
İnfection	20	21.50
Malposition	5	5.37
Other	5	5.37
Total	93	100

Arterial puncture was not performed in any of the patients during the interventions. Pneumothorax was seen in 2 patients. Tube thoracostomy was required in 1 patient who developed pneumothorax. Hemothorax was not observed in any patient.

Catheter infection was seen in 20 patients as one of the late complications. The catheters of all patients with catheter infections were removed, and new ones were inserted. Intra-catheter thrombosis was observed in 63 patients, and catheter malposition was observed in 5 patients. No deep vein thrombosis was observed in the extremities connected to the catheter. There was no mortality in any patient during the insertion of the catheters.

DISCUSSION

The most recommended vascular access for hemodialysis in patients with end-stage renal disease is natural arteriovenous (AV) fistulas. According to the kidney disease outcome quality initiative (KDOQI) (Vascular Access Work Group, 2006) guidelines, it is recommended that at least 50% of these patients begin hemodialysis treatment with a mature AV fistula and less than 10% with a permanent catheter.[6]

However, the use of permanent catheters in patients has recently increased for various reasons. These are reasons such as not waiting for the necessary time to enter the fistula, providing painless access to the patient's blood, or sometimes the patient's request. For this reason, it has been reported in the literature that the rate of permanent catheter use in patients with renal failure is up to 32%.[7]

Permanent catheter insertion is, of course, a complex vascular access procedure. Significant complications such as arterial injury, pneumothorax, and hemothorax may occur. The process must be performed under sterile operating room conditions.[8] To avoid such undesirable situations, permanent tunneled catheter applications under the guidance of Doppler ultrasonography are widely used.[9] Complications such as

arterial puncture, arterial injury, hematoma, pneumothorax, and hemothorax have been reported during catheterization with the traditional (blind) technique.[10] Studies have reported 0.4-4.1% pneumothorax, 0.2-1.5% hemothorax, and 1% death during permanent catheter insertion procedures with imaging techniques.[11] Pneumothorax rates are seen to be higher, especially in subclavian vein interventions.[12] We found our pneumothorax rate of 0.31% in only 2 of 720 permanent catheters we inserted without imaging. This was seen as a low complication compared to the literature. We did not know of any mortality related to catheter insertion in our patients. In addition, we did not have arterial puncture in any of the patients during catheterization. Hemothorax and pericardial effusion due to cardiac and vascular injury were not observed in any of the patients.

The need for re-catheter insertion developed for various reasons in 93 patients with a catheter. Infection in 20 patients, intracatheter thrombosis in 63 patients, catheter malposition in 5 patients, and other reasons in 5 patients were replaced with a new permanent catheter. In our study group, the rate of catheter dysfunction was 14.8%. In the literature, this rate was 38.4%. Our catheter infection rate was 3.1%. The rate of catheter infection was 9.6% in the literature. Both rates were relatively low compared to the literature.[13]

The insertion of a permanent tunneled catheter guided by Doppler ultrasonography has been reported as a procedure to reduce complications.[14,15] However, with increasing clinical and surgical experience and standardized traditional methods (blind technique), permanent catheter interventions can be performed.

We have reached results that are consistent with the results of permanent catheter inserted with imaging in the literature. All catheter insertion procedures were performed by the same surgeon using standard methods. All catheter placement procedures were performed in the operating room under sterile conditions. A catheter was inserted in every patient who needed a permanent catheter on the same day without waiting. Without Doppler Ultrasound or any other imaging method, we placed all catheters at no cost and no additional time. Since the scope was not used, there was no radiation exposure. Cost and time loss are minimized. Mortality and morbidity rates were reasonable.

Limitations

First, some data may need to be included because it is a retrospective study. In addition, it is challenging to generalize interventions performed by a single-centered and experienced surgeon to clinical practice. Some patients with minimal pneumothorax and hemothorax may have been overlooked because routine control X-rays were not performed. However, we take a consistent approach because the aim of the study is less time and cost. This study showed that "ordering fewer tests" does not increase complications and mortality in clinical practice. The patients included in the study were those who applied to our hospital's cardiovascular surgery clinic for permanent hemodialysis catheterization. In the literature, the importance of experience is emphasized in both imaging-guided and blind technique insertion catheters.[16] We aimed to present our blind technique experiences in our clinic. Considering patient satisfaction, our clinic has low mortality and morbidity rates in our city and the Western Black Sea Region. It provides permanent catheter service in the provinces and districts of Çankırı, Karabük, Sinop.

CONCLUSION

The permanent hemodialysis catheter placement method depends on the clinician's experience. Complication rates for permanent hemodialysis catheters inserted with the traditional (blind) technique are similar to other methods.

ETHICAL DECLARATIONS

Ethics Committee Approval

Before the start of the study, approval was obtained from the Kastamonu University Clinical Researches Ethics Committee (Date: 14.12.2022, Decision No: 2022-KAEK-118).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Original Article

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The role of immature granulocytes in the early diagnosis of pneumonia developing secondary to rib fractures

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ABSTRACT

Aims: This retrospective study aimed to investigate the role of immature granulocytes (IGs) in the early diagnosis of pneumonia secondary to rib fractures.

Methods: This study was conducted on patients who applied to the emergency department of our hospital between 2019 and 2022. Patients aged between 18 and 100 years who were found to have rib fractures in the thorax CT report and were hospitalized, who had hemogram data in the hospital's database, were included in the study. Patients with detected COVID-19 infection without hemogram data and patients who refused examination and treatment were excluded from the study. Patients' blood tests, radiological images, and epicrisis reports were analyzed. The data of patients with and without pneumonia were compared statistically.

Results: Overall, 155 patients, 117 men and 38 women were included in the study. Pneumonia developed in 11 patients, and two patient died. In our study, it was determined that the risk of pneumonia increased by 38% in each additional rib fracture, and the risk of pneumonia increased 9.44 times if the IG value at the 48th hour was greater than 0.06. In addition, when the receiver operating characteristic curves in our study were examined, it was observed that the IG number at 48 hours gave excellent results in the diagnosis of pneumonia, with 75% sensitivity and 88% specificity (cut off: 0.055, AUC: 0.827, p=0.002).

Conclusion: Our study showed that IGs are an effective marker in the early diagnosis of pneumonia secondary to rib fractures.

Keywords: Rib fracture, pneumonia, immature granulocytes, CRP

INTRODUCTION

One of the most common pathologies observed in blunt thoracic trauma is rib fracture. Rib fractures are observed in 10% of patients with blunt thoracic traumas.[1] Rib fractures can cause conditions that require emergency intervention, such as hemothorax, pneumothorax, and lung contusion. In addition, hypoventilation and atelectasis may develop due to pain. If atelectasis continues for a long time, pneumonia and acute respiratory distress syndrome (ARDS) may develop. The incidence of pneumonia due to rib fractures varies between 6% and 27% in studies.[2,3] Therefore, early diagnosis of pneumonia developing in trauma patients and initiation of appropriate antibiotic therapy are vital.

Pneumonia developing secondary to rib fractures occurs mostly in the hospital-acquired pneumonia group because there is no pneumonia at the time of admission to the hospital, and it mostly develops during the hospitalization period. It has different clinical features from community-acquired pneumonia. One of the main differences is an inflammatory response resulting from the trauma itself. This inflammatory response complicates the diagnosis of pneumonia. The second difference is exposure to the common disruptive effects of both thoracic trauma and pneumonia in the respiratory system. The third difference is that the clinical picture is more complicated due to extrathoracic trauma (cranial injury, abdominal injury, orthopedic injuries). The fourth difference is that pneumonia due to rib fractures is predictable. This predictability opens a window of opportunity for early diagnosis and treatment.

Fever, sputum, dyspnea, rales on auscultation, leukocytosis, increased C-reactive protein (CRP), reproduction in sputum culture, and radiological pneumonic infiltrates play a role in diagnosing pneumonia. However, it is not always easy to diagnose pneumonia after thoracic trauma. There are various reasons for this. Pulmonary contusion, which is very common in thoracic trauma, can mimic pneumonia radiologically. Another reason is atelectasis due to pain and shallow breathing in patients with thoracic trauma. Although atelectasis is not considered infected at first, pneumonia may develop in the lung that remains atelectatic for a long time.[4] Furthermore, there

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are laboratory tests and radiological images that complicate the diagnosis of pneumonia. Since CRP is a nonspecific test, it can increase both in trauma and pneumonia, making the diagnosis difficult. Similarly, leukocytosis, which develops as an inflammatory response secondary to trauma, may cause false positives in the diagnosis of pneumonia. A delay in diagnosis can lead to increased morbidity and mortality. Moreover, false positivity in the diagnosis can lead to undesirable results, such as unnecessary antibiotic use, antibiotic resistance, and drug side effects.

There are also inflammation markers not yet included in the clinical routine in diagnosing pneumonia. For example, immature granulocytes (IGs) in peripheral blood reflect the bone marrow response to bacterial infection. IG is classified by microscopic examination as promyelocytes, myelocytes, and metamyelocytes.[5,6] Advances in technology have enabled automated hematology analyzers to count IGs.[7]

This study aims to investigate the role of IGs in the early diagnosis of pneumonia secondary to rib fracture.

METHODS

This study was conducted on patients who applied to the emergency department of our hospital between 2019 and 2022. The patients' clinical, radiological, and laboratory data were collected retrospectively from the hospital's database. Before starting the study, approval was obtained from Kastamonu University Clinical Researches Ethics Committee (Date: Decision No: 2022-KAEK-58). In the study, the principles of the Declaration of Helsinki were adhered to.

Patients aged between 18 and 100 years, who were found to have rib fractures in the thorax CT report and were hospitalized, who had hemogram data in the hospital's database, were included in the study. Patients who were diagnosed with COVID-19 infection, did not have hemogram data, were referred out of the province, and refused examination and treatment were excluded from the study.

The following criteria were used as an indication for hospitalization in patients with rib fractures: Patients with three or more rib fractures, concomitant hemothorax or pneumothorax condition, patients over 65 years old with rib fractures, first rib fractures, and patients hospitalized for serious concomitant extrathoracic trauma.

During their hospitalization, daily hemograms and chest X-rays were routinely done on the patients, and their vital signs were monitored. In addition, paracetamol and dexketoprofen were administered to the patients as routine analgesic treatments. Opioid analgesics were administered as needed. Routine prophylactic antibiotics were not administered.

Infectious diseases consultation was done with patients with fever, sputum, dyspnea, rales on auscultation, leukocytosis, increased CRP, reproduction in sputum culture, and radiological pneumonic infiltration. All pneumonia diagnoses were made by an infectious diseases specialist. Antibiotherapy was started with the recommendation of the infectious diseases specialist for the patients diagnosed with pneumonia.

Blood tests were taken during the initial admission and 24 and 48 hours after the patients were analyzed. Hemogram parameters were calculated with an automated hematological analyzer (XN-1000 Hematology Analyzer Sysmex Corporation, Japan).

The data of patients with and without pneumonia diagnosis were compared using the Statistical Package for Social Sciences 23.0 for Windows (SPSS Inc., Chicago, USA) program. Descriptive statistics are given as numbers and % for categorical variables. Continuous data are given as median (25% percentiles, 75% percentiles). Chi-square and Fischer's exact tests were used to analyze categorical data. Mann Whitney U test was used to compare the mean values. Receiver operating characteristic (ROC) analysis was performed, and Youden's index was used to determine the area under the curve (AUC), cut-off, specificity, and sensitivity. Finally, binary logistic regression analysis was used in univariate and multivariate analyses.

RESULTS

One hundred and sixty-seven patients were evaluated for eligibility for the study. Twelve patients were excluded from the study-eight were due to COVID-19 infection, three patients' hemogram data could not be accessed, and one patient refused examination and treatment. Overall, 155 patients, 117 men and 38 women, who met the inclusion criteria were included in the study (Figure 1).

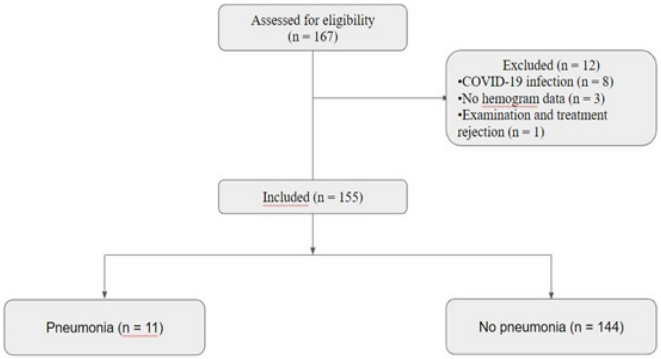

Figure 1. Consort diagram

Pneumonia developed in 11 of the patients included in the study, while no sign of pneumonia was observed in 144 patients. The median age was 66 (59; 86) in the pneumonia group. The median age was 65 (55; 72.75) in the group without pneumonia. There was no significant age difference between the groups (p=0.314). In the group that developed pneumonia, 10 patients (91%) were male, and one was female (9%; p=0.296). The most common etiologies for rib fractures were falls and motor vehicle accidents. No significant correlation was observed between the etiologic causes and the development of pneumonia (p=0.635). Six patients (54%) who developed pneumonia required intensive care admission. In the group without pneumonia, 11 patients (8%) needed intensive care (p=0.000). The median Charlson score was 3 (2; 5) in the pneumonia group and 2 (1; 3) in the non-pneumonia group (p=0.096). The median number of broken ribs was 4 (4; 7) in the pneumonia group and 3 (2; 5) in the group without pneumonia (p=0.057), while the median Injury Severity Index score was 16 (9; 25) in the pneumonia group and 9 (9; 16) in the non-pneumonia group (p=0.025). The median hospital stay was 7 (6; 14) days in the group with pneumonia and 3 (2; 4) days in the group without pneumonia (p=0.000; Table 1).

In the ROC analysis (Figure 2, Table 2), acceptable and excellent values were obtained for the following parameters: 24th-hour WBC (cut off: 11.07, AUC: 0.779), 24th-hour IG count (cut off: 0.045, AUC: 0.758), 48th-hour WBC (cut off: 12.01, AUC: 0.827), and 48th-hour IG count (cut off: 0.055, AUC: 0.827).

Table 1. Demographic and clinical data of patients

	Pneumonia (n=11)	No pneumonia (n=144)	p value
Age, years median (IQR)	66 (59; 86)	65 (55; 72.75)	0.314
Male, n (%)	10 (91%)	107 (74%)	0.296
Etiology			
Fall, n (%)	7 (63%)	91 (63%)	0.635
MVA, n (%)	4 (37%)	43 (29%)	
Others, n (%)	0 (0%)	10 (8%)	
ICU admission, n (%)	6 (54%)	11 (7%)	0.000
Charlson score, median (IQR)	3 (2; 5)	2 (1; 3)	0.096
Fractured ribs, median (IQR)	4 (4; 7)	3 (2; 5)	0.057
ISI score, median (IQR)	16 (9; 25)	9 (9; 16)	0.025
Admission time, days median (IQR)	7 (6; 14)	3 (2; 4)	0.000

IQR: Inter quartile range, MVA: Motor vehicle accident, ICU: intensive care unit; ISI: Injury severity index

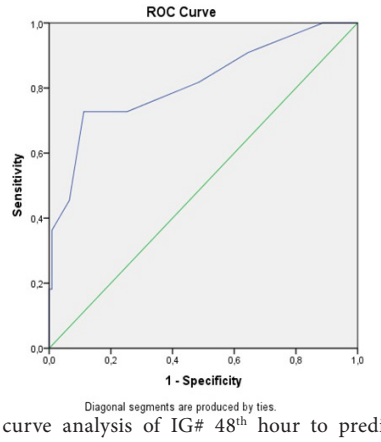

Figure 2. ROC curve analysis of IG# 48th hour to predict pneumonia development

ROC: Receiver operating characteristic, IG: Immature granulocyte

Table 2. ROC curve analysis to predict pneumonia development

	Cut-off	AUC	95% CI	p	Sensitivity	Specificity
CRP* (mg/L)	20.50	0.671	0.43-0.90	0.109	50	89
WBC* (×10⁹/L)	11.79	0.625	0.42-0.82	0.242	75	55
IG#* (×10⁹/L)	0.075	0.548	0.31-0.77	0.656	75	55
IG%*	2.80	0.464	0.23-0.69	0.733	12	100
WBC** (×10⁹/L)	11.07	0.779	0.58-0.97	0.009	87	69
IG#** (×10⁹/L)	0.045	0.758	0.57-0.93	0.016	75	66
IG%**	0.35	0.665	0.48-0.84	0.123	75	49
WBC*** (×10⁹/L)	12.01	0.827	0.63-1.00	0.002	75	90
IG#*** (×10⁹/L)	0.055	0.827	0.64-1.00	0.002	75	88
IG%***	0.55	0.654	0.46-0.84	0.150	37	89

*Initial admission, **24th hour, ***48th hour, ROC: Receiver operating characteristic, CRP: C-reactive protein, AUC: Area under the curve, CI: Confidence interval, IG: Immature granulocyte

In univariate logistic regression analysis, Charlson score (OR 1.487, 95% CI 1.018-2.173, p=0.040), the number of broken ribs (OR 1.345, 95% CI 1.054-1.717, p=0.017), CRP (OR 1.016, 95% CI 1.001-1.031, p=0.035), and the 48th-hour IG# (OR 11.905, 95% CI 2.899-48.893, p=0.001) were found to be significantly associated with pneumonia. When multivariate logistic regression analysis was performed, the number of broken ribs (OR 1.385, 95% CI 1.035-1.852, p=0.028) and IG# at 48 hours (OR 9.441, 95% CI 1.865-47.797, p=0.007) were found to be associated with pneumonia (Table 3).

Table 3. Logistic regression analysis of independent markers of pneumonia

	Univariate analysis		Multivariate analysis	
Variables	OR (95% CI)	p	OR (95% CI)	p
Charlson score	1.487 (1.018-2.173)	0.040	1.434 (0.929-2.213)	0.104
Fractured ribs	1.345 (1.054-1.717)	0.017	1.385 (1.035-1.852)	0.028
CRP (mg/L)	1.016 (1.001-1.031)	0.035	1.009 (0.990-1.028)	0.373
IG#*** (×10⁹/L)>0.06	11.905 (2.899-48.893)	0.001	9.441 (1.865-47.797)	0.007

***48th hour, CI: Confidence interval, OR: Odds ratio, CRP: C-reactive protein, IG: Immature granulocyte

Tube thoracostomy was performed on 20 patients in the study population. Thoracic surgery was not applied to the patients included in the study, except for tube thoracostomy. Two patients died in the study population. A 93-year-old male patient died on the 30th day of hospitalization, and a 71-year-old male patient died on the 6th day of hospitalization. Pneumonia developed in both patients and they were being followed up in the intensive care unit.

DISCUSSION

In our study, it was determined that the risk of pneumonia increased by 38% in each additional rib fracture, and the risk of pneumonia increased 9.44 times if the IG number at the 48th hour was greater than 0.06.

In the literature, the rate of pneumonia in patients hospitalized for rib fractures varies. While some studies have reported rates as low as 6%,[2] others have reported pneumonia rates as high as 27%.[3] In our study, the rate of pneumonia in hospitalized patients with rib fractures was calculated as 7%, and all the pneumonia diagnoses were made by an infectious diseases specialist. Therefore, we avoided the potential errors of studies reporting high pneumonia rates. It is also known in the literature that each additional rib fracture increases the rate of pneumonia development by 27% and the mortality rate by 19%.[3,8] In our study, the number of broken ribs was found to be an independent risk factor in multivariate analysis. In this respect, our study achieved similar results to the literature.

IGs occur in states of inflammation and infection.[9] Being able to detect IGs quickly can help diagnose many diseases early. They are a marker with successful results in diagnosing bacterial pneumonia, sepsis, acute pancreatitis, and acute appendicitis and predicting prognosis.[10-13] In our study, we observed the effect of IGs in a new area. Our study showed that they are effective in the early diagnosis of pneumonia developing secondary to thoracic trauma. If the IG number is greater than 0.06 in the sample taken at 48 hours, the risk of pneumonia increases 9.44 times. In addition, when the ROC curves in our study were examined, it was observed that the IG number at 48 hours gave excellent results in diagnosing pneumonia, with 75% sensitivity and 88% specificity (cut off: 0.055, AUC: 0.827, p=0.002).

In our study, the CRP value was statistically insignificant (p=0.373) in the diagnosis of pneumonia in multivariate analysis. CRP is a non-specific test. It is already known that

CRP is elevated in both trauma and pneumonia situations. Therefore, it has been observed that it cannot sufficiently help the diagnosis of pneumonia in trauma patients.

Our study may have some implications in clinical practice. In our study, it was shown that the risk of pneumonia increased in patients with WBC >12.000 and IG# >0.06 at 48th hour. The clinical reflection of this may be that in patients with rib fractures, it can be decided whether to start antibiotic therapy or not by simply looking at the 48th hour hemogram value.

Limitations

The our study is that, it is a retrospective and single-center study. More studies are needed to generalize the results. In addition, rib fixation surgery could not be performed in our hospital at the time of the study. It is known that rib fixation reduces the incidence of pneumonia.[14] There was only one thoracic surgeon working in our hospital. On days when the thoracic surgeon was on leave, patients with thoracic trauma were transferred out of the province. This may have affected the results of the study.

CONCLUSION

Our study showed that IGs are an effective marker in the early diagnosis of pneumonia secondary to rib fractures. Patients with an IG count greater than 0.06 at 48 hours have a 9.44-fold increased risk of pneumonia.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Kastamonu University Clinical Researches Ethics Committee (Date: Decision No: 2022-KAEK-58).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Evaluation of pediatric patients referred from the secondary care state hospital emergency department

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ABSTRACT

Aims: Determining the profiles of pediatric patients who need to be referred from the emergency department is important in terms of taking the necessary precautions during the referral process and providing care opportunities. This study aimed to examine the characteristics of pediatric patients who applied to our hospital's emergency department and were referred to other hospitals.

Methods: A total of 4870 children aged 0-17 years who presented to the emergency department of our secondary regional hospital and were referred to other hospitals over a five-year period were included in the study.

Results: The median age of the patients was 7 (min-max 0-17) years, and 2809 (57.7%) were male. The highest referral rate during the day was between the hours of 16-24 (46.6%). A total of 66.5% of referrals were made to tertiary care hospitals, and 92.8% were to the emergency department. The most common cause for referral was the lack of relevant branch and/or specialist (68.8%). The most common preliminary diagnosis or findings in referred children were convulsion (11.4%), acute appendicitis (9.0%) and abdominal pain (6.2%). In the 14-17 age group, the rate of those referred due to convulsions, trauma, burns and ileus was significantly lower than the other groups, while the rate of those referred due to drug poisoning, traffic accident, chest pain, pneumothorax, sharp object injuries and electric shock was significantly higher ($p<0.05$). The rate of those referred due to fever, chemical exposure, ileus, foreign body aspiration or ingestion, respiratory failure, acute gastroenteritis and gastrointestinal hemorrhage was significantly higher in the 0-3 age group compared to other groups ($p<0.05$). In cases such as drug poisoning, soft tissue injury, fall, fever, trauma, traffic accident, burn, foreign body aspiration or ingestion, pneumothorax, fracture and head trauma, the rates of patients referred to the tertiary care were significantly higher than those referred to the secondary care ($p<0.05$).

Conclusion: The findings obtained from this study has showed that the most frequently referred cases in pediatric patients are acute appendicitis, convulsion and abdominal pain, that the majority of referrals are made to tertiary care hospitals and especially emergency services, that the absence of a relevant branch or specialist physician is the most common reason for referrals, that the patients' preliminary diagnoses, patient age and time of admission significantly direct the referral characteristics.

Keywords: Child, referral, secondary care hospital

INTRODUCTION

Pediatric patients brought to the emergency department for non-urgent reasons prevent a significant portion of the staff, time and effort that would be devoted to other emergency patients. The applications of these patients should be prevented as much as possible or they should be directed to general outpatient clinics without delay.[1-4] However, the rapid, comprehensive and most appropriate approach given by experienced physicians and healthcare personnel to children brought for urgent reasons is life-saving and also reduces the risk of morbidity and complications that may develop.[2,3] However, in most hospitals, there is no child health and disease specialist or emergency medicine specialist in the emergency department, or the available facilities do not allow providing the most appropriate approach to the patient.[1-4] In these cases, after the necessary first intervention, the patient must be treated as quickly as possible. It is necessary to be referred from the emergency department to a higher or more comprehensive health institution with treatment options.[3-5]

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In hospitals in small settlements, there is often no separate pediatric emergency unit due to the lack of specialist physicians, equipment and facilities, and a significant portion of pediatric patients in emergency situations need to be referred.[1,2] While referrals from second-level hospitals are generally expected to be to tertiary care hospitals, referrals from such small-scale hospitals are not available. Some of the referrals can be made to another secondary care hospital in a larger settlement nearby. When following this path, it is generally taken into consideration which hospital is closest to the specialist physician or the necessary care unit, which is suitable for the patient's preliminary diagnosis. Although the majority of such referrals are to general hospitals, some of them may be to branch hospitals such as children's hospitals, mental health hospitals or chest hospitals. However, the highest referral rate generally belongs to tertiary care hospitals.[1,2,6,7]

Our aim in this study was to examine the reasons for referral of patients who were thought to require special treatment from a secondary care hospital and to investigate the appropriateness of the referral requirement.

METHODS

Selection of Patients

In this study, the data of a total of 21826 patients who applied to the emergency department and were referred to other hospitals between January 2019 and December 2023 were retrospectively examined. Among the patients, 4870 children between the ages of 0-17 were included in the study. The data of these patients were obtained by scanning hospital records. Patients aged 18 and over, patients who were transferred back to the institution they came from, and patients who were transferred to a department within the hospital were not included in the study. For referred pediatric patients, the yearly periods to be used in the evaluation were determined as April-September and October-March, referral time intervals were 08-16, 16-24 and 24-08, and age groups were 0-3, 4-8, 9-13 and 14-17. The study was carried out with the permission of the Samsun University Clinical Researches Ethics Committee (Date: 03.01.2024, Decision No: 2024/1/4). Since this is a retrospective study, informed consent forms are not required. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Statistical Analysis

The sample size in the study was calculated by power analysis using G-Power (version 3.1.9.6, Franz Faul, Universitat Kiel, Germany). Effect size 0.1; Type 1 error was taken as 0.05 and test power as 0.95, and the total required sample size was determined as at least 1979.

All statistical analyzes in the study were performed using SPSS 25.0 software (IBM SPSS, Chicago, IL, USA). Comparisons between groups in terms of categorical variables were made with the Chi-square test. The results were evaluated within the 95% confidence interval and p values <0.05 were considered significant. Bonferroni correction was made where necessary.

RESULTS

The median age of the patients was 7 (min-max: 0-17), 2809 (57.7%) were male, and 1652 (33.9%) were in the 0-3 age group. The highest referral rate during the day was between the hours of 16-24 (46.6%). A total of 66.5% of referrals were made to tertiary care hospitals. The most frequently referred hospitals were the university hospital (55.1%), children's hospital (30.9%) and training and research hospital (11.4%), and these constituted a total of 97.4% of all referrals. A total of 92.8% of referrals were made to the emergency department. The most common cause for referral was the lack of relevant branch and/or specialist (68.8%) (Table 1).

Table 1. Distribution of pediatric patients referred from the emergency department according to age

	n	%
n	**4870**	**100**
Gender		
Male	2809	57.7
Female	2061	42.3
Age (years)		
0-3	1652	33.9
4-8	1224	25.1
9-13	1005	20.6
14-17	989	20.3
Year admitted		
2019	1266	26.0
2020	1177	24.2
2021	952	19.5
2022	860	17.7
2023	615	12.6
Referred period		
April-september	2507	51.5
October–march	2363	48.5
Referred hour		
08-16	1815	37.3
16-24	2269	46.6
24-08	786	16.1
Referred level		
Secondary care	1631	33.5
Tertiary care	3239	66.5
Referred hospital		
University hospital	2683	55.1
Children's hospital	1504	30.9
Training and research hospital	556	11.4
Private hospital	54	1.1
State hospital	44	0.9
Mental health hospital	21	0.4
Chest diseases hospital	8	0.2
Referred unit		
Emergency room	4519	92.8
Clinics	351	7.2
Cause of referral		
Lack of relevant department or branch specialist	3350	68.8
Advanced testing and treatment	1348	27.7
Bed occupancy	133	2.7
Other	39	0.8

In the distribution of patients referred from our hospital, 22.3% were children, and the rates of pediatric patients referred in 2019 and 2020 were significantly higher compared to other years, and the rate of pediatric patients referred in 2023 was significantly lower (p<0.001). In the study; The rates of patients referred to tertiary care hospitals in 2020 and 2023 were significantly higher than in 2021 and 2022 (p<0.001) (Table 2).

Table 2. Distribution of patients by years and hospital level

	Total patients referred	Pediatric patients referred			Secondary care		Tertiary care		
	n	n	%	p	n	%	n	%	p
p				<0.001					<0.001
2019	4511	1266	28.1		426	33.6	840	66.4	0.89
2020	4017	1177	29.3		350	29.7	827	70.3	0.002
2021	4315	952	22.1		392	41.2	560	58.8	<0.001
2022	4601	860	18.7		329	38.3	531	61.7	0.001
2023	4382	615	14.0		134	21.8	481	78.2	<0.001
Total	21826	4870	22.3		1631		3239		

The most common preliminary diagnosis or findings in referred children were convulsion (11.4%), acute appendicitis (9.0%), abdominal pain (6.2%), drug poisoning (5.8%) and soft tissue injury (% was 4.8). In the 14-17 age group, the rate of those referred due to convulsion, trauma and ileus was significantly lower compared to other groups, while the rate of those referred due to drug poisoning, traffic accident, chest pain, pneumothorax, sharp object injury and electric shock was significantly higher (p<0.05 for each). The rate of those referred due to acute appendicitis and anxiety disorder was found to be significantly higher in the 9-13 and 14-17 age groups compared to the other groups (p<0.05 for both). The rate of those referred due to fever, chemical exposure, ileus, foreign body aspiration or ingestion, respiratory failure, acute gastroenteritis and gastrointestinal hemorrhage was significantly higher in the 0-3 age group compared to other groups (p<0.05 for each). In this group, the rate of those referred due to acute appendicitis, traffic accident, diabetes mellitus, fracture, arrhythmia and electric shock was found to be significantly lower than the other groups (p<0.05 for each) (Table 3).

Referral rates to secondary care hospitals were found to be significantly higher in cases of acute appendicitis, abdominal pain, nausea and vomiting, chemical exposure, respiratory tract infection, ileus, acute gastroenteritis and testicular torsion (p<0.05 for each). In cases such as drug poisoning, soft tissue injury, fall, fever, trauma, traffic accident, burn, foreign body aspiration or ingestion, pneumothorax, fracture and head trauma, the rates of patients referred to the tertiary care were significantly higher than those referred to the secondary care (each for p<0.05) (Table 4).

In the period between April and September, the rates of those referred to tertiary care, those with drug poisoning and falls were significantly higher compared to the October - March period, while the rates of those referred to children's hospitals, acute appendicitis, soft tissue injuries and traffic accident cases were significantly lower (p< for each 0.05) (Table 5).

Among those referred in the 8-16 hour period during the day, the rate of children in the 0-3 age group was significantly higher than other age groups, and the rates of 9-13 and 14-17 age groups were found to be significantly higher in the

Table 3. Distribution of referred patients according to preliminary diagnosis or findings

	Total		Age groups (years)								
			0-3		4-8		9-13		14-17		
	n	%	n	%	n	%	n	%	n	%	p
Convulsion	556	11.4	209	12.7	167	13.6	144	14.3	36	3.6	<0.001
Acute appendicitis	439	9	8	0.5	104	8.5	177	17.6	150	15.2	<0.001
Stomach ache	302	6.2	52	3.1	75	6.1	94	9.4	81	8.2	<0.001
Drug poisoning	282	5.8	118	7.1	38	3.1	20	2.0	106	10.7	<0.001
Soft tissue injury	232	4.8	74	4.5	81	6.6	39	3.9	38	3.8	0.004
Fall	194	4	72	4.4	74	6.0	28	2.8	20	2.0	<0.001
Fever	191	3.9	124	7.5	40	3.3	17	1.7	10	1.0	<0.001
Nausea and vomiting	179	3.7	68	4.1	43	3.5	43	4.3	25	2.5	0.127
Chemical exposure	172	3.5	129	7.8	27	2.2	10	1.0	6	0.6	<0.001
Respiratory tract infection	167	3.4	101	6.1	47	3.8	10	1.0	9	0.9	<0.001
Trauma	162	3.3	53	3.2	55	4.5	35	3.5	19	1.9	0.01
Ileus	156	3.2	83	5.0	46	3.8	24	2.4	3	0.3	<0.001
Traffic accident	153	3.1	23	1.4	48	3.9	28	2.8	54	5.5	<0.001
Burn	104	2.1	64	3.9	29	2.4	7	0.7	4	0.4	<0.001
Foreign body aspiration ingestion	94	1.9	50	3.0	14	1.1	18	1.8	12	1.2	0.001
Respiratory failure	91	1.9	66	4.0	13	1.1	6	0.6	6	0.6	<0.001
Diabetes mellitus	73	1.5	4	0.2	26	2.1	20	2.0	23	2.3	<0.001
Chest pain	67	1.4	3	0.2	10	0.8	8	0.8	46	4.7	<0.001
Syncope	63	1.3	19	1.2	18	1.5	13	1.3	13	1.3	0.903
Pneumothorax	49	1	0	0.0	0	0.0	0	0.0	49	5.0	<0.001
Fracture	46	0.9	4	0.2	22	1.8	13	1.3	7	0.7	0.004
Acute gastroenteritis	46	0.9	26	1.6	7	0.6	10	1.0	3	0.3	<0.001
Gastrointestinal hemorrhage	38	0.8	21	1.3	5	0.4	4	0.4	8	0.8	0.026
Testicular torsion	37	0.8	12	0.7	13	1.1	4	0.4	8	0.8	0.35
Bleeding disorder	36	0.7	17	1.0	11	0.9	4	0.4	4	0.4	0.217
Head injury	36	0.7	16	1.0	11	0.9	6	0.6	3	0.3	0.143
Falling from high	35	0.7	20	1.2	0	0.0	5	0.5	10	1.0	<0.001
Anxiety disorder	35	0.7	0	0.0	0	0.0	15	1.5	20	2.0	0.001
Gunshot wound	34	0.7	11	0.7	7	0.6	4	0.4	12	1.2	0.145
Bleeding	33	0.7	8	0.5	19	1.6	2	0.2	4	0.4	<0.001
Anemia	33	0.7	8	0.5	0	0.0	18	1.8	7	0.7	<0.001
Cerebral palsy	31	0.6	2	0.1	27	2.2	2	0.2	0	0.0	<0.001
Hyperglycemia	28	0.6	2	0.1	3	0.2	15	1.5	8	0.8	<0.001
Single finger amputation	27	0.6	9	0.5	4	0.3	8	0.8	6	0.6	0.519
Sharps injury	24	0.5	0	0.0	2	0.2	3	0.3	19	1.9	0.029
Arrhythmia	24	0.5	2	0.1	11	0.9	5	0.5	6	0.6	<0.001
Electric shock	20	0.4	2	0.1	6	0.5	3	0.3	9	0.9	0.019
Foreign body in eye	19	0.4	9	0.5	4	0.3	6	0.6	0	0.0	0.106
Other	562	11.5	163	9.9	117	9.6	137	13.6	145	14.7	<0.001

Table 4. Distribution of preliminary diagnoses according to the referral step

	Secondary care		Tertiary care		
	n	%	n	%	p
Convulsion	172	10.5	384	11.9	0.175
Acute appendicitis	394	24.2	45	1.4	<0.001
Stomach ache	214	13.1	88	2.7	<0.001
Drug poisoning	21	1.3	261	8.1	<0.001
Soft tissue injury	20	1.2	212	6.5	<0.001
Fall	15	0.9	179	5.5	<0.001
Fever	40	2.5	151	4.7	<0.001
Nausea and vomiting	105	6.4	74	2.3	<0.001
Chemical exposure	75	4.6	97	3.0	0.004
Respiratory tract infection	80	4.9	87	2.7	<0.001
Trauma	20	1.2	142	4.4	<0.001
Ileus	129	7.9	27	0.8	<0.001
Traffic accident	2	0.1	151	4.7	<0.001
Burn	2	0.1	102	3.1	<0.001
Foreign body aspiration-ingestion	20	1.2	74	2.3	0.011
Respiratory failure	24	1.5	67	2.1	0.147
Diabetes mellitus	19	1.2	54	1.7	0.173
Chest pain	22	1.3	45	1.4	0.909
Syncope	18	1.1	45	1.4	0.405
Pneumothorax	6	0.4	43	1.3	0.002
Acute gastroenteritis	23	1.4	23	0.7	0.017
Fracture	0	0.0	46	1.4	<0.001
Gastrointestinal hemorrhage	12	0.7	26	0.8	0.802
Testicular torsion	25	1.5	12	0.4	<0.001
Head injury	0	0.0	36	1.1	<0.001
Bleeding disorder	0	0.0	36	1.1	<0.001
Anxiety disorder	16	1.0	19	0.6	0.124
Falling from high	2	0.1	33	1.0	<0.001
Gunshot wound	0	0.0	34	1.0	<0.001
Anemia	0	0.0	33	1.0	<0.001
Bleeding	16	1.0	17	0.5	0.067
Cerebral palsy	0	0.0	31	1.0	<0.001
Hyperglycemia	14	0.9	14	0.4	0.063
Single finger amputation	0	0.0	27	0.8	<0.001
Arrhythmia	12	0.7	12	0.4	0.087
Sharps injury	2	0.1	22	0.7	0.009
Electric shock	4	0.2	16	0.5	0.200
Foreign body in eye	0	0.0	19	0.6	0.006
Other	107	6.6	455	14.0	<0.001
Total	1631	100	3239	100	

24-08 hour period (p<0.001). The rate of referral to tertiary care hospitals between the hours of 16-24 was significantly higher than other time periods (p<0.001). The rate of referral to emergency services between 8-16 period was found to be significantly higher than other time periods (p<0.001). The rate of those referred due to the absence of a relevant branch or specialist physician between 24-08 was significantly higher than other time periods, and the rate of those requiring further examination and treatment was significantly lower (p<0.001) (Table 5).

The rate of those referred due to convulsions and acute appendicitis between the hours of 24-08 was significantly higher compared to other time periods, while the rates of those referred due to soft tissue injuries, falls and trauma were significantly lower (p<0.05 for each).

Between the hours of 8-16, the rate of those referred due to abdominal pain, fever, nausea and vomiting was significantly higher compared to other periods, while the rate of those referred due to traffic accident was significantly lower (p<0.05 for each). The rate of those referred due to drug poisoning between the hours of 16-24 was significantly higher compared to other periods (p<0.05 for each) (Table 5).

DISCUSSION

The characteristics of pediatric patients who are brought to the emergency department and transferred to a hospital with more facilities after first aid vary depending on many factors.[1-3] In this study, the relationship between many factors regarding pediatric patients referred from the emergency department has been demonstrated.

The coronavirus disease 2019 (COVID-19) pandemic had a significant impact on pediatric patient referrals in 2020 and 2021.[8,9] In the present study, 22.3% of all referred patients in total were children, and the rates of pediatric patients referred in 2019 and 2020 were similar to other years. It was found that the rate of pediatric patients referred in 2023 was significantly higher than the previous year. In addition, the rates of patients referred to tertiary care hospitals in 2020 and 2023 were found to be significantly higher than in 2021 and 2022. These findings may indicate that during the COVID-19 pandemic, the impact of which was felt intensely in 2021 and 2022, various reasons such as the increase in the density of hospitals due to COVID-19, the reduction of routine patient admissions and planned operations, and the public not going to hospitals unless necessary, affected pediatric patient referral rates.

Although some criteria are suggested for the referral of pediatric patients who apply to the emergency department, there is variability in practices.[10,11] Urkin et al.[10] reported that 32% of pediatric patients were referred due to urgent further examination. Ezhumalai et al.[11] reported that one of the most common reasons for referral was consultation with the relevant specialist physician, with a rate of 40.5%. In the present study, the most common reason for referral was found to be the absence of the relevant branch and/or specialist, and other common reasons were the purpose of further examination, bed occupancy, and lack of the relevant imaging method. These findings show that the lack of branch and specialist medicine or relevant special units in small-scale hospitals is the main factor in referrals. In addition, although there is a specialist physician, reasons such as not having sufficient facilities to provide treatment to the relevant patient or limited accessibility to the specialist physician may also have increased the number of such referrals. In the present study, it was observed that 92.8% of referrals were made to emergency rooms. This finding shows that referral cases mostly involve real urgency. In addition, the idea that the referred emergency

Table 5. Distribution of some variables according to the shipping period and the shipping time of the day

	Referred period					Referred hour						
	April-september		October-march			08-16		16-24		24-08		
	n	%	n	%	p	n	%	n	%	n	%	p
n	2507		2363			1815		2269		786		
Gender					0.522							0.562
Male	1435	57.2	1374	58.1		1036	57.1	1327	58.5	446	56.7	
Female	1072	42.8	989	41.9		779	42.9	942	41.5	340	43.3	
Age (years)					0.073							<0.001
0-3	840	33.5	812	34.4		694	38.2	726	32.0	232	29.5	<0.001
4-8	651	26.0	573	24.2		438	24.1	632	27.9	154	19.6	<0.001
9-13	487	19.4	518	21.9		343	18.9	447	19.7	215	27.4	<0.001
14-17	529	21.1	460	19.5		340	18.7	464	20.4	185	23.5	0.019
Referred level					<0.001							<0.001
Secondary care	729	29.1	902	38.2		682	37.6	363	28.0	313	39.8	
Tertiary care	1778	70.9	1461	61.8		1133	62.4	1633	72.0	473	60.2	
Referred hospital					<0.001							<0.001
University hospital	1459	58.2	1224	51.8	<0.001	937	51.6	1324	58.4	422	53.7	<0.001
Children's hospital	685	27.3	819	34.7	<0.001	633	34.9	578	25.5	293	37.3	<0.001
Training and research hospital	319	12.7	237	10.0	0.003	196	10.8	309	13.6	51	6.5	<0.001
Private hospital	24	1.0	30	1.3	0.298	24	1.3	18	0.8	12	1.5	0.131
State hospital	8	0.3	36	1.5	<0.001	17	0.9	22	1.0	5	0.6	0.761
Mental health hospital	12	0.5	9	0.4	0.271	2	0.1	16	0.7	3	0.4	0.015
Chest diseases hospital	0	0.0	8	0.3	0.015	6	0.3	2	0.1	0	0.0	0.184
Referred unit					0.556							<0.001
Emergency room	2321	92.6	2198	93.0		1734	95.5	2067	91.1	718	91.3	
Clinics	186	7.4	165	7.0		81	4.5	202	8.9	68	8.7	
Reason for referral					0.098							<0.001
Lack of relevant department or branch specialist	1763	70.3	1587	67.2		1260	69.4	1506	66.4	584	74.3	<0.001
Advanced testing and treatment	664	26.5	684	28.9		504	27.8	675	29.7	169	21.5	<0.001
Bed occupancy	63	2.5	70	3.0		35	1.9	71	3.1	27	3.4	0.027
Other	17	0.7	22	0.9		16	0.9	17	0.7	6	0.8	0.888
Preliminary diagnoses												
Convulsion	284	11.3	272	11.5	0.841	174	9.6	258	11.4	124	15.8	<0.001
Acute appendicitis	190	7.6	230	9.7	0.007	124	6.8	168	7.4	128	16.3	<0.001
Stomach ache	144	5.7	158	6.7	0.173	155	8.5	98	4.3	49	6.2	<0.001
Soft tissue injury	115	4.6	167	7.1	<0.001	87	4.8	140	6.2	5	0.6	<0.001
Drug poisoning	146	5.8	86	3.6	<0.001	76	4.2	161	7.1	45	5.7	<0.001
Fall	141	5.6	53	2.2	<0.001	82	4.5	99	4.4	13	1.7	0.001
Traffic accident	86	3.4	105	4.4	<0.001	40	2.2	82	3.6	31	3.9	0.014
Trauma	78	3.1	101	4.3	<0.001	69	3.8	88	3.9	5	0.6	<0.001
Fever	114	4.5	58	2.5	0.069	100	5.5	62	2.7	29	3.7	<0.001
Chemical exposure	107	4.3	55	2.3	<0.001	66	3.6	85	3.7	21	2.7	0.355
Nausea and vomiting	127	5.1	26	1.1	0.031	110	6.1	44	1.9	25	3.2	<0.001
Respiratory tract infection	23	0.9	92	3.9	<0.001	48	2.6	46	2.0	21	2.7	0.357
Fracture	24	1.0	22	0.9	0.925	13	0.7	28	1.2	5	0.6	0.146

service will be responsible for referral to the relevant branch or specialist physician may have increased the frequency of referral to the emergency department.

The time when pediatric patients are brought to the hospital is important in terms of approach to the patient and prognosis.[12,13] In the present study, it was found that the highest referral rate during the day was made between the hours of 16-24 (46.6%). In addition, referral rates to both tertiary care hospitals and emergency departments between the hours of 16-24 were found to be significantly higher compared to other time periods. These findings may be due to the increase in the number of pediatric patients brought to the emergency department and requiring referral during the time period when it is more difficult to reach specialist physicians after working hours but social life continues. This may also be due to the fact that patients brought during working hours tend to go to outpatient clinics rather than the emergency department, but this may mean that the cases in question are not urgent. However, in the study, the rate of children aged 0-3 among those referred in the 8-16 time period was found to be significantly higher than other age groups, and in the 24-08 time period, the rates of age groups over 13 years of age were found to be significantly higher. These findings may have been caused by the fact that children who were old enough to be cared for by their mothers or a caregiver were brought to the emergency department during working hours. The fact that referral rates in older age groups occur after midnight may be due to the fact that hospital facilities are at their lowest level at that time rather than the increase in the number of patients.

The rate of patients referred between 24-08 due to the absence of a relevant branch or specialist physician was found to be significantly higher compared to other time periods, and the rate of patients referred due to advanced examination and treatment was found to be significantly lower. Although referral rates are higher between late working hours and midnight, the main reason for referral after midnight may be that the possibility of further examination is much less at that time than after working hours.For this reason, there was a significant decrease in referrals for further examination after midnight, and accordingly, the other reason, which was the lack of a relevant physician or branch, may have become more prominent.

In the present study, it was observed that the rate of those referred due to convulsions and acute appendicitis between the hours of 24-08 was significantly higher compared to other time periods. The main reason for this may be that these cases are unexpected, sudden and emergency situations, and that the cases are of such severity that they need to be referred urgently, rather than the increase in the number of such patients at those hours. The rate of those referred due to abdominal pain, fever, nausea and vomiting between the hours of 8-16 and the proportion of those referred due to drug poisoning between the hours of 16-24 was found to be significantly higher compared to other periods. The rate of those referred due to traffic accidents was found to be significantly lower between the hours of 8-16 compared to other groups. It is expected that the frequency of traffic accidents will be lower during working hours when the child is at school or when young children are with a caregiver at home. Drug poisoning may be caused by the time period when the child who is at home after school hours is more likely to take medication.

Pediatric patients brought to the emergency departments of small-scale secondary care hospitals are most frequently referred to tertiary care hospitals or second-level children's hospitals.[1,2,6,7] In the present study, 66.5% of the referrals were made to tertiary care hospitals. The most frequently referred hospital types are university hospitals (55.1%), children's hospitals (30.9%) and training and research hospitals (11.4%), and these hospitals accounted for 97.4% of the total referral cases. These findings show that emergency pediatric cases are most frequently referred to large or superior health centers where the number of specialist physicians and facilities are greater. However, it has been determined that some cases in critical condition are referred to nearby public or private hospitals in order to avoid wasting time, and some cases are referred to branch hospitals.

In the present study, the most common preliminary diagnosis or findings in referred children were convulsion (11.4%), acute appendicitis (9.0%), abdominal pain (6.2%), drug poisoning (5.8%) and soft tissue injury (4.8%). These findings suggest that these diseases are at a higher frequency and that the patient may have been presented with a referral condition. In the present study, referral rates to secondary care hospitals were found to be significantly higher in cases of acute appendicitis, abdominal pain, nausea and vomiting, chemical exposure, respiratory tract infection, ileus, acute gastroenteritis and testicular torsion. This may be due to the fact that some of these cases may have been presented with a clinical condition serious enough to require urgent referral to the nearest large institution, while some may have resulted from the thought that extensive examination was not necessary. In the present study, it was observed that the rates of patients referred to the third step were significantly higher than those referred to the second step in cases such as drug poisoning, soft tissue injury, fall, fever, trauma, traffic accident, burn, foreign body aspiration or ingestion, pneumothorax, fracture and head trauma. These findings may indicate that these cases are likely to be in a clinical situation that will require extensive and advanced intervention rather than being a case of urgency regardless of the step of referral.

In the present study, the rate of those referred to tertiary care in the period between april and september was found to be significantly higher compared to the period between october and march, and the rate of those referred to the children's hospital was found to be significantly lower. This may be due to the increase in the frequency of cases requiring referral to larger hospitals, rather than advanced and comprehensive intervention, especially during the school period. In the present study, the rates of drug poisoning and falls in the period between april and september were found to be significantly higher compared to the period between october and march, while the rates of acute appendicitis, soft tissue injuries and traffic accidents were significantly lower. This may be due to seasonal and social conditions, such as traffic congestion during the cold season and when work-school life increases, and the increase in the frequency of falls due to children spending more time outdoors during the summer holiday period.

Acute appendicitis is one of the most common surgical emergencies in children.[14] It has been stated that in cases of appendicitis in children, patients under the age of 5 should be referred to pediatric surgery, and those who are older should be referred to pediatric or general surgery.[14,15] It has been reported that 68% of these cases are operated on by general surgeons.[16,17]

In the present study, acute appendicitis was one of the most frequently referred cases from the emergency department. It has been observed that these cases are more frequently referred to secondary care hospitals, especially in the October-March period and between 24-08 hours. This supports the fact that the frequency of acute appendicitis shows such a temporal change. One reason for this is that the increase in respiratory tract infections in this period is included in the etiology of appendicitis, and in the present study, the rate of respiratory tract infections is higher in the October-March period. In addition, it may be due to the increased awareness of the patient's situation by his family in these time periods or the fact that intervention opportunities in the hospital are more limited in those periods. In the study, the rate of those referred due to acute appendicitis was found to be significantly higher in the 9-13 and 14-17 age groups compared to other groups, and significantly lower in the 0-3 age group. This may be related to the age at which acute appendicitis occurs.

Abdominal pain is a common reason for admission to the emergency department in children of all ages.[18,19] Olympia et al.[18] reported that the most frequently referred cases from the emergency department in children were abdominal pain cases with a rate of 18%, but the rate of unnecessary referral in these cases was higher than other reasons. In their study in Canada, Reiner et al.[19] reported that the rate of abdominal pain among pediatric patients coming from the referral emergency department to the regional pediatric emergency department was 5.1%. Abdominal pain was seen in 6.2% of the children referred in the present study. In the study, it was determined that referrals due to abdominal pain were at least in the 0-3 age range, abdominal pain cases were significantly referred to secondary care hospitals, and referrals due to abdominal pain were higher, especially during working hours, compared to other time periods. These findings may indicate that cases of abdominal pain are common, especially from the age at which this complaint can be expressed, and that they are most likely brought to the hospital during school hours or during the time period of the caregiver. These findings may also indicate that abdominal pain cases are more often referred to secondary care with the thought that they will not require further examination.

Convulsion is among the most common reasons for admission to the emergency department in children and can be a cause of significant morbidity.[20] In the present study, the most frequent referral rate was seen in convulsion cases. Additionally, it was found that the rate of patients referred due to convulsions was significantly lower in the 14-17 age group compared to other groups. In terms of referral rates of convulsion cases, no difference was detected in terms of seasonal and daytime periods and referral steps. These findings generally show that convulsions are common in all ages except older children and that no difference is taken into consideration when referring cases.

Bone fractures are a common cause of emergency admission in children. Although intervention in the emergency room is often sufficient in fracture cases, specialist intervention is required in many cases. In some cases, advanced intervention may be required.[18,19,21,22] Ramasu et al.[22] showed that 30% of pediatric fracture cases presenting to the emergency department were referred unnecessarily. In their study in Canada, Reiner et al.[19] reported that the rate of fracture cases among pediatric patients referred to the regional pediatric emergency department from other emergency services was 15.8%. Olympia et al.[18] reported this rate as 12%. In the present study, fracture cases constituted 0.9% of all referred children. These inconsistencies arise from the difference in population and hospital size between studies and show the difference between the referral criteria of small-scale hospitals and large-scale hospitals. In the present study, it was determined that all referred fracture cases were sent to tertiary care hospitals. This finding shows that advanced and comprehensive intervention is required in all fracture cases that can be referred. The study also found that referred fracture cases did not vary according to seasonality and daytime. In addition, it was observed that the rate of cases referred due to fracture was significantly lower in the 0-3 age group and significantly higher in the 4-8 age group compared to other groups. This may be due to the fact that younger children experience fewer fractures due to their bone structure, and most likely because children in the 4-8 age group are much more active.

Although fever is very common in children, it can be an indicator of some very serious emergency situations, and in cases of feverish children, rapid intervention and differential diagnosis must be made.[10,23] Urkin et al.[10] reported that 12% of referred pediatric patients were referred due to fever, which required immediate intervention. Olympia et al.[18] reported that fever cases constituted 9% of referred children. Evans et al.[24] reported this rate as 4.6%. In their study in Canada, Reiner et al.[19] reported the infection rate as 4% among pediatric patients who came from the referral emergency department to the regional pediatric emergency department. In the present study, those referred due to fever constituted 3.9% of all patients. In the present study, the rate of those referred due to fever was found to be significantly higher in the 0-3 age group compared to other groups. It was also found that the rate of referral to tertiary care hospitals due to fever was significantly higher. These findings show that these cases are referred to higher centers and at a higher rate due to the fever seen in younger children and the fact that infants are faced with many serious infections during the development of immunity.

It has been shown that the referral status in children brought to the emergency department is significantly related to the child's age.[25] In the present study, the rate of those referred due to drug poisoning, traffic accidents, sharp object injuries and electric shock was found to be significantly higher in the 14-17 group. The rate of people referred due to anxiety disorders was found to be significantly higher in the 9-13 and 14-17 age groups compared to other groups. This is related to the fact that these findings and preliminary diagnoses are seen mostly in older children. In the present study, the rate of those referred due to chemical exposure, ileus, foreign body aspiration or ingestion, respiratory failure, acute gastroenteritis and gastrointestinal hemorrhage was found to be significantly higher in the 0-3 age group compared to other groups. This is related to the fact that these findings and preliminary diagnoses are seen mostly in young children. Similarly, the rate of those referred due to traffic accidents, diabetes mellitus, arrhythmia and electric shock, which are not common in young children, was found to be significantly lower than other groups.

Limitations

The fact that our hospital's facilities and specialist physician diversity change rapidly over time and that this cannot be clearly distinguished, and that pediatric patient referrals depend on both the patient, the physician's condition at that

moment, and many different factors during the day, have made analysis difficult. However, the fact that the present study was conducted on a number of nearly five thousand patients, which is rare in the literature, may have minimized the possibility of errors in the analysis. In the present study, since mortality data on referred children was not available, an analysis could not be made in this regard.

CONCLUSION

The findings obtained from this study, which is one of the rare studies in the literature as far as we can reach, has showed that the most frequently referred cases in pediatric patients are acute appendicitis, convulsion and abdominal pain, that the majority of referrals are made to tertiary care hospitals and especially emergency services, that the lack of a relevant branch or specialist physician is the most common reason for referrals, and that the preliminary diagnosis of the patients, the patient's age and the time of admission significantly direct the referral characteristics.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Samsun University Clinical Researches Ethics Committee (Date: 03.01.2024, Decision No: 2024/1/4).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Comparison of the efficacy of two different doses of low-dose bupivacaine for spinal anesthesia in patients undergoing cesarean operations on anesthesia quality and intraoperative hemodynamic parameters

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ABSTRACT

Aims: The primary aim of this study was to investigate the effects of two different low-dose bupivacaine used in cesarean operations on intraoperative hemodynamic parameters, and the secondary aim was to evaluate the time of anesthesia onset, motor block scores, and the need for vasopressor agent.

Methods: This prospective randomized double-blind study was performed on 72 pregnant women who underwent cesarean surgery. We randomized the patients into two groups, Group A and Group B, and performed a combined spino-epidural anesthesia. Group A received a solution containing 5 mg isobaric bupivacaine+15µg fentanyl+0.5 isotonic (total volume 1.8 ml) and Group B received a solution containing 7.5 mg bupivacaine+15µg fentanyl (total volume 1.8 ml) over a period of 30 seconds. Vital signs were recorded before the spinal anesthesia and perioperatively. Demographic data, hemodynamic parameters, vital signs and side effects, operation duration, time interval from spinal injection to placement in the supine position, Apgar scores, time interval from spinal injection to delivery, analgesia duration, the degree of motor block immediately before the surgery and at the end of the operation, maximum block level, time for sensory block to reach T6 dermatome level after spinal injection and postoperative side effects were recorded. We recorded the postoperative time to resolution of motor block and the time to regression of sensory block to T10.

Results: There was no statistically significant difference between the two groups in terms of demographic data, anesthesia duration, surgery duration, time interval from spinal injection to placement in the supine position, time interval from spinal injection to delivery, analgesia duration, time for sensory block to reach T10, T6, and T4 dermatomes, 1- and 5-minute (min) Apgar scores, and preoperative Bromage scores. While the mean time to resolution of motor block was 159.69±65.72 min in Group B, the mean time to resolution of motor block was 123.13±64.93 min in Group A and the difference was statistically significant (p=0.02). Hypotension was observed in 19 patients (52.77%) in group A and 29 patients (80.55%) in group B (p=0.012). A statistically significant difference was detected between the two groups in terms of the need for vasopressor agent and the amount of ephedrine used (p=0.012, p=0.021, respectively). Postoperative Bromage score was 1.25±0.93 in group A while it was 2.47±1.27 in group B (p=0.000).

Conclusion: In patients undergoing CS, we found that intrathecal administration of 5 mg isobaric bupivacaine combined with 15 mcg fentanyl and 0.5 ml isotonic not only provided adequate anesthesia but also better-preserved hemodynamic stability and significantly shortened the time to resolution of motor block. We believe that this dose can be used safely in patients undergoing CS. Further studies using varying intrathecal bupivacaine doses are necessary to validate our findings.

Keywords: Cesarean, spinal anesthesia, low-dose bupivacaine, hemodynamics

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INTRODUCTION

Spinal anesthesia (SA) is currently the most commonly used regional anesthesia technique for cesarean section (CS) procedures, as it provides a rapid and intense sensory block.[1] Spinal anesthesia-induced hypotension is the most commonly observed complication. Intraoperative hypotension causes nausea, dizziness, and impaired utero-placental blood flow in the mother and may lead to neonatal acidosis and fetal death.[2-4] In the recent years, the use of combined spino-epidural anesthesia has become increasingly common in CS procedures.

In the application of combined spinal-epidural anesthesia (CSEA), different techniques in terms of both the dosage and administration of medications are used by clinicians. Techniques such as administration of low-dose local anesthetics, combined use of local anesthetics and opioids, and epidural volume extension have been used. One of these techniques is the use of low-concentration medication in spinal anesthesia, and if this medication is inadequate, elevation of anesthesia level by subsequently administering epidural fluids. It is unclear whether epidural fluid administered together with low-dose spinal anesthesia affects the onset of anesthesia. This method may not be suitable for emergency cesarean delivery, which requires more rapid action. While the use of low-dose local anesthetic in CSEA might decrease the severity of hypotension, it might lead to intraoperative pain and shorter anesthesia duration.[5-7] Providing effective analgesia after CS enables the mother to be active and free depending on the needs of the newborn infant and allows the mother to be psychologically better.[6]

Bupivacaine is the most commonly used agent in cesarean operation, and while hyperbaric and hypobaric bupivacaine provides effective anesthesia and adequate analgesia duration, its high doses are associated with hypotension.[3,8] Use of low-dose bupivacaine decreases hypotension and nausea but leads to shorter motor block and analgesia duration.[9,10] Use of intratechal opioid in combination with low-dose bupivacaine (5-9 mg) can provide adequate anesthesia and leads to less hemodynamic changes.[5,10,11]

In this study, the aim was to evaluate the effect of two different low-dose bupivacaine in combined spino-epidural anesthesia in cesarean operations on intraoperative hemodynamics. The primary aim was to assess the need for ephedrine, and the secondary aim was to evaluate the time of anesthesia onset, motor block scores and the need for a vasopressor agent.

METHODS

For this prospective randomized double-blind study, Atatürk University, Faculty of Medicine Research Hospital Clinical Researches Ethics Committee approval (Date: 28.09.2017, Decision No: 8) and verbal informed consent of the patients were obtained. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. The study was performed on 72 pregnant women between 16-50 years of age, who were ASA II, between 150-180 cm height, had a BMI<40 kg/m², and were planned to undergo elective cesarean operation. Those with a history of emergency obstetric surgery, pregnancy-induced hypertension, severe systemic disease, multiple gestations, fetal or placental abnormalities, hypersensitivity or allergy, contraindications to neuroaxial anesthesia, impaired coagulation, infection at the injection site, and refused to participate into the study were excluded from the study. Patients were transferred to operation room and routine monitoring comprising electrocardiogram (ECG), peripheric oxygen saturation (SpO_2) and non-invasive blood pressure was performed. Using 18 G branula, intravenous (IV) vascular access was established. During the surgery, Isolyte S was administered at an infusion rate of 10 ml/kg/h, but no preload and co-load fluids were administered. Using sealed envelope system, randomization was performed and the patients were randomly divided into two groups, group A and group B. The using needle-through-needle technique, combined spino-epidural anesthesia was administered to pregnant women while in seated position. The skin was sterilized and local infiltration was performed using 2% lidocaine. Using loss-of-resistance technique, 18 Gauge Tuohy needle (BBraunPerican® 88x1.3 mm, Melsungen/Germany) was inserted using midline approach between L3-L4 or L4-L5, and epidural space was identified. Then, dura was punctured by inserting a 27 Gauge pencil point needle (BBraunPencan® 138.5x0.42 mm, Melsungen/Germany) through the Tuohy needle. After observing the flow of cerebrospinal fluid, a solution containing 5 mg isobaric bupivacaine+15 µg fentanyl+0.5 ml isotonic was administered to Group A and a solution containing 7.5 mg bupivacaine+15 µg fentanyl was administered to Group B through the spinal needle over a period of 30 seconds. Spinal needle was removed. Through the Tuohy needle, epidural catheter (20 G BBraunPerifix® 1000X0.45 mm, Melsungen/Germany) was inserted 3 cm into the epidural space. Patients were immediately made to lie supine with a wedge beneath the right hip, to tilt the pelvis 15° to the left. Using a chronometer, procedure durations were recorded. Other researchers collecting intraoperative and postoperative data were blind to the group of the patient they evaluated. During the operation, the room temperature was maintained at 24°C. In order to conserve the patients' body temperature, warming blankets were used, and all fluids administered during the surgery were at room temperature. Oxygen was administered via a face mask at a flow rate of 4 l/min to the patients in the supine position.

Patients' blood pressure and heart rate were recorded before the administration of spinal anesthesia, and these values were considered basal values. The same parameters were recorded every 2 minutes (min) within the first 20 min after spinal anesthesia, and then, every 15 min until the surgery was over. Hypotension was described as systolic blood pressure dropping below 20% of the basal value, and when hypotension occurred, 5 mg ephedrine was administered initially. When perfusion could not be restored, 3 mg ephedrine was administered every 2 minutes until normal blood pressure was restored. Bradycardia was described as a heart rate below 50 beats/min and when it occurred, it was treated with 1 mg iv atropine.

Sensory block level was assessed using cold discrimination by examining the respective dermatomes when the patient was placed in supine position after applying the coolpack bilaterally at 1-minute intervals until the sensory block level reached T6, and then at 2-minute intervals until the maximum block level was attained. If the sensory block level did not reach T6 or if the patient felt pain during the skin incision, spinal anesthesia was considered unsuccessful. In that case, 5 ml of a solution containing 15 ml 2% lidocaine+2 ml bicarbonate+2 ml fentanyl+1 ml 1/200000 adrenaline (Lidocaine-Aritmal® 2% ml ampulla, 100 mg, Osel İlaç Sanayi, İstanbul, Turkiye/Fentanyl-Talinat® 10 ml ampulla, 0.5 mg, Vem İlaç, İstanbul, Turkiye/

Bicarbonate-Sodium Bicarbonate 8.4% molar 10 ml, Galen İlaç, İstanbul/ Adrenaline- Adrenaline ¼ mg 1 ml, Galen İlaç, İstanbul) was administered via epidural catheter. If adequate block could not be attained despite the administration of this solution, general anesthesia was used, and the patient was excluded from the study.

The efficacy of anesthesia was evaluated based on criteria including the motor block of the patient's lower extremity, muscle relaxation, and whether the patient felt pain during the skin incision and abdominal exploration. Motor block was identified based on the following criteria: 0=able to lift extended leg; 1=able to freely flex the knee; 2=unable to flex the knee but can move the ankle; 3=unable to move the ankle but toes are still active; 4=no movement at the lower extremity.

Muscle relaxation was evaluated using a subjective scale based on the surgeon's comments: good (satisfactory), poor (insufficient but operation is possible), very poor (more anesthetic interventions are required to continue the operation).

Pain during skin incision and abdominal exploration was graded as none, moderate (tolerable pain) and severe (intolerable pain). When the patient felt abdominal pain or discomfort during the surgery, administration of 50 µg fentanyl was planned.

Parameters such as demographic data, intraoperative hemodynamics, intraoperative and postoperative complications, need for vasopressor agents, operation, anesthesia, and analgesia (time from spinal injection to onset of pain and time until the need for analgesics) were recorded. Additionally, spinal time from injection to placement in the supine position, pain, abdominal discomfort, 1- and 5-minute appearance, pulse, grimace, activity and respiration (APGAR) scores, time from spinal injection to birth, degree of motor block just before and after surgery, time to resolution of motor block (time to move both legs), maximum block level, time for sensory block to reach T6 dermatome level after spinal injection, and the need for epidural drug application were recorded. Postoperatively, the patient was transferred to PACU, and sensory and motor block levels were assessed at every 15 minutes. The time to resolution of motor block and the time to regression of sensory block to T10, time to lift extended leg, and the time to the onset of pain were recorded.

Statistics Analysis

The primary aim of this study was to reduce the need for ephedrine. In the preliminary study performed for this purpose, it was found that the difference between the arithmetic means of the amounts of ephedrine used in group A and B was 3.30 mg, and the standard deviation was 4.30 in group A and 4.79 in group B. Assuming an α=0.05, β=0.20, with a power of 80%, the number of patients per group was calculated as 32. In our study, we included 36 patients in each of the two groups.

For statistical analyses, SPSS 22 software package (IBM, Armonk, New York, USA) package was used. Numerical data were presented as mean and standard deviation, categorical data were presented as numbers and percentages. If conditions for parametric analysis were met when analyzing numerical data and intergroup differences, Independent Samples T test was used, if not, the Mann-Whitney U test was used, and when analyzing categorical data, the chi-square test was used. A p value <0.05 was considered statistically significant.

RESULTS

A total of 72 patients were included in the study. There was no difference between the groups in terms of demographic data, operation duration, and anesthesia duration (p>0.05). Analgesia duration was 166.09±64.93 min in group A whereas it was 166.09±64.93 min in group B, and there was no statistically significant difference between the groups in terms of analgesia duration (p>0.65). Time to motor block resolution was 123.13±64.93 min in group A while it was 159.69±65.72 min in group B. Time to motor block resolution for pregnant women in group A was statistically significantly shorter than Group B (p=0.02, Table 1).

Table 1. Demographic characteristics, anesthesia duration, operation duration analgesia duration and time to resolution of motor block

	Group A (n=36)	Group B (n=36)	p
Age (years)	31.38±5.07	31.36±4.98	0.981
Height (cm)	161.44±6.13	163.05±5.65	0.250
Weight[27]	77.52±10.86	77.02±9.03	0.832
BMI (kg/m²)	29.70±3.86	29.02±3.35	0.428
Anesthesia duration (min)	52.30±11.28	52.08±10.30	0.931
Operation duration (min)	39.44±11.46	38.27±9.20	0.635
Time to resolution of motor block (min)	123.13±64.93	159.69±65.72	0.02[b]

[a]All values were presented as mean±SD. [b]p<0.05, [a]All values were presented as mean±SD, SD: Standard deviation, BMI: Body mass index, min: Minimum

Changes in systolic blood pressure, diastolic blood pressure and heart rate between groups over time are shown in the figure (Figure 1, Figure 2, Figure 3).

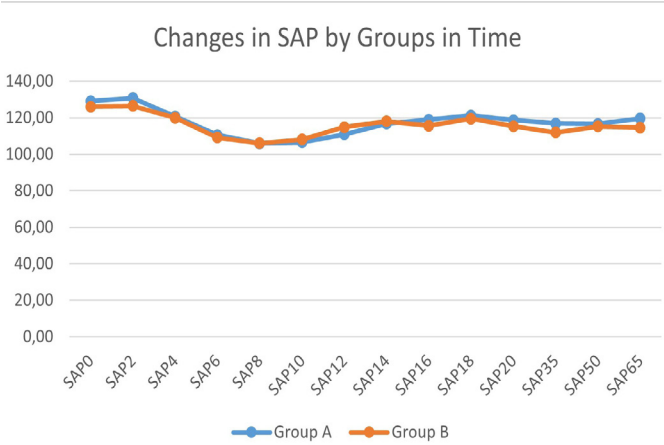

Figure 1. Changes in SAP by groups in time

SAP: Contractility

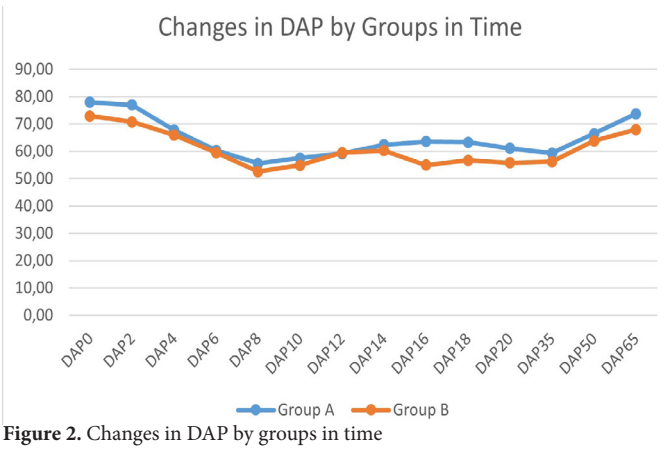

Figure 2. Changes in DAP by groups in time

DAP: Arterial tone

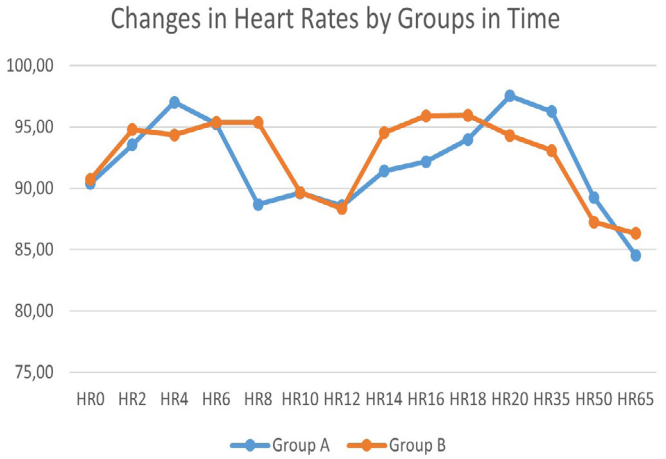

Figure 3. Changes in heart rate by groups in time

There was no difference between the groups in terms of preoperative Bromage scores (p=0.310). Postoperative Bromage score was 1.25±0.93 in group A, whereas it was 2.47±1.27 in group B. Postoperative Bromage scores of pregnant women in Group A were statistically significantly lower than Group B (p<0.05, Table 2).

Table 2. Preoperative and postoperative bromage scores

	Group A (n=36)	Group B (n=36)	p
Preoperative Bromage score	1.55±0.84	1.75±0.76	.310
Postoperative Bromage score	1.25± 0.93	2.47±1.27	.000[b]

[a]All values were presented as mean±SD, [b]p<0.05, SD: Standard deviation

Hypotension was observed in 19 cases (52.77%) in group A and 29 cases (80.55%) in group B. The incidence of hypotension in pregnant women in group A was statistically significantly lower than group B (p=0.012). While side effects or complications such as nausea, itching and SpO_2<95% were not observed in any of the groups, no statistically significant difference was detected between the groups in terms of the incidence of bradycardia and incidence of nausea (p>0.05, Table 3).

Table 3. Intraoperative hemodynamics and complications[a]

	Group A (n=36)	Group B (n=36)	p
Hypotension % (N/n)	52.77 (19/36)	80.55 (29/36)	.012[b]
Bradycardia % (N/n)	2.77 (1/36)	5.55 (2/36)	.555
Nausea % (N/n)	16.66 (6/36)	13.88 (5/36)	.743
Vomiting % (N/n)	0/36	0/36	-
Itching % (N/n)	0/36	0/36	-
SpO_2 <95% (N/n)	0/36	0/36	-

[a]All data were presented as mean±SD and %, N: Number of patients with complication [b]p<0.05, SD: Standard deviation

The need for vasopressor agent and the amount of ephedrine used were lower in group A (52.77%) than group B (80.55%) (p=0.012, p=0.032, respectively Table 4).

Table 4. Amount and need for vasopressor agent

	Group A (n=36)	Group B (n=36)	p
Need for vasopressor agent % (N/n)	52.77 (19/36)	80.55 (29/36)	.012[a]
Amount of vasopressor agent median (min-max) (mg)[b]	5 (0-11)	8 (0-18)	.032[a]

[a]p<0.05 [b] Median (min-max), N: Number of cases in need of vasopressor agent, min: Minimum, max: Maximum

There was no statistically significant difference between the groups in terms of the time for sensory block to reach T10, T6 and T4 dermatome (p=0.671, p=0.468, p=0.579, respectively). The time for sensory block to reach T10 dermatome was 5.16±2.28 min in Group A, whereas it was 4.94±2.12 min in group B. The time for sensory block to reach T6 dermatome was 7.72±3.82 min in group A, whereas it was 7.16±2.50 min in group B; and the time for sensory block to reach T4 dermatome was 9.72±4.39 min in group A while it was 9.22±3.09 min in group B. When neonatal outcomes were evaluated, no statistically significant difference could be detected between the two groups in terms of 1-minute and 5-minute APGAR scores (p=0.494, p=0.673, respectively, Table 5).

Table 5. The mean times for sensory block to reach T10, T6 and T4 dermatomes and neonatal outcomes[a]

	Group A (n=36)	Group B (n=36)	p
Time to reach T10 (min)	5.16±2.28	4.94±2.12	.671
Time to reach T6 (min)	7.72±3.82	7.16±2.50	.468
Time to reach T4 (min)	9.72±4.39	9.22±3.09	.579
1-min APGAR	8.38±0.76	8.25±0.93	.494
5-min APGAR[b]	10 (8-10)	10 (9-10)	.673

[a]All data were presented as mean±SD, [b]Median (min-max), SD: Standard deviation, min: Minimum, APGAR: Appearance, pulse, grimace, activity and respiration

DISCUSSION

In this study, we found that hypotension incidence was lower, the amount of vasopressor agent needed was lower, and the time to resolution of motor block was shorter in the group administered low dose local anesthetic.

Hypotension is a common outcome of the sympathetic nerve block caused by spinal anesthesia used in cesarean delivery. Spinal anesthesia-induced hypotension is a common problem in cesarean delivery if preventive measures are lacking. In order to reduce the incidence and severity of hypotension, approaches such as left lateral tilt position, crystalloid and colloid infusion, prophylactic administration of vasopressor agents have been used. None of these strategies have been able to fully treat spinal anesthesia-induced hypotension. Therefore, reducing the dose of local anesthetics used in spinal anesthesia was recommended to decrease the severity and incidence of hypotension.[1,12,13]

In the study by Chandra et al.,[14] adequacy of anesthesia, time to resolution of motor block and spinal anesthesia-induced side effects were recorded. No difference in terms of hypotension incidence was detected between patients who were given 5 mg bupivacaine and 7.5 mg bupivacaine. In the study by Ben David et al.,[11] hypotension was observed in more patients in the high-dose bupivacaine group and higher amount of ephedrine use was detected. In our study, hypotension occurred in more patients in group B than group A. Higher amount of ephedrine was used in group B than group A. We suggest that hypotension incidence and the amount of vasopressor agent used can be reduced by using bupivacaine at a lower dose.

Dyspnea during cesarean delivery is a tentative marker of spinal anesthesia-induced high sensory block. Dyspnea might occur as a result of the atrophy of thoracic proprioception or partial block of abdominal and intercostal muscles.[15] In the study by Kimoto et al.,[16] dyspnea incidence was higher in the group receiving 12.5 mg bupivacaine than the groups receiving 5, 7.5 and 10 mg bupivacaine. In our study, dyspnea was not observed in any of the patients.

In cesarean operations, nausea and vomiting are very frequently observed events that cause patient discomfort. Hypotension is the most common problem associated with nausea and vomiting during a cesarean operation. Moreover, vagal hyperactivity, visceral pain, and the use of iv opioids and uterotonic agenst may lead to nausea and vomiting. The incidence of intraoperative nausea and vomiting might be reduced by preventing hypotension, minimizing the amount of iv and neuroaxial opioids, and improving the quality of the block.[17,18]

In the study by Jung Hyang Lee et al.,[19] sufentanil and fentanyl were added to 0.5% bupivacaine. In terms of the complications observed, the incidence of nausea and itching was higher in the group that received 20 µg fentanyl than the control group and the group that received 2.5 µg sufentanil, and the difference was statistically significant, whereas no difference was reported between the groups in terms of other complications such as vomiting, shivering, and hypotension. In our study, vomiting and itching were not observed in any of the patients. In the study by Mebazaa et al.,[20] the incidence of hypotension and nausea was higher in the group that received 10 mg bupivacaine. In our study, there was no difference between the groups in terms of the incidence of nausea and low-dose local anesthetic and opioid were used. As a result, the incidence of spinal anesthesia-induced complications was lower.

Rapidly ascending sensory block levels lead to a high incidence of hypotension following spinal anesthesia in cesarean deliveries. This increases the risk of maternal distress and fetal anoxia. Hypotension is believed to have the potential to cause abnormalities in fetal acid-base balance by leading to reduced utero-placental perfusion. Various studies have revealed that spinal anesthesia-induced hypotension incidence is higher after a sensory block at a level ≥T5 or at the T4 level during delivery. The fact that nerve fibers affecting the vasomotor tone of the arterial and venous vessels arise from T5-L1 and that cardioaccelerator fibers arise from T1-T4 corroborate these findings.[21,22]

Turhanoğlu et al.[23] could not find any association between the time of sensory block to reach T6 dermatome and bupivacaine amount. They reported that 1- and 5-minute APGAR scores were similar in both groups. Bryson et al.[24] could not find any association between bupivacaine dose and APGAR scores. In our study, both groups were similar in terms of APGAR scores. Our findings were in concordance with the literature.

It is well known that drug dose affects both the sensory and motor block duration and has a significant effect on the severity of hypotension. Low concentrations of local anesthetics used in spinal anesthesia are associated with less sensorial and motor block. This contributes to early mobilization.[25] Leo et al.[26] found that the level of block was lower in patients who received lower doses of bupivacaine. Mebazaa et al.[20] found that the time to regression of sensory block to T10 dermatome and time to resolution of motor block were shorter in the low-dose bupivacaine group. Ben David et al.[11] found that block level was higher and Bromage scores were higher in patients who received high-dose bupivacaine. In our study, time to resolution of motor block was shorter in group A than group B. We assumed that the high amount of local anesthetic used in group B might have contributed to the late resolution of motor block. Postoperative Bromage scores were lower in group A than group B. Lower Bromage scores were obtained in the group that received lower amount of local anesthetic. Despite the low dose of drug, adequate level of anesthesia was attained.

Limitation

Our research has certain limitations. A major limitation of our investigation was the relatively small patient sample size and the absence of a multi-center approach. The assessment of hemodynamic parameters using noninvasive methods posed another constraint. Furthermore, a better assessment could have been made using blood gas parameters in addition to the APGAR score to better see the effect of hemodynamic variables on neonatal variables.

CONCLUSION

In patients undergoing CS, we found that intrathecal administration of 5 mg isobaric bupivacaine combined with 15 mcg fentanyl and 0.5 ml isotonic not only provided adequate anesthesia but also better-preserved hemodynamic stability and significantly shortened the time to resolution of motor block. We believe that this dose can be used safely in patients undergoing CS. Further studies using varying intrathecal bupivacaine doses are necessary to validate our findings.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Atatürk University, Faculty of Medicine Research Hospital Clinical Researches Ethics Committee (Date: 28.09.2017, Decision No: 8).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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KASTAMONU MEDICAL JOURNAL

Original Article

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Labial fusions and age periods

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ABSTRACT

Aims: Although labial fusion disease is usually seen in infancy, it can also be seen in other age groups. Our study aimed to evaluate whether labial fusion disease creates significant clinical problems across age periods by considering childhood periods.

Methods: Following ethics committee approval, the files of patients who came to the Pediatric Surgery outpatient clinic with complaints of labial fusion between 2017 and 2023 were retrospectively examined. These patients were divided into groups related to their childhood periods and the causative cause, other accompanying problems, treatment method, number of recurrences of labial fusion, and reasons for recurrence. These patients were evaluated by grouping them as 0-2 months, 2 months-2 years, 2 years-6 years, and over six years of age. Additionally, the results obtained were evaluated in the light of the literature.

Results: Of the 94 patients with labial fusion complaints, one was two months old, 51 were 2 months-2 years old, 34 were 2-6 years old, and eight were over six years old. A hygiene problem was identified in only 1 of these patients. In others, the reason for the complaint needed to be clarified. One patient had urinary complaints, and 4 had constipation. Fusion excision was performed as a treatment under outpatient clinic conditions. Recurrence occurred in 16 patients. It recurred once in 13 patients and twice in three patients. Estrogen-containing cream was used in 10 of the relapsed patients. Relapses were performed for recurrent patients under outpatient clinic conditions.

Conclusion: Labial fusion is rarely seen in the neonatal period. This situation may be considered pleasing, but it may also cause people to think that perineal examinations were not performed well. We have implemented practices that can be said to be directly proportional to the literature for infants and school-age children. In patients over the age of six, no apparent cause could be identified. In treatment, only one patient required a surgical procedure, such as a straightforward fusion opening. The presence of additional complaints in some patients rose whether constipation, especially constipation, affected the formation of labial fusion, although its detection was proportionally low.

Keywords: Labial fusion, child, prepuberty

INTRODUCTION

Labial fusion is a common problem in infancy and prepubertal periods.[1,2] The most common age range is between 3 months and six years.[2-4] The probability of having a child older than this age range has been expressed as 22% in some studies.[4,5] In one study, it was stated that it was between 0.6-5% in prepubertal women.[6,7] Rarely, vulvovaginitis, urination dysfunctions, pain, post-micturition dribble incontinence, and urinary retention may be encountered.[1,3,5]

Suppose the development of labial fusion is not due to congenital causes. In that case, it may be caused by reasons such as chronic inflammation, vulvar infection, poor hygiene, vulvar trauma or surgery, sexual abuse, and perineal damage at birth.[1,3,4,6] Estrogen regulation problems or estrogen deficiency are expressed as the causative factor.[2,8] No cause can be found in some of them.[1] It is also stated that the continuity of the mentioned reasons may also cause recurrence.[6,7] The success rate after treatment with estrogen creams in patients with recurrence is expressed as 35%.[7]

It is stated that if labial fusion is not opened in children who have reached puberty, spontaneous recovery may occur with estrogen dominance.[7] For this reason, some studies suggest that prepubertal children can only be treated if they show symptoms.[7]

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Three main methods are used to treat labial fusions. Treatment uses topical cream, manual opening, or surgical methods. The first two methods have a 55% and 33% chance of recurrence, respectively. This possibility can be expressed as low in those requiring surgical procedures.[4]

In our study, we aimed to compare similar and different aspects with the literature by investigating the distribution of patients coming to our clinic according to their age ranges, what the detectable causes might be, and which procedures were used as treatment.

METHODS

After obtaining permission from the Yozgat Bozok University Clinical Researches Ethics Committee (Date: 29.04.2024, Decision No: 2024-GOKAEK-242_2024.04.24_02), the electronic files of patients diagnosed with labial fusion in our polyclinic between 2017 and 2023 were examined. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Patients were grouped as 0-2 months, 2 months-2 years, 2 years-6 years, and over six years. Whether the patients had additional complaints, the treatment method, and whether the complaints recurred were recorded. Among these patients, those aged six and over were also examined. The complaints of patients over six, their additional complaints, the treatments they received, whether they benefited from the treatment, and the number of adhesion complaints they experienced were re-evaluated. In the light of this data, the frequently seen complaints, the processes that may cause these complaints, and the amount of recurrence were evaluated by comparing them with the literature.

The patients' data were added to the SPSS statistical program, and descriptive statistics were performed.

Table 1. Distribution of patients according to age, treatment and recurrence

Age/clinical findings (n=94)	0-2 months (n=1)	2months-2 years (n=51)	2years-6 years (n=34)	6 years and above (n=8)
Age (median) (months)	2	11.9±10	45.6±9	103±29
Fusion (total=94)	1	51	34	8
Infection	0	0	0	0
Dripping	0	0	0	0
Other	0	5	4	0
Manual excision (total=50)	1	28	16	4
Oinment (total=44)	0	23	18	3
Surgery	0	0	0	1
Other	0	0	0	0
1 recurrence (total=13)	0	5	5	3
1-3 recurrence	0	1	2	0
3< recurrence	0	0	0	0

Table 2. Other complaints and findings in patients with fusion

Age/complaints and findings	0-2 months (n=1)	2 months-2 years (n=51)	2 years-6 years	6 years and above
Hygiene problems	0	1	0	0
Constipation	0	1	3	0
Haemorrhagic	0	1	0	0
Hydronephrosis	0	1	0	0
Laparotomy	0	1	0	0
Urinary tract infections	0	0	1	0

RESULTS

A total of 94 patients were included in the study. There were 51 patients between 2 months and two years and 34 patients between 2 and 6 years. Manual excision was applied to 50 patients, and ointment treatment was applied to 44 patients. Recurrence occurred in 13 of 94 patients and one required surgical intervention. The findings of the patients included in the study are summarized in Table 1.

Table 2 lists other complaints and findings in patients presenting with labial fusion.

Eight patients were found to be older than 6 years of age and were of school age and prepubertal. Information about this group of patients is presented in Table 3.

DISCUSSION

Although labial fusion problems are more common between the ages of 3 months and three years, as in our study, it is observed that patients rarely consult a physician at older ages.[3,9] It is also said that labial fusions occurring in the older age group may be due to the ongoing effect of diseases that are thought to have developed in the vulvar region between the ages of 0-4.[8] Some studies, for example, India, have shown that the reason for this may be related to the place of residence; most of the population in India lives in villages, and health services and patient transfer services are limited.[3] The same study stated that the treatment management of the issue may be incomplete, as access to pediatric surgery services is at 50% compared to the countrywide.[3] Most labial fusions are asymptomatic.[4]

Table 3. Patients older than 6-years-old with labial fusion is demonstrated consisting clinical findings

Patients	Age	Complaint	Add complaint	Treatment	Treatment success	Recurrence
1	10	Adhesion in genital region	Frequent urinary tract infections and constipation	Manual excision in newborn period	Successful	Four months later
2	12	Striates on vulva	-	-	Successful	-
3	9	Adhesion in genital region	-	Surgical excision	Successful	-
4	7	Adhesion in genital region	-	Manual	Successful	-
5	11	Adhesion in genital region	-	Estrogen oinment	Successful	-
6	6	Adhesion in genital region	-	Manual excision +topical ointment	Successful	-
7	7	Adhesion in genital region	Diagnosed during trauma examination	Manual	Successful	-
8	12	Adhesion in genital region	Fusion + in newborn period	Manual	Successful	-

For this reason, there is a possibility that families may be lacking in perineal evaluation of their children and, as a result, the problem may be overlooked.[4] There is no problem reaching a doctor in our country, and there is a pediatric surgery branch in many cities. It should be noted that perineal evaluation is not only the duty of pediatric surgeons. Pediatricians, gynecologists, family physicians, and general practitioners can perform this examination efficiently. Although there is no written data regarding the perineal examination of all these physician groups in our country, we believe that they are not paid enough attention. Despite this, it was found pleasing that only our patients had poor perineal hygiene.

Topical estrogen preparations can be used in labial fusion treatment, and if used appropriately, it is observed that the problem disappears within 2-6 weeks.[4] The probability of recurrence of labial fusions is between 7-55%.[3] It is stated that this probability is as high as 26%.[6] It is stated that this is especially the case when manual treatment is performed, and topical creams are not used afterward.[6] However, using topical creams has some side effects. Local irritation, redness, breast budding, and hyperpigmentation of the vulva may occur.[4] Approximately half of our patients were treated using only a topical estrogen preparation. Recurrence occurred in ten patients, but no local complications were reported.

The probability of recurrence with the surgical method was found to be 9% in a study. In frequent recurrences, if the adhesion is too dense to be removed by manual treatment, a surgical procedure can be performed without trying a topical cream.[4] Unlike the literature, only one patient underwent a surgical procedure.

It has been determined that most patients with fusion problems have hygiene problems.[3] However, a study stated that using cream may not be practical in low-income societies such as Tunisia. Therefore, the best approach is to pay attention to local hygiene after manual treatment.[10] Our patients also presented clinically with complaints of a history of laparotomy, urinary tract infection, and vaginal bleeding. Constipation was most commonly associated with constipation. It may be worth examining whether there is an interaction between constipation and labial synechiae.

The internal genital structures in the labial fusion opening are not damaged or diseased. However, manual expansions may have psychological or emotional effects. When this situation is taken into account, the use of topical cream may be preferable.[2]

CONCLUSION

Labial fusion is rarely seen in the neonatal period. This situation may be considered pleasing, but it may also cause people to think that perineal examinations were not performed well. We have implemented practices directly proportional to the literature for infants and school-age children. In patients over the age of six, no apparent cause could be identified. In treatment, only one patient required a surgical procedure, such as a straightforward fusion opening. The presence of additional complaints in some of the patients raised the question of whether constipation, especially constipation, had an effect on the formation of labial fusion, although its detection was proportionally low.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Yozgat Bozok University Clinical Researches Ethics Committee (Date: 29.04.2024, Decision No: 2024-GOKAEK-242_2024.04.24_02).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Original Article

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Cancer screening in people aged between 30-69 in a town: a cross-sectional study in Turkiye

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ABSTRACT

Aims: Breast, cervical, and colorectal cancer screening programs are available in Turkiye. This study aimed to assess people's knowledge and behaviors regarding these cancer screening tests.

Methods: This population-based, cross-sectional study involved individuals aged between 30 and 69 living in Kastamonu, Turkiye. A total of 201 participants were included. The study examined participants' sociodemographic characteristics, the presence of chronic diseases and cancer diagnoses, knowledge of cancer screening tests conducted in Turkiye, their status regarding cancer screening, and the reasons for not undergoing such screenings.

Results: Among the participants, 63.7% were women, and 29.4% had a family history of cancer. Additionally, 49.8% stated they had no information about cancer screening tests in Turkiye. Of those informed about cancer screening tests in Turkiye, 63.8% had undergone at least one cancer screening test. The two most common reasons for not having a cancer screening test were believing they were healthy (50.0%) and lacking information (32.1%). There were significant differences in the rates of cancer screening tests based on age ($p<0.001$), gender ($p<0.001$), employment status ($p<0.001$), educational level ($p<0.001$), and knowledge about screening ($p=0.009$).

Conclusion: Lack of knowledge and beliefs about health were effective in not having a cancer screening test. Health education is necessary for individuals to obtain accurate information and gain awareness.

Keywords: Cervical cancer, colonic neoplasms, breast cancer, early diagnosis, cancer screening

INTRODUCTION

Cancers constitute a significant health burden worldwide, with an estimated 19.3 million new cases and 10 million deaths annually. Common cancers include lung, prostate, and colorectal in men and breast, colorectal, and lung in women. In terms of mortality, lung, liver, and colorectal cancers are the most fatal for men, while breast, lung, and colorectal cancers are the most fatal for women.[1,2] In Turkiye, the most common cancers are lung, prostate, colorectal, bladder, and stomach in men, and breast, thyroid, colorectal, uterine, and lung in women.[3]

In addition to causing physical ailments, cancer also creates significant financial and emotional burdens for individuals.[4] For this reason, cancer prevention should be a public health priority. With the rising incidence of cancer in middle- and low-income countries like Turkiye, implementing screening programs as a secondary prevention method has become essential.[5] Globally, cancer remains one of the leading causes of death. Screening tests aim to improve quality of life and life expectancy through early diagnosis and treatment. Early detection of cancer is cost-effective when identified in its initial stages.[6] The World Health Organization (WHO) defines screening tests as "tests that can be quickly and easily administered to a target population for the detection of disease that is unrecognized through examinations or other procedures in a healthy, asymptomatic population."[7]

Cancer screening programs are widely implemented in high-income countries with more available resources. However, countries have significant differences regarding screening methods, initiation and discontinuation ages, and screening intervals.[8] For colorectal cancer screening in the United

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States, adults aged 50-75 years are advised to undergo one or a combination of seven tests, including colonoscopy. In contrast, Canada does not recommend colonoscopy as a screening test.[9,10] Although there are variations among European countries regarding the tests recommended for cervical cancer screening, screening starting ages, and screening intervals, most countries recommend starting screening between ages 18 and 29 and discontinuing between ages 60 and 70. Breast cancer screening practices in Europe are more consistent, with mammography recommended for women aged 50-69. Screening for prostate, skin, and lung cancers is generally not recommended, except in some developed countries.[11]

Cancer early diagnosis, screening, and training centers (KETEM) provide cancer screening services in Turkiye. With around 200 centers nationwide, each staffed by doctors, nurses, midwives, X-ray technicians, and medical technologists, KETEMs offer screenings for three types of cancer based on WHO guidelines. For breast cancer, women aged 40-69 are advised to perform monthly breast self-exams, have an annual clinical breast examination, and undergo a mammogram every two years. Cervical cancer screening includes a smear and HPV-DNA test every five years for women aged 30-65. Colorectal cancer screening involves a stool occult blood test every two years for those aged 50-70 and a colonoscopy every ten years for the same age group.[12]

Early cancer detection through screening tests improves prognosis and reduces mortality. Understanding people's knowledge and behaviors regarding these tests can highlight gaps in awareness, which could inform health interventions aimed at promoting education and early screening. It could enhance cancer outcomes. This study aims to assess the knowledge and behaviors of individuals aged between 30-69 concerning cancer screening tests, identify associated factors, and raise awareness on this critical subject.

METHODS

Study Design

The study was carried out with the permission of the Gazi University Ethics Committee (Date: 13.10.2021, Decision No: 2021/79). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. The ethical considerations ensured the confidentiality and voluntary participation of all study subjects.

This population-based, cross-sectional study was conducted in the Kuzeykent neighborhood of Kastamonu province, Turkiye. Located in the Western Black Sea Region, Kastamonu makes up 1.7% of Turkiye's total surface area. The city center has a population of 152,541, with Kuzeykent being its largest neighborhood. The local family health center provides primary health care services in Kuzeykent.

Sample Selection Criteria

The study population consisted of people aged between 30 and 69 years who are registered with Kuzeykent Family Health Center, 11,776 people. At 80% statistical power, 0.2 effect size, α=0.05 significance level, the smallest required sample size was calculated as 196 using a one-degree-of-freedom Chi-square test. Individuals excluded from the study were those under 30 years old, over 70 years old, mentally incapable of communication, or residing outside the city for various reasons despite indicating Kastamonu as their residence. After obtaining the ethics committee's approval, a list of people aged between 30 and 69 years registered in the family health center was obtained, and the appropriate sample size was determined by weighting. Since it was aimed to reach 196 people, the interpersonal interval was 11776/196=60.0. A lot was drawn to determine the starting point, and the following people were determined by adding 60 to the number obtained. We excluded people under 30 years old, over 69 years old, and who were mentally incapable of communication. People who indicated Kastamonu as their residence address but were outside the city for different reasons and who did not volunteer to participate in the research were also excluded. The remaining people were included in the study.

Data Collection

The data collection phase was concluded in 2022. Completing the survey took approximately 8 to 10 minutes. Participants were invited to the family health center, where the surveys were administered through face-to-face interviews. In total, 201 individuals participated.

Survey Instrument

The survey form included 29 questions designed to assess various research variables. The dependent variables were age, gender, marital status, number of children, employment status, educational background, smoking habits, income level, presence of chronic diseases, family history of cancer, knowledge of screening tests, and awareness of KETEM (Cancer Early Diagnosis, Screening, and Training Centers). The independent variable was whether participants had undergone at least one cancer screening test. The survey also collected information on participants' sociodemographic characteristics, chronic disease status, family history of cancer, knowledge of cancer screening tests available in Turkiye, and awareness of KETEM. Participation in cancer screening programs was verified through health records, which included data on fecal occult blood tests, colonoscopies, Pap smears, HPV-DNA tests, breast self-exams, clinical breast exams, and mammograms for female participants. Participants were categorized into four age groups: 30-39, 40-49, 50-59, and 60-69, reflecting the typical age range for starting cancer screening in Turkiye.

Statistical Analysis

Statistical analysis was conducted using SPSS (Statistical Package for the Social Sciences) version 22.0. Categorical variables are reported as counts and percentages, while continuous variables are presented as means, standard deviations, and medians. Categorical variables were compared using Pearson's Chi-square test and Yates' correction for continuity. A p-value of less than 0.05 was considered statistically significant.

RESULTS

In our study, 201 people who were confirmed to be eligible after the sample calculation from 11,776 potentially eligible people were included. The mean age of the participants was 49.16±11.31 years, and the median age was 48 (min: 30; max: 76) years.

Of all participants, 27.9% (n=56) were aged 40-49 years, 63.7% (n=128) were women, 88.6% (n=178) were married, 38.8% (n=78) were homemakers, and 52.3% (n=105) were middle school graduates or below. Smokers made up 28.9% (n=58) of the sample. A majority, 67.2% (n=135), were in the middle-

income level, while 48.8% (n=56) reported having a chronic disease, and 29.4% (n=56) had a family history of cancer (Table 1).

Table 1. Distribution of some descriptive characteristics of the participants, Kastamonu, 2021

	Number (n)	Percentage (%)
Age (n=201)		
30-39	50	24.9
40-49	56	27.8
50-59	52	25.9
60-69	43	21.4
Gender (n=201)		
Female	128	63.7
Male	73	36.3
Marital status (n=201)		
Married	178	88.6
Single	12	6.0
Widow/divorced	11	5.4
Number of children (n=201)		
0	22	10.9
1	37	18.4
2	96	47.8
3 and more	46	22.9
Occupation (n=201)		
Housewife	78	38.8
Worker	45	22.4
Clerk	30	14.9
Retired	25	12.4
Tradesman	12	6.0
Other	11	5.5
Educational status (n=201)		
Not completed any school	11	5.5
Primary school graduate	47	23.4
Middle school graduate	47	23.4
High school graduate	51	25.3
University graduate	33	16.4
Master's/PhD	12	6.0
Smoking (n=201)		
No	143	71.1
Yes	58	28.9
Alcohol consumption (n=201)		
No	190	94.5
Yes	11	5.5
Income level (n=201)		
Low-income	41	20.4
Middle-income	135	67.2
High-income	25	12.4
Chronic disease (n=201)		
No	103	51.2
Yes	98	48.8
Cancer (n=201)		
No	196	97.5
Yes	5	2.5
Presence of cancer in the family (n=201)		
No	142	70.6
Yes	59	29.4

Nearly half of the participants, 49.8% (n=100), were unaware of cancer screening tests in Turkiye, and 14.9% (n=30) knew about KETEM. Information about screening was received by 61.4% (n=62) from their family physician. A total of 64.2% (n=105) had undergone at least one screening test. The main reasons for not screening were feeling healthy (50.0%, n=48) and lack of knowledge (32.3%, n=31). Among those eligible for screening, 26.3% (n=25) had fecal occult blood tests and 21.1% (n=20) had colonoscopies. Participation in a colorectal cancer screening program was 33.7% (n=32) (Table 2).

Table 2. Distribution of participants' characteristics about cancer screening tests, Kastamonu, 2021

	Number (n)	Percentage (%)
Knowledge of screening tests (n=201)		
Yes	101	50.2
No	100	49.8
Information resource about screening tests (n=101)*		
Family physician	62	61.4
Television	35	34.6
Internet	25	24.8
Other physicians	21	20.8
Non-doctor healthcare staff	18	17.8
Family/acquaintances	16	15.8
Brochure/book	7	6.9
Knowledge of KETEM (n=201)		
Yes	171	85.1
No	30	14.9
Cancer screening test status (n=201)		
Yes	105	64.2
No	96	35.8
Reason for not having cancer screening test (n=96)		
Thinking they are healthy	48	50.0
Lack of knowledge	31	32.3
Fear	9	9.4
Embarrassment	7	7.3
Thinking it won't work	1	1.0
Knowledge of fecal occult blood test (n=201)		
Yes	72	35.8
No	129	64.2
Having a fecal occult blood test (n=95)		
No	70	73.7
Yes	25	26.3
Knowledge of colonoscopy (n=201)		
Yes	131	65.2
No	70	34.8
Having colonoscopy (n=95)		
No	75	78.9
Yes	20	21.1
Participation in colorectal cancer screening program (n=95)		
No	63	66.3
Yes	32	33.7

*More than one option was answered, KETEM: Cancer early diagnosis, screening and education center

For female participants, 69.5% (n=89) had a smear test, 20.3% (n=26) had an HPV-DNA test, 73.4% (n=94) performed breast self-examinations, and 57.0% (n=73) had a breast examination at a health institution. Among women in the screening age group, 71.1% (n=69) had mammography. Participation in breast cancer screening was 73.4% (n=94), and 19.5% (n=25) participated in cervical cancer screening (Table 3).

Screening rates varied significantly across demographic factors. Among those aged 30-39 years, 28.0% (n=14) were screened, while 87.5% (n=31) of those aged 60-69 years had undergone

Table 3. Knowledge and behaviors of female participants about cervical and breast cancer screening tests, Kastamonu, 2021

	Number (n)	Percentage (%)
Knowledge of smear test (n=128)		
Yes	110	85.9
No	18	14.1
Having smear test (n=128)		
Yes	89	69.5
No	39	30.5
Knowledge of HPV-DNA test (n=128)		
Yes	35	27.3
No	93	72.7
Having HPV-DNA test (n=128)		
Yes	26	20.3
No	102	79.7
Participation in cervical cancer screening program (n=128)		
Yes	25	19.5
No	103	80.5
Knowledge of breast self-exam (n=128)		
Yes	99	77.3
No	29	22.7
Having breast self-exam (n=128)		
Yes	94	73.4
No	34	26.6
Knowledge of breast exam in a health institution (n=128)		
Yes	93	72.7
No	35	27.3
Having breast exam in a health institution (n=128)		
Yes	73	57.0
No	55	43.0
Knowledge of mammography (n=128)		
Yes	108	84.4
No	20	15.6
Having mammography (n=97)		
Yes	69	71.1
No	28	28.9
Participation in breast cancer screening program (n=128)		
Yes	94	73.4
No	34	26.6

HPV: Human papillomavirus, DNA: Deoxyribonucleic acid

screening. For men, 6.8% (n=5) were screened compared to 78.1% (n=100) of women. Employees had a screening rate of 32.0% (n=31), whereas 71.2% (n=74) of the unemployed were screened. Education also influenced screening rates, with 66.7% (n=70) of those with middle school or below education and 36.5% (n=35) of those with higher education having been screened. Among smokers, 41.4% (n=24) were screened compared to 56.6% (n=81) of non-smokers. Additionally, 69.4% (n=26) of low-income participants were screened, compared to 32.0% (n=8) of high-income participants. Screening rates were 42.7% (n=44) for those without chronic disease and 62.2% (n=61) for those with chronic disease. Those with a family history of cancer had a screening rate of 66.1% (n=39), compared to 46.5% (n=66) of those without such a history. Among those unaware of cancer screening tests, 43.0% (n=43) were screened, while 61.4% (n=62) of those knowledgeable about the tests were screened. Lastly, 30.0% (n=9) of those unfamiliar with KETEM and 56.1% (n=96) of those who knew about KETEM had undergone screening. Statistically significant differences were observed across these variables (p<0.05) (Table 4).

Table 4. Having a cancer screening test according to characteristics of the participants, Kastamonu, 2021

	Not having (n=96)		Having (n=105)	
	Number (n)	Percentage (%)	Number (n)	Percentage (%)
Age (n=201)				
30-39 (n=50)	36	72.0	14	28.0
40-49 (n=56)	26	46.4	30	53.6
50-59 (n=52)	22	42.3	30	57.7
60-69 (n=43)	12	12.5	31	87.5
p<0.001*				
Gender (n=201)				
Male (n=73)	68	93.2	5	6.8
Female (n=128)	28	21.9	100	78.1
p<0.001**				
Marital status (n=201)				
Married (n=178)	85	47.8	93	52.2
Unmarried (n=23)	11	47.8	12	52.2
p=0.995**				
Number of children (n=201)				
0 (n=22)	14	63.6	8	36.4
1 (n=37)	21	56.8	16	43.2
2 (n=96)	39	40.6	57	59.4
3 and more (n=46)	22	47.8	24	52.2
p=0.146*				
Working status (n=201)				
Employed (n=97)	66	68.0	31	32.0
Not employed (n=104)	30	28.8	74	71.2
p<0.001*				
Educational status (n=201)				
Middle school and below	35	33.3	70	66,7
High school and above	61	63.5	35	36.5
p<0.001*				
Smoking (n=201)				
Yes (n=58)	34	58,6	24	41.4
No (n=143)	62	43.4	81	56.6
p=0.049**				
Income level (n=201)				
Low-income	15	30,6	26	69,4
Middle-income	64	47.4	71	52.6
High-income	17	68.0	8	32.0
p=0.046*				
Chronic disease presence (n=201)				
No (n=103)	59	57.3	44	42.7
Yes (n=98)	37	37.8	61	62.2
p=0.006*				
Cancer presence in the family (n=201)				
No (n=142)	76	53.5	66	46.5
Yes (n=59)	20	33.9	39	66.1
p=0.011**				
Knowledge of screening tests (n=201)				
No (n=100)	57	57.0	43	43.0
Yes (n=101)	39	38.6	62	61.4
p=0.009*				
Knowledge of KETEM (n=201)				
No (n=30)	21	70.0	9	30.0
Yes (n=171)	75	43.9	96	56.1
p=0.008**				

*Pearson's Chi-square test, **Chi-square test with Yates' correction for continuity, KETEM: Cancer early diagnosis, screening and education center

DISCUSSION

In this study, we collected data on participants' descriptive characteristics, their knowledge about cancer screening tests, their screening test history, and related factors. Half of the participants had not undergone any cancer screening tests. Analysis of the reasons for not participating in screening revealed that a lack of knowledge and personal health beliefs were significant factors. Additionally, factors such as age, gender, employment status, education level, smoking habits, income level, presence of chronic diseases, family history of cancer, general knowledge of screening tests, and awareness of KETEM significantly influenced the likelihood of undergoing cancer screening tests.

In our study, three-quarters of the subjects participated in breast cancer screening, one-third in colorectal cancer screening, and one-fifth in cervical cancer screening programs. According to European Union data, participation rates in cancer screening programs were 60.2% for breast cancer, 50.7% for cervical cancer, and 38.2% for colorectal cancer.[13] In Australia, the reported participation rates were 50.0% for breast cancer, 68.0% for cervical cancer, and 40.9% for colon cancer.[14] In South Korea, participation was 54.3% for breast cancer, 46.9% for cervical cancer, and 28.6% for colon cancer.[15] The variation in screening participation rates may be attributed to differences in the age at which countries begin screening, the types of screening tests used, and health policies. Participation rates are often linked to public awareness and knowledge about cancer, as well as the accessibility of health systems. In some societies, low participation may result from cultural beliefs, feelings of shame, traditions, or misconceptions about medical examinations. Overall, our results indicate that participation in screening programs, particularly for cervical cancer, is insufficient.

In our study, half of the participants indicated that they did not undergo cancer screening because they felt healthy, while one-third lacked knowledge about screening. A study conducted in the Philippines found that 62% of respondents cited economic concerns as the primary barrier to accessing costly screening methods like mammography. Additionally, 15% of participants felt they were healthy and did not see the need for screening. Psychological factors, such as fear and perceived pain, also contribute to reluctance to screen.[16] In Saudi Arabia, a study showed that one-fourth of participants avoided screening due to fear of the results, while the second most common reason was a lack of time.[17] In India, psychosocial factors like fear of the screening process and the potential cancer diagnosis are significant barriers. Other issues include financial difficulties, healthcare system inefficiencies, lack of awareness, and cultural beliefs.[18] In Turkiye, where cost is not a significant barrier, our findings suggest that many respondents avoid screening due to a sense of good health or insufficient information. Cultural beliefs and mistrust of the healthcare system may also affect participation. Our study highlights a general lack of awareness about cancer and cancer screening among participants.

Our study found that the frequency of cancer screening tests increases with age. Individuals with chronic diseases tend to have a more positive attitude towards these tests, which may also be related to their age. Increased maturity and chronic conditions can heighten health awareness, encouraging individuals to pay more attention to their health and resulting in more frequent cancer screenings. Additionally, the awareness that aging and chronic diseases can raise cancer risk may motivate individuals to undergo regular screenings. Expanding cancer screening programs available to older individuals might also influence participation rates.

In our study, 78.1% of women underwent at least one cancer screening test, compared to 6.8% of men. Kim et al.[19] reported that 74.2% of women and 64.1% of men were screened for cancer in the past two years. Davis et al.[20] found that 95.0% of women and 59.0% of men had undergone cancer screening at some point. Gender is a significant factor influencing cancer screening in the United Kingdom.[21] This disparity can be attributed to several factors. Women generally have better access to routine screening opportunities and use primary health care services more frequently. Additionally, certain cancers that are more common in women, such as breast or cervical cancer, lead to more regular screening. In contrast, there is less consensus on the necessity of prostate cancer screening for men, which may contribute to the lower screening rates observed.

In our study, one-third of employed individuals and seven out of ten unemployed individuals have previously undergone cancer screening. This prevalence is similar across different income levels, which can be interpreted as related to employment status. Thus, unemployed individuals who need financial support are more likely to participate in cancer screening programs compared to those who are employed and saving money. These results are statistically significant. This finding contrasts with previous studies,[22-24] which often show that unemployment leads to loss of health insurance. However, universal health insurance covers all citizens in Turkiye, and screening tests are free. Consequently, unemployed individuals may have more free time and greater flexibility in accessing healthcare. They might also be more focused on their health and attentive to regular health checks.

In our study, 41.4% of smokers and 56.6% of non-smokers had at least one cancer screening test. A cohort study by Eng et al.[25] found that active smoking was strongly associated with reduced use of cancer screening services and more advanced cancer stages at diagnosis. According to national health data from the United States, current smokers are less likely to participate in guidelines-compliant screening studies for breast, prostate, and colorectal cancer compared to never-smokers.[26] Byrne et al.[27] also found that smokers were less likely to screen for cancer than non-smokers and that those with higher nicotine dependence had lower adherence to some screening tests. Our findings match existing literature, likely because smokers may be overly optimistic about their health or underestimate their cancer risk. Alternatively, those recognizing their high risk might feel less motivated to get screened. Further research is needed to see if smoking affects participation in cancer screening programs.

Our study found that individuals with a family history of cancer and those informed about screening tests and early diagnosis centers were more likely to participate in cancer screenings. This difference was statistically significant. Personal experience and increased awareness among those with a family history likely drive higher participation. Informative activities by early diagnosis centers, like campaigns and educational materials, can boost public participation in screenings. Raising awareness about early diagnosis can further improve participation rates.

Limitations

Our cross-sectional study has limitations in establishing causality and generalizing results beyond the town where it

was conducted. Self-reported data may affect accuracy, though we mitigated this by using health databases for screening information. Unlike previous research, which often focuses on specific cancer types, our population-based analysis evaluates all cancers in the national screening program.

CONCLUSION

The study reveals significant gender disparities in cancer screening rates, with women participating more than men. Variations in screening rates suggest the need for targeted interventions to address knowledge gaps and psychosocial factors influencing screening behaviors. While the findings align with existing literature, the cross-sectional nature and self-reported data warrant caution in generalizing results. Further research is needed to explore the nuanced factors affecting screening uptake and develop strategies for diverse populations. Health education is crucial to correct misconceptions, improve health behaviors, and increase awareness. Training by primary care professionals, supported by educational materials, can enhance knowledge and attitudes towards cancer screening. Additionally, considering sociodemographic factors such as age, gender, employment, education, and income when designing screening programs can improve their effectiveness.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Gazi University Ethics Committee (Date: 13.10.2021, Decision No: 2021/79).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Evaluation of intracranial pressure using optic nerve sheath diameter in patients undergoing thulium laser prostatectomy with spinal or general anesthesia

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ABSTRACT

Aims: This study aims to evaluate optic nerve sheath diameter (ONSD) measurements as a non-invasive indicator of intracranial pressure in patients undergoing thulium laser prostatectomy (ThuLEP) under spinal or general anesthesia.

Methods: 44 patients aged 18-90 years were included in this prospective observational clinical study. Patients were randomly divided into general anesthesia and spinal anesthesia groups. ONSD measurements were made before, during and after surgery. Mann-Whitney U test, Wilcoxon signed rank test and Spearman chi-square test were used in statistical analysis.

Results: There was no statistically significant difference in preoperative, intraoperative and postoperative ONSD values between both groups. In patients who underwent general and spinal anesthesia, an increase in ONSD values was observed after anesthesia compared to the preoperative period.

Conclusion: ONSD measurement may be a useful, non-invasive technique for assessing intracranial pressure. This study showed that both anesthesia methods had similar effects on intracranial pressure. However, studies with a larger number of patients are needed to evaluate the effect of anesthesia management and surgical position on intracranial pressure.

Keywords: ThuLEP, optic nerve sheath diameter, anesthesia

INTRODUCTION

Benign growths of the prostate are the most common urological conditions in men, while malignant growths are the most common urological malignancies. Transurethral resection surgery is considered the gold standard treatment approach in the treatment of benign prostatic hyperplasia, the frequency of which increases with aging.[1] Thulium laser surgery is an enucleation-based method that started to be used in prostate surgery in 2010 and has gained popularity by offering less invasive alternatives.[2] The lithotomy position during this surgery in the lithotomy position during this surgery may lead to an increase in intracranial pressure. The fact that most of the patients undergoing this surgery are elderly with concomitant diseases and thus included in the fragile patient group highlights the need for intracranial pressure monitoring.

Although direct ventriculostomy is the gold standard in intracranial pressure measurement, it has limitations due to the fact that it is invasive and requires an experienced neurosurgeon. Intracranial pressure assessment can be performed more easily with other methods such as computed tomography (CT) and magnetic resonance imaging (MRI), but these methods also have their own limitations. CT evaluation may cause problems in repetitive evaluations due to the fact that it requires mobilization of the patient and contains radiation. Although MRI provides a high-quality image, it also has limitations such as requiring patient mobilization, taking a long time, patients' compatibility with the device is not good, and repetitive imaging takes a long time. Ultrasonography stands out in intracranial pressure measurement because it does not require patient mobilization, does not contain radiation, can be applied at the bedside, other physicians can also use it without the need for a specialist radiologist, and provides the possibility of frequent repeated imaging.[3]

The optic nerve is a continuation of the intracranial dura surrounding the subarachnoid space, and this feature causes it to expand with an increase in intracranial pressure. The optic nerve is a continuation of the dura surrounding the subarachnoid space. It expands with increases in intracranial pressure. When the intracranial pressure increases, the optic

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nerve sheath swells and becomes visible on ultrasound. Due to this feature, ultrasonography is an important point in the evaluation of intracranial pressure increase. Measurements of optic nerve sheath diameter (ONSD) by ultrasonography are compatible with measurements made by MRI, and ONSD values greater than 5 mm are associated with ICP intracranial pressure (ICP) values greater than 20 mmHg.[4] It has been stated that the evaluation of optic nerve sheath diameter by ultrasonography is a noninvasive, reliable method in intracranial pressure evaluation.[5,6]

The optic nerve sheath appears dark, linear, vertical on ultrasound and is about 3 mm behind the globe. The measurement is made from the place where the 3mm of the closed eyeball cuts the downward line perpendicular. It is recommended that at least two measurements are made and the average is taken to be evaluated with multiple measurements, since the sensitivity is higher than a single measurement.[7]

All inhalation agents have a dose-dependent effect on increasing intracranial pressure by cerebral vasodilation. Propofol has an effect on reducing intracranial pressure. Hypotension and CSF Cerebrospinal fluid (CSF) leakage due to spinal anesthesia cause intracranial pressure reduction.[7] Thulium laser prostatectomy (ThuLEP) surgery is performed in the lithotomy position. Since the legs are lifted in the lithotomy position, venous return increases, causing an increase in cardiac output. It also causes a moderate increase in intracranial pressure due to an increase in cerebral venous return.[8]

ThuLEP surgery can be performed under general anesthesia and spinal anesthesia. Since the majority of patients are elderly, monitoring of intracranial pressure is even more important. For this reason, we aimed to evaluate the optic nerve sheath diameter with USG as a noninvasive method to study the effects of anesthesia on the intracranial pressure of patients in this surgery and to find the appropriate form of anesthesia.

METHODS

April 2023 to February 2024 was held at Pamukkale University Faculty of Medicine Hospital. This study is a prospective, observational clinical study. Study protocol Pamukkale University Non-interventional Clinical Researches Ethics Committee (Date: 19.03.2024, Decision No: 341787) was approved by. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

The study included patients who underwent TURP surgery, aged 18-90, with ASA (American Society of Anesthesiologists) classifications I, II, or III. All participants were provided with the necessary information and gave written informed consent. Patients with neurological diseases, intracranial space-occupying masses (such as tumors or abscesses), a history of cerebral hemorrhage or infarction, acute or chronic eye-related diseases (such as optic nerve inflammation or cataracts), a diagnosis of any such conditions, a history of eye surgery, those using drugs known to affect intraocular pressure (such as beta-blockers, calcium channel blockers, nitrates, or statins), and those allergic to any of the study drugs were excluded from the study. Patients who did not give consent to participate in the study, withdrew their consent, and experienced data loss during follow-up were also excluded from the study.

The general anesthesia and spinal anesthesia methods were determined by random selection in the patients enrolled in the study. The patients were grouped into spinal group (GS) and general anesthesia group (GGA). All patients underwent standard anesthesia monitoring [ECG, non-invasive blood pressure, peripheral oxygen saturation ($SpPO_2$)] and intravenous isolyte S balanced crystalloid fluid was started by opening the vascular tract. For spinal anesthesia, GS patients were given 15 mg of heavy bupivacaine at the L3-L4 level. For general anesthesia, GGA patients were intubated following induction with propofol (2 mg/kg), rocuronium (0.6 mg/kg), and fentanyl (2 mcg/kg). 2% sevoflurane, 40% O2/60% air distribution was made (GE DATEX OHMEDA AVANGE CS2 USA, USA). In the mechanical ventilation volume control mode, the tidal volume was adjusted to 8 mg/kg, respiratory frequency; between 12-14, the end-of-breath Decarbonization level was adjusted to 35-40 mm/hg. In the mechanical ventilator volume control mode, the initial settings were a respiratory rate of 12-14 breaths per minute and a tidal volume of 8 ml/kg. The respiratory frequency was adjusted to maintain an end-tidal carbon dioxide pressure between 35-40 mmHg.

All patients underwent ONSD measurement (T0) before spinal or general anesthesia was applied in the operating room and this value was accepted as the baseline ONSD value. Subsequent ONSD measurements were performed after spinal or general anesthesia was applied to the patient and the patient was placed in the lithotomy position (T1) and after the patient was placed in the supine position at the end of the operation (T2). The ONSD measurement was transorbitally positioned with an ultrasound linear probe (GE LOGIQ-E, USA). Before the measurement, the patient was asked to close his eyes and not to move. The ultrasound linear probe on the closed eye was slightly placed on the eyelid so as not to create pressure on the patient's eye. The length of the line showing the optic nerve sheath diameter cutting the line drawn 3 mm down from the lower edge of the eyeball seen on ultrasound at a right angle was measured and recorded. The optic nerve sheath diameter was measured twice transorbitally vertically and horizontally from both eyes in the first measurement and the averages were taken. Blood was taken for sodium and hemoglobin values at T0 and 2. Demographic data of the patients, body-mass index (BMI), duration of operation, sodium and hemoglobin values measured in T0 and T2 were recorded. Isotonic sodium chloride solution (0.9% NaCl) was used as irrigation fluid in all patients and the amount of solution used during the operation was recorded.

Statistical Analysis

GraphPad Prism 19 program was used to calculate the sample size. In this study, with an alpha of 0.05, a beta of 0.10, and 1-beta of 0.90, it was decided to include 22 individuals in each group. The power of the test was found to be 0.90681. Data were analyzed using SPSS 25.0 software (IBM SPSS Statistics 25, IBM Corp., Armonk, NY). Continuous variables were presented as mean±standard deviation, and categorical variables were presented as number and percentage. Parametric test assumptions were not met. Mann-Whitney U test was used to compare differences between groups forcontinuous variables. Wilcoxon signed-rank test was used for within-group changes over time. Spearman chi-square test was used for comparisons between categorical variables and groups. In all analyses, $p<0.05$ was considered statistically significant.

RESULTS

A total of 60 patients underwent transurethral prostate resection with ThuLEP. 18 Patients who did not meet the inclusion criteria were excluded from the study. 44 patients who met the inclusion criteria were randomly selected and divided into two groups GS and GGA. The mean age of the patients was 67.80±7.95 years, and the mean age of the Group (69.95±8.55) was significantly higher than GGA (65.64±6.83) (p=0.043). The duration of surgery was significantly longer in Group GGA (147.68±47.65 min) compared to Group GS (118.77±36.38 min) (p=0.040). BMI, amount of irrigation fluid used, ASA scores were similar in both groups (Table 1). When the additional diseases of the patients were examined, 13 of them had HT, 12 of them had DM and 7 of them had coronary artery disease.

Table 1. Demographic data

		GGA (n=22)	GS (n=22)	p	Total
Age (years)		65.64±6.83	69.95±8.55	0.043	67.80±7.95
BMI		26.76±3.68	26.56±2.84	0.999	26.66±3.25
Solution (ml)		52090.9±33043	40.681.8±18237	0.404	46386±26999
ASA score	1	0	3 (%13.6)	0.191	3 (%6.8)
	2	16 (%72.7)	13 (%59.1)		29 (%65.9)
	3	6 (%27.3)	6 (%27.3)		12 (%27.3)

GGA: General anesthesia group, GS: Spinal group, BMI: Body-mass index, ASA: American Society of Anestehesiology

The ONSD values were similar between the groups at all time intervals (p>0.05). In the intra-group evaluation, both right and left ONSD values significantly increased in T1 and T2 measurements compared to T0 measurement (p<0.05). The Na values measured at T0 and T1 times were similar in both groups. The group GGA T1 Hgb (12.24±1.71) was significantly lower compared to the T0 Hgb value (13.78±1.52) (p<0.00). The group GGA T1 Hgb (11.82±2.46) was significantly lower than the T0 Hbg value (13.13±1.99) (p<0.00). Although both Hgb value decreases were statistically significant, they were not clinically significant. The changes in the Hgb values were similar in the intergroup comparison (p>0.05) (Table 2).

Table 2. Optic nerve sheath diameter measurement over time

		GGA (mean±SD)	GS (mean±SD)	p*
ONSD (right) (mm)	T0	0.473±0.03	0.470±0.04	0.777
	T1	0.534±0.05	0.541±0.05	0.589
	T2	0.546±0.06	0.549±0.06	0.716
p**		0.001	0.030	
ONSD (left) (mm)	T0	0.470±0.03	0.472±0.04	0.934
	T1	0.536±0.06	0.536±0.06	0.787
	T2	0.548±0.07	0.541±0.06	0.972
p**		0.000	0.048	
Hemoglobin (g/dL)	T0	13.78±1.52	13.13±1.99	0.139
	T2	12.24±1.71	11.82±2.46	0.806
p**		0.000	0.000	
Na (mEq/L)	T0	139.77±2.51	138.77±2.81	0.237
	T2	139.14±2.17	137.45±2.74	0.032
p**		0.129	0.148	

GGA: General anesthesia group, SD: Standard deviation, GS: Spinal group, ONSD: Optic nerve sheet diameter, Na: Sodium, p*: Mann Whitney U test, p**: Wilcoxon test

DISCUSSION

In this study, we evaluated the relationship between optical ONSD measurements and an indirect increase in intracranial pressure and the applied anesthesia method in patients undergoing prostate resection with Thulium Laser in the lithotomy position. Dec. The study results showed that under spinal or general anesthesia, ONSD increased in the lithotomy position compared to preoperative values. At the end of the surgery, the ONSD measured in the supine position was found to be high compared to the initial value. Similar ONSD value increase was found in both anesthesia methods.

Optical nerve sheath diameter measurement using ultrasonography is a very sensitive method for measuring intracranial pressure. It helps to establish a strong relationship with the evaluation of intracranial pressure as well as invasive gold standard methods. Inhalation anesthetics increase intracranial pressure with cerebral vasodilation, while spinal anesthesia causes a decrease in intracranial pressure due to csf leakage and systemic hypotension.[6] ThuLEP surgery, which is used for the treatment of benign and malignant growths of the prostate, is performed in the lithotomy position and intracranial pressure increases due to an increase in venous return. Evaluation of intracranial pressure is of more importance in elderly patients. For this reason, the change of intracranial pressure was evaluated with the form of anesthesia to be selected in this surgery.

In our study, the average age in the spinal anesthesia group was found to be statistically significantly higher than the general anesthesia group with 69.95. The average age in the general anesthesia group was 65.64 and both groups were in the geriatric age group. Therefore, this statistical significance does not constitute a clinically significant difference. The duration of surgery under general anesthesia was found to be longer than in the spinal anesthesia group. This situation can be explained by the fact that the time elapsed until the patient is put to sleep and put in position in the general anesthesia group is shorter in the spinal anesthesia group, and the patient's recovery time after the end of the operation in the general anesthesia group is not in the spinal anesthesia group. This situation can be explained by the fact that the time spent intubating and positioning the patient in the general anesthesia group is not present in the spinal anesthesia group, and there is no need to wait for extubation at the end of the operation in the spinal anesthesia group.

There was no statistically significant difference between the general anesthesia and spinal anesthesia groups in terms of ONSD for both eyes during the preoperative, intraoperative, and postoperative periods. In both groups, ONSD was found to be significantly higher in the intraoperative and postoperative periods compared to the preoperative period. We think that performing the surgery in the lithotomy position causes increased ONSD values in both groups. Kim at al.[6] showed that in a study comparing sevoflurane and propofol anesthesia, ONSD increased in the sevoflurane group and there was no increase in the propofol group. The study of Lee et al.[9] showed no difference in intracranial pressure and optic nerve diameters between the choice of propofol-based anesthetic and the choice of sevoflurane-based anesthetic in gynecological surgery performed in the trendelenburg position. They showed that optic nerve sheath diameters increased in both groups after trendelenburg position and after abdominal insufflation.

They have shown that optic nerve sheath diameters increase as the surgery period progresses in patients who have undergone lower extremity surgery under spinal anesthesia.[10] This study supports the findings of increased ONSD under spinal anesthesia as observed in our study. In a study conducted by Gönen et al.[11] On pediatric patients, they showed that caudal injection is safe to increase intracranial pressure. Since the amount of anesthetic drug given in this study is at very low doses, we think that it will not be enough to compare the result with the intrathecal dose administered in our study. Postoperative hemoglobin values were found to be statistically significantly lower in both groups compared to the preoperative period. We think that the absorption of the fluid used for bladder flushing and the related dilutional hemoglobin decrease may occur during ThuLEP surgery. There was no significant difference between preoperative and postoperative sodium values in both groups. Although lower sodium values were observed in the spinal anesthesia group in the postoperative period, there was no clinically significant increase.

In our study, there was no difference between spinal anesthesia and general anesthesia in terms of increasing the optic nerve sheath diameter, and it was thought that the increase in both groups may be due to the lithotomy position. We think that the small number of patients may cause the results of our study to come out in this way. We think that optic nerve sheath diameter change should be evaluated under spinal anesthesia and general anesthesia in a larger patient population.

CONCLUSION

ONSD measurement may be a useful noninvasive technique for assessing intracranial pressure. In our study, spinal and general anesthesia setup in ThuLEP surgery did not make a difference in terms of intracranial pressure change, and ONSD increased in the lithotomy position in the postoperative and intraoperative periods compared to the preoperative period. We think that the effects of surgical position on ICP may be important for patients at risk, but more studies with higher patient numbers are necessary to evaluate the effects of anesthesia management on intracranial pressure and ONSD.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Pamukkale University No Interventional Clinical Researches Ethics Committee (Date: 19.03.2024, Decision No: 341787).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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KASTAMONU MEDICAL JOURNAL

Original Article

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Retrospective analysis of acute intoxication cases in the intensive care unit: a 5-year single-center study

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ABSTRACT

Aims: Our study aimed to retrospectively analyze the demographic and clinical characteristics of patients with acute drug intoxication admitted to the intensive care unit for follow-up and treatment.

Methods: The records of the patients who were admitted to the intensive care unit of Muş State Hospital with the diagnosis of acute intoxication between 01/01/2020 and 01/06/2024 were scanned from the hospital data system.

Results: Of the 177 patients, 53% were 18-34 years old, and 109 (61.5%) were female. The mean length of stay in the ICU was 2.18 ± 0.51 days. Suicide cases were 71.7%, accidental intoxication was 22.1%, and intentional/recreational use was 6.2%. Single drug ingestion was 29.1%, two drug ingestion 20.1%, more than two drug ingestion 14.0%, alcohol 3.4%, mushrooms 5.0%, rat poison 2.2%, pesticides 4.5%, carbon monoxide (CO) 9.5%, street drugs 2.8%, scorpion/snake bites 3.4%, food intoxication 6.1%. The most commonly used medications were antidepressants (27.2%), acetaminophen/NSAIDs/analgesics (20.2%), and antipsychotics (18.5%). While 89.3% of the patients were discharged, 4.5% were referred to an external center, 5.6% refused treatment, and 0.6% were discharged. Acute intoxication cases were most common in summer (32.9%).

Conclusion: Acute intoxications occurred mostly in young female patients with suicidal intent and during the summer months. We found that antidepressants were the most commonly used drugs in intoxication cases. Most intoxications were caused by the ingestion of two or more than two drugs.

Keywords: Intensive care unit, acute intoxication, intoxication, prognosis

INTRODUCTION

Any substance that has a harmful effect on a living system is defined as a toxin, and the disruption of the living being's physiology by these substances is called intoxication.[1,2] Intoxication can result from the intentional or accidental ingestion of drugs or substances. Additionally, intoxication can occur after taking a high dose of a drug or due to an unintentional drug interaction.[3]

In our country, 0.46-1.57% of patients admitted to hospital emergency departments are intoxicated cases.[4] Of these, 37% are admitted to the intensive care unit (ICU).[5] This rate is 5.5-12.8% in Western societies.[6,7]

In our study, we aimed to evaluate the reasons for ICU admission and the prognosis of patients with acute intoxication in our ICU.

METHODS

This study was retrospective, and permission was obtained from the University of Health Sciences Diyarbakir Gazi Yasargil Training and Research Hospital Clinical Researches Ethics Committee (Date: 10.05.2024, Decision No: 52). The study was conducted according to the Declaration of Helsinki. Our study included patients who were admitted to the intensive care unit of Muş State Hospital due to acute intoxication between 01.01.2020 and 01.06.2024. Patients under the age of 18 years and those who could not be contacted were excluded from the study. Age, sex, drug/substance ingested, reason for ingestion (accident-suicide), date of ICU admission, length of ICU stays, and patient prognosis were obtained from medical records and the hospital information system.

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Patients admitted to the ICU with acute intoxication were followed and treated according to standard ICU protocols and treatment guidelines of the Turkish National Poison Center.

Statistical Analysis

In statistical analyses, measurable variables were presented as mean±standard deviation (SD), and qualitative variables were presented as number (n) and percentage (%). The SPSS program (version 22, SPSS Inc., Chicago, IL, USA) was used for calculations.

RESULTS

A total of 177 patients admitted to the intensive care unit for acute intoxication were retrospectively analyzed. While 53% of the patients were aged 18-34 years, 61.5% were female. Suicide cases were 71.7%, accidental intoxication 22.1%, and voluntary/recreational intoxication 6.2%. The mean length of stay in the ICU was 2.18±0.51 days (Table 1).

Table 1. Patients' demographic characteristics

Age (year)	**n**	**%**	**mean±SD**
18-34	94	53	24.8±5.8
35-44	45	25	38.1±2.9
45-64	26	15	55.5±6.4
65 and over	12	7	67.5±2.0
Gender			
Female	109	61.5	
Male	68	38.5	
Material intake type			
Suicide	127	71.7	
Accident	39	22.1	
Voluntarily/for pleasure	11	6.2	
Days of stay in intensive care unit			2.18±0.51

n: Number of patients, %: Percentage, SD: Standard deviation

Single drug ingestion was 29.1%, two drug ingestion 20.1%, more than two drug ingestion 14.0%, alcohol 3.4%, mushrooms 5.0%, rat poison 2.2%, pesticides 4.5%, carbon monoxide (CO) 9.5%, street drugs 2.8%, scorpion/snake bite 3.4%, food intoxication 6.1% (Table 2). The most commonly used medications were antidepressants (27.2%), paracetamol/NSAIDs/analgesics (20.2%), and antipsychotics (18.5%) (Table 3).

While 89.3% of the patients were discharged, 4.5% were referred to an external center, 5.6% refused treatment, and 0.6% were exited (Table 4). Acute intoxication cases were most frequently seen in summer (32.9%) and spring (26.9%) (Figure).

DISCUSSION

Acute intoxications account for a significant proportion of emergency department and intensive care unit admissions. Morbidity and mortality rates decrease in patients with timely evaluation and treatment. The gender distribution of patients admitted to the ICU with acute intoxication is variable. In the study by Akgün et al.,[8] 74.3% of patients were female. This rate was 77.7% in the study of Kaydu et al.[9] In other studies conducted in our country, the rates of female patients were 69%, 56.5%, and 65.6%.[2,5,10] In our study, the number of female patients was higher than that of male patients.

Table 2. Substances causing intoxication

	Total n (%)	**Female n (%)**	**Male n (%)**
Taking a single drug	52 (29.1)	35 (32.4)	17 (23.9)
Taking two drugs	36 (20.1)	22 (20.4)	14 (19.7)
Taking more than two drugs	25 (14.0)	14 (13.0)	11 (15.5)
Alcohol	6 (3.4)	1 (0.9)	5 (7.0)
Mushroom	9 (5.0)	7 (6.5)	2 (2.8)
Rat poison intoxication	4 (2.2)	3 (2.8)	1 (1.4)
Pesticides	8 (4.5)	6 (5.6)	2 (2.8)
Carbon monoxide	17 (9.5)	9 (8.3)	8 (11.3)
Street drugs (cannabis/extasy/methamphetamine)	5 (2.8)	0 (0.0)	5 (7.0)
Scorpion/snake sting	6 (3.4)	3 (2.8)	3 (4.2)
Food poison intoxication/canned/expired food	11 (6.1)	8 (7.4)	3 (4.2)

n: Number of patients, %: Percentage

Table 3. Distribution of drugs

	n	**%**
Antidepressant	47	27.2
Antipsychotic	32	18.5
Antiepileptic	8	4.6
Paracetamol/NSAID/analgesic	35	20.2
Antigribal	12	6.9
Muscle relaxant	11	6.4
Oral antidiabetic	6	3.5
Antihistamine	8	4.6
Anticoagulant	4	2.3
Antiarrhythmic	6	3.5
Antihypertensive	4	2.3

n: Number of patients, %: Percentage, NSAID: Nonsteroidal anti-inflammatory drugs

Table 4. Patients' prognosis

	n	**%**
Discharge (service/home)	158	89.3
External center dispatch	8	4.5
Treatment refusal	10	5.6
Exitus	1	0.6

n: Number of patients, %: Percentage

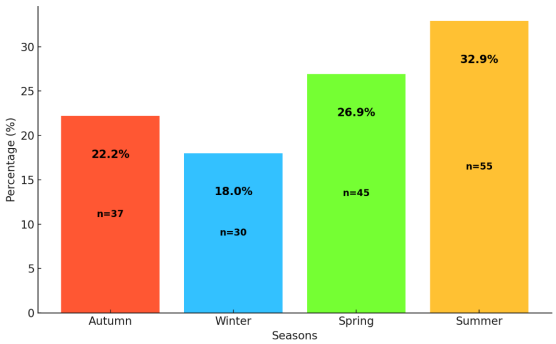

Figure. Distribution of acute intoxications based on seasons

When analyzing the mean age of the patients admitted to the intensive care unit, 29.54+13.51, 26.23±11.16, and 33.12±15.61 were found in studies from our country. The mean age of patients is younger in suicidal cases and older in accidental

admissions.[2,8,9] In our study, the mean age of patients admitted to the ICU for suicide attempts was higher. The mean age of patients with mushroom intoxication, carbon monoxide (CO) intoxication, and scorpion and snake bites was higher than the others.

In the study of Gürcü et al.,[10] the mean length of stay in the ICU for acute intoxication cases was 2.3 days. Yuzkat et al.[11] 2.69±0.89 days, Arikan et al.[12] 2.02 days, Bilge et al.,[13] 2.48±0.76 days. In the study of Totoz et al.,[14] the minimum ICU stay was one day, and the maximum stay was 12 days.

The percentage of ICU admission for carbon monoxide intoxication was 7.7% in the study of Gürcü et al.,[10] 4.9% in the study of Tüfek et al.,[1] 1.6% in the study of Özayar et al.,[4] and 4.5% in the study of Yeşiler et al.[15] In Arikan et al.[12] study, 24 patients were admitted to the intensive care unit with CO intoxication, and three of them died. In our study, this rate was 9.5%, and all but two of our patients were discharged after their general condition, and arterial blood gas improved after 100% oxygen treatment. Two patients were referred to an advanced center for hyperbaric oxygen therapy.

In developed countries, individuals unable to cope with the stress and socioeconomic problems of modern life often turn to substances such as drugs, alcohol, and narcotics. The more widespread use of alcohol and drugs in developed countries leads to more frequent intoxications.[16,17] In the study by Özayar et al.,[4] acute intoxications occurred with suicidal intent and were mostly realized with drug ingestion.[18] Patients who develop acute intoxication with a single drug or more than two drugs intake occur after taking drugs used in psychiatric diseases, such as antidepressants and antipsychotics.[19] In the study by Kaydu et al.,[9] 41.4% of patients were reported with a single drug, 21.7% with two drugs, and 26.2% with more than two drugs. In our study, drug intake was also prevalent in cases of acute intoxication. Upon initial presentation to the emergency department, patients were treated with an antidote according to the ingested substance and their clinical and laboratory findings, and then continued care in the intensive care unit. We found that these patients attempted suicide either by taking their own medications or by ingesting drugs found in their homes.

In some parts of our country, collecting mushrooms and selling some of these mushrooms in city markets and then eating them cause acute intoxication. Mushroom intoxication is very serious compared to other intoxications and can cause acute liver failure and may have a fatal course.[20] In the study of Yuzkat et al.,[11] the rate of patients admitted to ICU with mushroom intoxication was 1.2%. In the Arikan et al.[12] study, six patients were followed up in the ICU with mushroom intoxication, and all patients were discharged without any complications. Gürcü et al.[10] five patients were followed up in the ICU, and all of them were discharged with a cure. In our study, three of the nine patients admitted to our ICU were referred to an advanced liver transplant center because their general condition was poor. One patient died in the ICU. When we received the information about the referred patients later, we learned that liver transplantation was performed in two patients, and the other patient was an exitus.

Most of the patients we followed in the intensive care unit after alcohol consumption was admitted to the intensive care unit for follow-up, and most of them voluntarily refused treatment and left the intensive care unit before 24 hours.

The seasonal distribution of intoxications varies between countries and regions. In a study conducted in Iran, the highest number of intoxications occurred in the spring and summer months.[21] Kaydu et al.[9] found that the highest number of intoxications occurred in the summer months. Similarly, Gürcü et al.[10] reported that intoxications mostly occurred in the summer months. In our study, we also found that the season with the highest incidence of acute intoxication was summer, which is consistent with the literature.

Mortality rates in acute intoxications vary. Yuzkat et al.[11] reported a mortality rate of 0.31%, Altay et al.[22] 0.38%, Kaydu et al.[9] 0.6%, Aydın et al.[23] 1.4%, Özayar et al.[4] 1% and Arikan et al.[12] 5.5%. In our study, we found this rate to be 0.6% in accordance with the literature.

Limitations

The most important limitations of our study are its single-center and retrospective nature. Our results may differ from those of other intensive care units with other socioeconomic and cultural profiles.

CONCLUSION

In our study, we found that the majority of acute intoxications were suicidal. We also found that the most common cause of intoxication was drugs. In addition, the COVID-19 pandemic and changes in the intensive care patient profile during the specified date range made data analysis difficult. The fact that drugs were the most common cause of intoxication suggests that issues such as raising public awareness about drug use, reducing the sale of over-the-counter medicines, and keeping medicines out of the reach of everyone should be taken into consideration. Providing in-service training on intoxications to doctors and nurses working in emergency departments and intensive care units can increase awareness about intoxications.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of University of Health Sciences Diyarbakir Gazi Yasargil Training and Research Hospital Clinical Researches Ethics Committee (Date: 10.05.2024, Decision No: 52).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Financial Disclosure

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Author Contributions

All of the authors declare that they have all participated in the design, execution and analysis of the paper and that they have approved the final version.

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Original Article

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Evaluation of hematological markers and disease activity in relapsing-remitting multiple sclerosis

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ABSTRACT

Aims: Multiple sclerosis (MS) is an immune-mediated chronic disease of the central nervous system that causes demyelination and neuroaxonal damage. Systemic inflammation is thought to cause chronic neurodegeneration. It plays an essential role in the pathogenesis of MS. This study aims to compare the inflammatory parameters such as neutrophil-lymphocyte ratio (NLR), monocyte-lymphocyte ratio, platelet-lymphocyte ratio (PLR), systemic immune-inflammatory index (SII) and systemic inflammatory response index (SIRI) in relapsing-remitting multiple sclerosis (RRMS) patients during relapse and remission periods with the healthy control group and to investigate the relationship between these parameters and disease activity in MS patients.

Methods: This study involved one hundred four patients between the ages of 18 and 47 who applied to Kastamonu Training and Research Hospital with an MS attack and were diagnosed with RRMS according to the 2017 McDonald criteria were included in the study. The patients' hemogram results were compared in the relapse and remission periods. In addition, the hemogram results in the relapse and remission periods were compared with the hemogram results of the healthy control group.

Results: A total of 104 MS patients and 64 healthy controls were included in the study. 70 (67%) of MS patients were female, and 24 (33%) were male. The average disease duration of the patients was calculated as 4.7±3.7, and the average Expanded Disability Status Scale score was 2.17. NLR, PLR, SIRI, and SII were significantly higher during the attack period compared to the healthy group. Also, NLR, PLR, SII, and SIRI were significantly higher in the remission period compared to the healthy control group. However, there was no significant difference in NLR, PLR, SII, and SIRI levels in MS patients between the attack and remission phases.

Conclusion: Elevated inflammatory markers in MS patients compared to healthy controls suggest inflammation's role in the disease. Notably, similar levels during relapse and remission periods may indicate possible chronic inflammation. Larger prospective studies are needed to confirm these findings.

Keywords: Multiple sclerosis, inflammation, NLR, SII, SIRI

INTRODUCTION

Multiple sclerosis (MS) is an immune-mediated chronic disease of the central nervous system that causes demyelination and neuroaxonal damage.[1] MS is the leading cause of disability among young adults following trauma. Genetic and environmental risk factors are included in the multifactorial etiology. The most frequent type is relapsing-remitting multiple sclerosis (RRMS). It accounts for about 85 percent of the cases. RRMS is defined by recurring neurological symptoms that persist from a few days to weeks.[2]

MS pathology still needs to be fully understood. Systemic inflammation is thought to cause chronic neurodegeneration. It plays an important role in the pathogenesis of MS by triggering the activation of innate and adaptive immune cells and the production of pro-inflammatory cytokines. Thus, an inflammatory response occurs within the central nervous system (CNS), which causes demyelination by causing myelin damage in the white and gray matter in the CNS.[3] The variety and severity of clinical symptoms vary depending on the location and degree of this demyelination. Therefore, biomarkers that will help evaluate the disease process and treatment effectiveness are becoming essential. Markers such as light chain neurofilaments are gaining importance here, but

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since these markers are expensive and a significant portion of them are studied in cerebrospinal fluid (CSF), it is not always possible to reach them, so there is a need for easily accessible, reliable and cost-effective markers that will allow routine use.[4]

In various neurological diseases, neutrophil-lymphocyte ratio (NLR), monocyte-lymphocyte ratio (MLR), and platelet-lymphocyte ratio (PLR), which can be easily obtained from complete blood count, are increasingly coming to the fore as biomarkers of pathological inflammation.[5] For example, they have been used primarily to predict prognosis in cerebrovascular diseases, cancers, and autoimmune and inflammatory diseases.[6,7] In addition, platelet-leukocyte ratios are used in the diagnosis and prognosis prediction of many neurodegenerative diseases, including MS.[8]

The systemic immune-inflammatory index (SII) is calculated using the formula number of neutrophils x (number of platelets)/ number of lymphocytes. Its role in MS pathophysiology and prognosis has been investigated in various studies. In one study, it was higher in MS patients than in healthy controls, while in another study, it was higher in patients with active contrast retention.[9,10] Systemic inflammatory response index (SIRI) is calculated by the formula neutrophil count×monocyte count)/ lymphocyte count and its function has been investigated in neurological diseases such as cerebrovascular diseases and restless legs syndrome.[11,12] To our knowledge, very few studies examine the relationship between SII and MS. Moreover, there are no studies investigating the relationship between SIRI and MS.

This study compares the NLR, MLR, SII, and SIRI values of RRMS patients during relapse and remission periods with the healthy control group. We also aimed to investigate the relationship between these parameters and disease activity in MS patients.

METHODS

Ethics

The study was approved by the Kastamonu University Clinical Researches Ethics Committee (Date: 01.11.2023, Decision No: 2023-KAEK-132) by the Declaration of Helsinki.

Study Design and Population

This study, conducted at Kastamonu Training and Research Hospital, has a retrospective character. The hospital HIS (hospital information management system) was used to obtain the data and was scanned between January 2012 and June 2023. One hundred four patients between the ages of 18 and 47 who applied to Kastamonu Training and Research Hospital with an MS attack and were diagnosed with RRMS according to the 2017 McDonald criteria were included in the study[2]. The hemogram results of these patients, taken both during the attack period and later during the inter-attack periods, were compared. In addition, a healthy group with no statistically significant age and gender differences was created, and their hemogram results were obtained from white blood cell count (WBC), red blood cell count (RBC), hemoglobin concentration (HGB), hematocrit (HCT), mean corpuscular volume (MCV), platelet count (PLT), neutrophil count (NEUT), lymphocyte count (LYMPH), monocyte count (MONO), NLR, PLR, SII, and SIRI were also compared. The NLR, MLR, PLR, SII, and SIRI were calculated as follows: NLR = Neutrophil count (x10³/µL) / Lymphocyte count (x10³/µL), MLR = Monocyte count (x10³/µL) / Lymphocyte count (x10³/µL), LMR = Lymphocyte count (x10³/µL) / Monocyte count (x10³/µL), PLR = Platelet count (x10³/µL) / Lymphocyte count (x10³/µL), SII = Platelet count (x10³/µL) x NLR, and SIRI = Neutrophil count (x10³/µL) x MLR. Patients with hematological and autoimmune comorbidities, patients with kidney and liver dysfunction, patients with cardiac and cerebrovascular diseases, patients receiving anticoagulant treatment, patients who had an infection in the last month, and patients who received steroid treatment in the previous month were excluded from the study. Hemogram parameters were routinely measured on the Sysmex XN 1000 hematology analyzer (Sysmex Corporation, Kobe, Japan) and were compared statistically between groups.

Statistical Analysis

The "Statistical Package for Social Sciences 18.0 for Windows" (SPSS Inc., Chicago, USA) program was used to analyze the data. Descriptive statistics of the data obtained were given as numbers and percentages for categorical variables and medians (25 Percentiles, 75 Percentiles) for numerical variables. Mann Whitney U test was used to compare the data between the group with an MS attack and the healthy groups and the data between the group in the MS attack period and the healthy groups, as the data did not comply with normal distribution. The Wilcoxon Test was used to compare the attack and inter-attack periods in MS patients since the groups were dependent. Receiver operating characteristic (ROC) analysis was performed and Youden's index was used to determine area under curve (AUC), cut-off, sensitivity and specificity values. A value of $p<0.05$ was considered statistically significant.

RESULTS

A total of 104 MS patients and 64 healthy controls who met the inclusion criteria were included in the study. 70 (67%) of MS patients were female, and 24 (33%) were male. In the healthy group, 44 (69%) were women, and 20 (31%) were men. The median age of the patients was 30(26, 35); In the healthy group, the median age was 30 (25, 40). There was no statistically significant difference between the healthy group and the MS group in terms of both age and gender (Table 1). The average disease duration of the patients was calculated as 4.7±3.7, and the average Expanded Disability Status Scale score was 2.17.

Table 1. Demographic data of MS patients and healthy control groups

	Attack group (104)	Healthy group (64)	p
Age, (year)	30 (26, 35)	30 (25, 40)	0.567
Male gender, n (%)	24 (33)	20 (31)	0.948
Disease duration (year)	4.7±3.7	-	
Expanded Disability Status Scale	2.17±1.41	-	
Disease-modifying therapy (DMT) n (%)			
Interferon beta-1a	31 (30)		
Interferon beta-1b	4 (4)		
Glatiramer acetate	21 (20)		
Fingolimod	10 (10)		
Teriflunomide	19 (18)		
Dimethyl fumarate	15 (14)		
Natalizumab	1 (1)		

MS: Multiple sclerosis, DMT: Dimetiltriptamin

When MS patients experiencing attacks were compared with the healthy control group, NLR (p=0.004), PLR (p=0.009), SIRI (p=0.015), and SII (p=0.001) values were significantly higher

during the attack period compared to the healthy group. The lymphocyte count was found to be significantly low (p=0.024) (Table 2).

Table 2. Demographic and hemogram data of MS patients in the attack group and the healthy control group

	Attack group (104)	Healthy group (64)	p
Age	30 (26, 35)	30 (25, 40)	0.567
Male gender n (%)	24 (33)	20 (31)	0.948
WBC (10^3/μL)	6.94 (5.89, 8.80)	6.80 (5.43, 8.33)	0.477
RBC (10^6/μL)	4.91 (4.56, 5.38)	4.79 (4.50, 5.19)	0.199
HGB (g/dL)	13.6 (12.8, 15.3)	13.9 (12.8, 15.0)	0.839
HCT (%)	41.5 (38.4, 45.4)	40.8 (39.2, 44.6)	0.860
MCV (fL)	85 (82.2, 87.6)	85.5 (83.3, 88.5)	0.156
PLT (10^3/μL)	252 (219, 302)	260 (214, 287)	0.714
NEUT (10^3/μL)	4.21 (3.39, 5.65)	4.00 (2.84, 5.15)	0.171
LYMPH (10^3/μL)	1.91 (1.43, 2.49)	2.15 (1.80, 2.60)	0.024
MONO (10^3/μL)	0.51 (0.40, 0.70)	0.49 (0.41, 0.61)	0.751
NLR	2.14 (1.59, 3.52)	1.83 (1.42, 2.36)	0.004
PLR	138 (100, 187)	118 (94, 138)	0.009
SIRI	1.14 (0.76, 1.94)	0.84 (0.65, 1.43)	0.015
SII	604 (415, 950)	441 (339, 589)	0.001

MS: Multiple sclerosis, WBC: White blood cell, RBC: Red blood cell, HGB: Hemoglobin, HCT: Hematocrit, MCV: Mean corpuscular volume, PLT: Platelet, NEUT: Neutrophil, LYMP: Lymphocyte, MONO: Monocyte, NLR: Neutrophil-to-lymphocyte ratio, MLR: Monocyte-to-lymphocyte ratio, LMR: Lymphocyte-to-monocyte ratio, PLR: Platelet-to-lymphocyte ratio, SIRI: Systemic inflammation response index, SII: Systemic immune-inflammation index

When MS patients in the inter-attack period were compared with the healthy control group, monocyte (p=0.018), NLR (p=0.006), PLR (p=0.007), SII (p=0.011), and SIRI (p<0.001) values were significantly higher in the inter-attack period compared to the healthy control group. The lymphocyte count was found to be significantly low (p=0.004) (Table 3).

Table 3. Demographic and hemogram data of MS patients in the inter-attack period and the healthy control group

	Inter-attack group (104)	Healthy group (64)	p
Age	30 (26, 35)	30 (25, 40)	0.567
Male gender n (%)	24 (33)	20 (31)	0.948
WBC (10^3/μL)	6.68 (5.44, 7.93)	6.80 (5.43, 8.33)	0.371
RBC (10^6/μL)	4.81 (4.47, 5.22)	4.79 (4.50, 5.19)	1.000
HGB (g/dL)	13.6 (12.7, 15.0)	13.9 (12.8, 15.0)	0.769
HCT (%)	40.7 (38.3, 44.4)	40.8 (39.2, 44.6)	0.528
MCV (fL)	85.6 (83.5, 87.7)	85.5 (83.3, 88.5)	0.392
PLT (10^3/μL)	245 (212, 286)	260 (214, 287)	0.542
NEUT (10^3/μL)	4.00 (3.26, 5.06)	4.00 (2.84, 5.15)	0.684
LYMPH (10^3/μL)	1.84 (1.44, 2.42)	2.15 (1.80, 2.60)	0.004
MONO (10^3/μL)	0.57 (0.46, 0.78)	0.49 (0.41, 0.61)	0.018
NLR	2.28 (1.62, 3.10)	1.83 (1.42, 2.36)	0.006
PLR	135 (105, 176)	118 (94, 138)	0.007
SIRI	1.38 (0.82, 2.24)	0.84 (0.65, 1.43)	<0.001
SII	565 (356, 817)	441 (339, 589)	0.011

MS: Multiple sclerosis, WBC: White blood cell, RBC: Red blood cell, HGB: Hemoglobin, HCT: Hematocrit, MCV: Mean corpuscular volume, PLT: Platelet, NEUT: Neutrophil, LYMP: Lymphocyte, MONO: Monocyte, NLR: Neutrophil-to-lymphocyte ratio, MLR: Monocyte-to-lymphocyte ratio, LMR: Lymphocyte-to-monocyte ratio, PLR: Platelet-to-lymphocyte ratio, SIRI: Systemic inflammation response index, SII: Systemic immune-inflammation index

No significant difference was observed in NLR, PLR, SII, and SIRI values between attack and remission periods in MS patients. RBC values were significantly higher in the attack group compared to the inter-attack period (p=0.027). Monocyte values were significantly low (p=0.001) (Table 4).

Table 4. Comparison of hemogram data of MS patients during the attack period and the inter-attack period

	Attack group (104)	Inter-attack group (104)	p
WBC (10^3/μL)	6.94 (5.89, 8.80)	6.68 (5.44, 7.93)	0.066
RBC (10^6/μL)	4.91 (4.56, 5.38)	4.81 (4.47, 5.22)	0.027
HGB (g/dL)	13.6 (12.8, 15.3)	13.6 (12.7, 15.0)	0.349
HCT (%)	41.5 (38.4, 45.4)	40.7 (38.3, 44.4)	0.071
MCV (fL)	85 (82.2, 87.6)	85.6 (83.5, 87.7)	0.161
PLT (10^3/μL)	252 (219, 302)	245 (212, 286)	0.195
NEUT (10^3/μL)	4.21 (3.39, 5.65)	4.00 (3.26, 5.06)	0.141
LYMPH (10^3/μL)	1.91 (1.43, 2.49)	1.84 (1.44, 2.42)	0.254
MONO (10^3/μL)	0.51 (0.40, 0.70)	0.57 (0.46, 0.78)	0.001
NLR	2.14 (1.59, 3.52)	2.28 (1.62, 3.10)	0.475
PLR	138 (100, 187)	135 (105, 176)	0.858
SIRI	1.14 (0.76, 1.94)	1.38 (0.82, 2.24)	0.653
SII	604 (415, 950)	565 (356, 817)	0.316

MS: Multiple sclerosis, WBC: White blood cell, RBC: Red blood cell, HGB: Hemoglobin, HCT: Hematocrit, MCV: Mean corpuscular volume, PLT: Platelet, NEUT: Neutrophil, LYMP: Lymphocyte, MONO: Monocyte, NLR: Neutrophil-to-lymphocyte ratio, MLR: Monocyte-to-lymphocyte ratio, LMR: Lymphocyte-to-monocyte ratio, PLR: Platelet-to-lymphocyte ratio, SIRI: Systemic inflammation response index, SII: Systemic immune-inflammation index

In the ROC analysis (comparing the attack group with the healthy group), SIRI (cut off: 1.22, AUC: 0.612), SII (cut off: 592, AUC: 0.649), PLR (cut off: 137, AUC: 0.622) and NLR. (cut off: 2.67, AUC: 0.633) tests showed moderate predictive properties (Figure, Table 4).

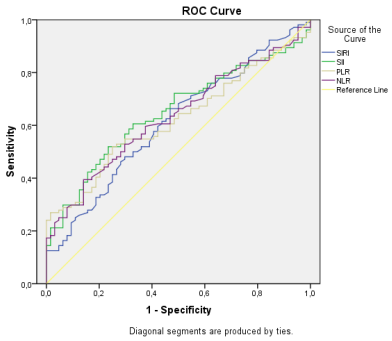

Figure. ROC curve analysis of some hematological data in MS patients

ROC: Receiver operating characteristic, SIRI: Systemic inflammation response index, SII: Systemic immune-inflammation index, PLR: Platelet-to-lymphocyte ratio, NLR: Neutrophil-to-lymphocyte ratio, MS: Multiple sclerosis

DISCUSSION

The most important results of this study are that NLR, PLR, SII, and SIRI biomarkers of inflammation were significantly higher in MS patients compared to healthy controls during relapse and remission periods (Tables 2, 3). In addition, monocyte values were significantly lower, and red blood cell values were significantly higher in MS patients compared to remission periods (Table 5).

Neutrophils play an essential role in neuroinflammation in MS. They are thought to play an important role in the damage and inflammation of the blood-brain barrier (BBB). However, markers such as NLR can be biomarkers of systemic

Table 5. ROC analysis values of inflammation biomarkers in MS patients

	Cut-off	AUC	95%CI	p	Sensitivity%	Specificity%
SIRI	1.22	0.612	0.53-0.70	0.015	48	70
SII	592	0.649	0.57-0.73	0.001	52	77
PLR	137	0.622	0.65-0.80	0.009	52	75
NLR	2.67	0.633	0.55-0.72	0.004	40	86

SIRI: Systemic inflammation response index, SII: Systemic immune-inflammation index, PLR: Platelet-to-lymphocyte ratio, NLR: Neutrophil-to-lymphocyte ratio

inflammation in many inflammatory and autoimmune diseases, better than neutrophils or lymphocytes alone.[13] In particular, it has recently gained increasing importance as a marker of systemic inflammation, as it is an easily accessible and inexpensive parameter.[14]

Since diagnosis and treatment follow-up are important in MS, cheap and practical biomarkers such as NLR have been widely studied. Many studies in the literature investigate the relationship between NLR and MS. Demirci et al.[15] first made the relationship between MS and NLR, and in this study, they found the NLR value to be higher in RRMS patients compared to healthy controls and showed a correlation between clinical symptom severity and NLR value. In another study, many cases showed a significant increase in NLR values between MS and healthy controls. In their case-control study on patients who had not yet received any disease-modifying therapy, Hasselbalch et al.[16] found the NLR value in MS patients to be significantly higher than in healthy controls, but a weak relationship was found between MS severity and NLR. Disease activity of MS is evaluated by the frequency of relapses, new T2 lesions and contrast-enhancing lesions, and the Expanded Disability Status Scale (EDSS). There are several studies investigating the relationship between NLR and disease activity. Damico and colleagues found that the risk of disease activity was higher in MS patients with high NLR who presented for the first time and had not received any treatment.[17] Hemond et al.[5] found that NLR was closely associated with high EDSS and discriminated between patients with poor prognosis. In a study conducted in Turkiye, NLR levels were higher in MS patients with EDSS ≥5 than in patients with EDSS <5.[5] Yetkin et al.[19] showed that baseline NLR in RRMS patients who have just started treatment can predict high-risk patients and guide the selection of disease-modifying treatment. In a recent study, they found a significantly higher NLR value in MS patients compared to healthy controls, but they did not find a relationship between disease activity and disability.[20] In our study, similar to the literature, NLR values were significantly higher than those of the healthy control group, supporting the inflammatory pathogenesis in MS. Moreover, NLR (cut off: 2.67, AUC: 0.633) showed moderate predictive properties. However, no significant difference was found between relapse and remission periods in MS patients by chronic inflammation, which probably continues during the remission period in MS patients.[21]

PLR has previously been investigated as a marker for diagnosis and prognosis prediction in many neurological diseases. It has been shown that high PLR levels are associated with poor prognosis, especially in ischemic stroke patients.[22,23] There are a few studies on PLR levels in MS patients. In a recent study, PLR values were higher in patients with contrast-enhancing lesions on cranial and cervical magnetic resonance imaging (MRI) than in patients without contrast enhancement.[9] Fathy et al.[24] found high PLR values associated with 3-year deterioration and attributed this to the possible relationship of platelets with other inflammatory mediators. In their study, Saçmaci et al.[25] found the PLR values higher in MS patients than healthy controls. However, no significant relationship existed between PLR and EDSS values in MS patients. Moreover, a recent study showed that PLR values were not associated with MS prognosis.[24] In our study, while a significant difference was observed in PLR values between MS and the healthy control group, it was determined that PLR values were unrelated to MS severity and did not distinguish relapses and remissions in MS.

As an inflammatory index, SII's role in diagnosis and prognosis prediction in many neurological diseases has been investigated.[26-28] These studies have shown that SII is associated with poor prognosis. Several studies investigated the relationship between SII and MS. Vural et al.[29] found that SII in the emergency department could predict MS relapses. In a recent prospective study conducted in Turkiye, the SII value was significant in patients with NEDA-3.[30] Saçmacı et al.[10] In their study, they found the SII value of patients with EDSS >3 to be higher than those with EDSS <3 and stated that SII could indicate the prognosis in MS. Gokce et al.[9] found the SII value higher in MS patients than healthy controls. In addition, the SII value was significantly higher in patients with contrast-enhancing lesions than others. In our study, consistent with the literature, the SII value was significantly higher in MS patients compared to healthy controls during relapse and remission periods. Furthermore, SII (cut off: 592; AUC: 0.649) had moderate predictive properties. However, no significant difference was detected in SII values between relapse and remission periods in MS patients. This result may be due to chronic inflammation that continues, albeit at a low level, in MS patients during the remission period.[31]

The possible effect of SIRI on diagnosis and prognosis in neurological diseases has been investigated in a few studies. Moreover, to our knowledge, no study has examined the relationship between MS and SIRI. Our study is the first in this respect. Recent studies have shown that SIRI can predict neurological deterioration in ischemic stroke.[32] Li et al.[33] showed that intracerebral hemorrhage was an independent predictor of 3-month functional outcomes and 1-month mortality. In our study, the SIRI value was significantly higher in MS patients compared to the healthy control group. Furthermore, SIRI (cut-off: 1.22, AUC: 0.612) had mild predictive properties. However, no significant difference was observed between relapse and remission periods.

Limitations

There were some limitations in our study. It is a single-center retrospective study. Only RRMS patients were included in the study, and secondary progressive and primary progressive MS patients were excluded. In addition, since our study was retrospective, information such as smoking and body mass index, which may affect hematological parameters, could not be obtained. Additionally, due to the relatively small number of patients, the possible effects of disease-modifying agents on hematological parameters could not be evaluated. Therefore, prospective studies with a large sample size are needed.

CONCLUSION

As a result, inflammatory parameters such as NLR, PLR, SII, and SIRI were found to be higher in MS patients than in the

healthy control group, both during relapse and remission periods. However, no significant difference was found in these parameters between relapse and remission periods. These findings support inflammatory pathogenesis in MS patients. Additionally, the lack of a significant difference in these inflammatory parameters between relapse and remission periods may support ongoing chronic inflammation in MS patients. More comprehensive, prospectively designed studies with a large sample size are needed in the future on this subject.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Kastamonu University Clinical Researches Ethics Committee (Date: 01.11.2023, Decision No: 2023-KAEK-132).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Original Article

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Association of visceral and subcutaneous adiposity with tumor and histologic grade in breast cancer

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ABSTRACT

Aims: Obesity is a risk factor for breast cancer. This study aims to evaluate the relationship between abdominal fat tissue and the risk of breast cancer and the histological degree of cancer with the help of computed tomography (CT).

Methods: This study is a retrospective, cross-sectional study. It consists of patients diagnosed with breast cancer and a control group. Abdominal fat tissue measurements were taken from the navel or 4th lumbar vertebra level using an abdominal CT workstation. Visceral adipose tissue (VAT), subcutaneous adipose tissue (SAT), fat ratio (FR), and waist circumference measurements were made. The relationship between the obtained measurements and breast cancer, histological grade, and hormone status was analyzed.

Results: Forty-one breast cancer patients and forty-two individuals without known diseases were examined. VAT and SAT were found to be higher in patients with breast cancer and it was statistically significant ($p<0.05$). Estrogen and/or progesterone receptor-negative patients tended to have a higher VAT rate. An increase in VAT and FR in breast cancer patients was found to have a more significant effect in patients with negative hormone receptors than in positive ones (estrogen receptor r: 0.585 $p<0.05$, progesterone receptor r: 0.579, $p<0.05$).

Conclusion: The relationship between breast cancer and abdominal adipose tissue has been demonstrated. In addition, a correlation was found between high VAT and FR and histological grade in patients with hormone receptor-negative.

Keywords: Breast cancer, abdominal visceral fat, abdominal subcutaneous fat, histological type of neoplasm

INTRODUCTION

Breast cancer is the most frequently diagnosed cancer in women.[1] Obesity affects the incidence and progression of many cancer types and is thought to be associated with 20% of cancer deaths. It is estimated that this relationship is due to metabolism in adipose tissue, and the mechanism has not been fully elucidated.[2]

Some studies used body-mass index (BMI) to examine the relationship between obesity and breast cancer. Mortality was found to be low in those with high BMI.[3] Similarly, there are studies claiming that breast cancer survivors have a higher-than-ideal weight.[4] These inconsistencies cannot differentiate between adipose tissue and other tissues in BMI. For this reason, adipose tissue stores such as visceral and subcutaneous adipose tissue are not adequately represented.[5]

Visceral adipose tissue (VAT) and subcutaneous adipose tissue (SAT) indicate central obesity. Some studies have stated that SAT stored especially around the hips and thighs better reflects the metabolic profile.[6] In classical measurements of central obesity, VAT and SAT distinction cannot be made. Instead of classical measurements such as WC and BMI measurements of abdominal obesity, the determination of the amount of adipose tissue and accumulation sites with computed tomography (CT) gives more accurate results.[7]

VAT is a source of estrogen and cytokines that cause inflammation.[5] VAT is associated with hyperinsulinemia and may shorten the proliferation of tumor cells and the patient's life span.[8] In addition, high fasting insulin levels pose a risk for breast cancer and have been associated with poor prognosis and advanced disease.[9]

This study aims to investigate the relationship of specific adipose tissue depots such as VAT and SAT with breast cancer. It is also to evaluate the relationship between histological grade and adipose tissue.

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METHODS

Study Population

This study is a retrospective, cross-sectional study. Before starting this study, approval was obtained from the Sivas Cumhuriyet University Faculty of Medicine Clinical Researches Ethics Committee (Date: 21.09.2023, Decision no: 2023-09/08). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Between January 2018 and June 2023, all female patients who were older than 18 years of age, had no previous cancer diagnosis, were diagnosed with breast cancer after biopsy, and had abdominopelvic CT imaging within 3 months before treatment were included. Among the patients with pathology results, the study did not include those with missing estrogen receptor (ER), progesterone receptor (PR), or Ki-67 index. In addition, patients with moving CT images were excluded. As a result, the study group consists of 41 patients who meet the inclusion and exclusion criteria for a diagnosis of breast cancer. As a control group, 42 healthy individuals over the age of 18, with no known diseases (e.g., diabetes, Cushing's syndrome, cancer) and who underwent abdominopelvic CT due to a traffic accident, were randomly selected and included in the study.

Pathological Evaluation

In this study, patients diagnosed with invasive breast cancer in the pathology department of this institution were evaluated. Histological grade, ER, PR, and Ki-67 index information of the cases were evaluated in this study.

Histological grade, modified Nottingham combined histological grading system was used. Histological grade was determined by evaluating three parameters: glandular/acinar/tubular differentiation, nuclear pleomorphism, and mitotic count. They were divided into grade 1, grade 2, and grade 3. Immunohistochemical evaluation: Nuclear staining of 1% or more was considered positive for ER and PR.[10]

Body Composition Analysis

In this study, images were performed using a 128-slice multi-detector CT (Aquilion, Toshiba Medical Systems, Tokyo, Japan) device using an abdominopelvic CT protocol. The technical parameters of this device are listed in Table 1.

Measurements such as VAT, SAT, fat ratio (FR=VAT/VAT+SAT), and waist circumference (WC) were made at the level of the navel or 4th lumbar vertebra, which is a valid method.[11] Measurements were made using the oil analysis program (Aquarius iNtuition Edition ver 4.4.6, Califonia, USA) available at the station (Figure). The measurement of individuals in the study and control groups was made by two expert radiologists using the double-blind randomization method.

Statistical Analysis

SPSS 22.0 (SPSS Inc., Chicago, IL, USA) program was used to evaluate the characteristics of individuals in the study and control groups. The normality of the variables was analyzed using analytical methods (Kolmogorov Smirnov/Shapiro Wilk tests). Descriptive statistics of the data were given as standard deviation. In quantitative data, all means were analyzed using a t test. Spearman's correlation test was used to measure the correlation between variables. Type 1 error level was taken as 0.05.

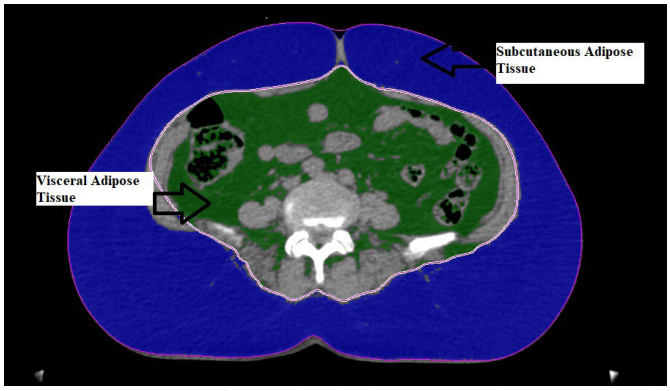

Figure. Measurement of visceral and subcutaneous adipose tissue at the level of the navel or 4th lumbar vertebra with computed tomography

RESULTS

There were 41 patients between the ages of 41 and 83 in the study group, and the mean age was 60.75. There are 42 individuals in the control group between the ages of 40 and 82, and the average age is 56.78 years. There was no statistically significant difference between the groups (p>0.05). In the study group, the mean VAT was 137.64 cm^2, SAT was 330.44 cm^2, and WC was 101.56 cm on average. In the control group, the mean VAT was 75.88 cm^2, SAT was 168.87 cm^2, and WC was 82.95 cm on average. There was a significant difference between the groups in terms of VAT, SAT, and WC (p<0.05). The fat ratio was 29.97 in the study group and 31.15 in the control group, and no statistically significant difference was found (p>0.05) (Table 2).

Table 2. Abdominal fat distribution and waist circumference of the groups

	Groups	n	Mean	SD	p
Age (years)	Case	41	60.75	10.72	p=0.101
	Control	42	56.78	11.07	
Visceral adipose tissue (VAT) (cm^2)	Case	41	137.64	65.66	p=0.0001*
	Control	42	75.88	33.94	
Subcutaneous adipose tissue (SAT) (cm^2)	Case	41	330.44	146.21	p=0.0001*
	Control	42	168.87	69.58	
Fat ratio	Case	41	29.97	11.09	p=0.586
	Control	42	31.15	8.28	
Waist circumference (cm)	Case	41	101.56	16.22	p=0.0001*
	Control	42	82.95	14.82	

Fat ratio: VAT/VAT+SAT, SD: Standard deviation, VAT: Visceral adipose tissue, SAT: Subcutaneous adipose tissue, p<0.05*: Statistically significant

Fifteen (36%) of the patients in the study group were found to be grade 1, 22 (53%) grade 2, and 4 (11%) grade 3 histological subtypes. The ER was positive in 29 (70%) patients, and the ER was negative in 12 (30%) patients. The PR was positive in

Table 1. Technical parameters of CT used in the study

CT scanner	Tube voltage (kV)	Total tube current (mA)	Slice thickness (mm)	Acquisition FOV (mm)	Rotation time (sn)	Pitch factor
128-slice multi-detector CT	120	100-400	3	400	0.5	1.58

CT: Computed tomography, FOV: Field of view

27 (65%) patients and negative in 14 (35%) patients. The Ki-67 index is in the range of 5-70, with a median value of 20. A correlation test was performed to investigate the relationship between ER, PR, Ki-67 index, histological grade, VAT, SAT, and FR. No statistically significant finding was detected (p>0.05).

Correlation analysis was performed to investigate the relationship between histological grade and VAT, SAT, FR, and Ki-67 index according to estrogen and progesterone receptor-negative status. In patients with negative estrogen receptors and/or progesterone receptors, the correlation between VAT and FR and histological grade was statistically significant (p<0.05). There is a correlation between SAT and Ki-67 index, but it is not statistically significant (p>0.05) (Table 3).

Table 3. Correlation analysis between abdominal fat distribution and grade in hormone receptor-negative patients

		Visceral adipose tissue	Subcutaneous adipose tissue	Fat ratio	Ki-67
ER (-) patients histological grade	Correlation coefficient	0.585	0.084	0.585	0.140
	Sig (2-tailed)	0.046*	0.796	0.046*	0.665
	n	12	12	12	12
PR (-) patients histological grade	Correlation coefficient	0.579	0.138	0.707	0.374
	Sig (2-tailed)	0.048*	0.637	0.005*	0.188
	n	14	14	14	14

ER (-): Estrogen receptor-negative, PR (-): Progesterone receptor-negative, p<0.05*: Statistically significant

DISCUSSION

In this study, the relationship between abdominal fat tissue parameters and breast cancer was evaluated with analyses performed at the workstation from abdominal CT, and a significant difference was detected. Additionally, a relationship was found between VAT and FR values in the hormone receptor-negative patient group. No relationship existed between histological grade and VAT, SAT, FR, and WC.

Obesity is a risk factor for breast cancer.[12] In a recent study by Smith et al.,[13] it was stated that the risk of breast cancer increases with an increase in BMI index. Many studies have examined the relationship between obesity and breast cancer with less specific data such as BMI or WC. In this study, only fat tissue measurement was made, excluding areas other than adipose tissue, such as other organs and muscle tissue. Thus, the relationship between breast cancer and fat tissue was intended to be revealed more accurately. The amount of VAT and SAT was found to be higher in breast cancer patients, and it is estimated that abdominal fat tissue is associated with cancer. Similar to this study, a study evaluating fat tissue with CT also stated that the risk of breast cancer increased 1.5 times.[7]

Abdominal adipose tissue comprises VAT around the internal organs and SAT under the skin. VAT has a higher hormonal effect than SAT. Insulin resistance, increased insulin level, increased fatty acid amount, and increased estradiol bioavailability are known important effects. These hormonal changes increase the risk of breast cancer.[14] Obesity may pose a risk for the formation and progression of breast cancer in several ways. Among the molecular mechanisms between obesity and tumor formation are aromatase enzyme and estrogen increase in adipose tissue, circulating insulin and insulin-like growth factor (IGF-1), adipokine amount, and signaling pathways that cause chronic inflammation.[15]

Generally, similar age, gender, and body fat percentages in BMI are close to each other. However, unlike VAT, BMI, and WC, it differs according to age, gender, and race.[7] Fat distribution seems to be very important not only for metabolic disorders but also for susceptibility to cancer.[14] Showing the body fat distribution by taking cross-sectional images with CT is an accurate method since it is easy to distinguish from other tissues. In terms of breast cancer risk, CT provides the most accurate information by dividing the abdominal adipose tissue into sections.[16] In this study, the areas where fat is stored in the abdominal region were specifically measured and it was shown that it may cause breast cancer due to many of the above hormonal mechanisms and metabolites.

Hormone receptor status is very important in breast cancer and is a prognostic indicator. Hormone receptor negativity is an indicator of rapid growth and is a poor prognostic factor.[17] In this study, parameters such as histological grade, ER, PR, Ki-67 index, and VAT, SAT, and FR relationships were evaluated in patients with breast cancer. A negative correlation was found with VAT and FR in both ER-negative patients and PR-negative patients, which was statistically significant (p<0.05). This shows that the increase in VAT affects the histological grade in patients with hormone receptor-positive rather than negative ones. In the study conducted by Lee et al.,[18] high VAT and mortality rates were found in patients with negative progesterone receptors. In another study, similar to these results, it was shown that increased intra-abdominal fat tissue and breast cancer risk were more associated with estrogen and/or progesterone-negative patients.[7] In general, breast cancer patients with positive estrogen and progesterone receptors live longer than those with negative estrogen and progesterone receptors.[19] In addition, these receptors must be positive for hormone therapy. Intra-abdominal adipose tissue increases the risk of breast cancer and negatively affects the prognosis.[20] In addition, it is thought that the relationship between intra-abdominal fat tissue and histological grade varies according to the hormone receptor, as seen in previous studies.

The strong points of the study include the ability to perform quantitative measurements with CT, as well as the capability to differentiate fat tissue from other soft tissues and organs. Additionally, comparing the results with pathology findings is another strong aspect.

Limitations

There are some limitations of this study. First of all, since it is a retrospective study, the data are based on medical records. In addition, although there are many risk factors for breast cancer, it was only associated with intra-abdominal adipose tissue in this study. It is recommended that the relevant study be conducted prospectively in large populations.

CONCLUSION

It was concluded that there is a relationship between VAT and SAT and breast cancer. In addition, it is thought that the relationship between high VAT and FR and hormone receptor negativity is related to the inability to apply hormone therapy and poor prognosis.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Sivas Cumhuriyet University Faculty of Medicine Clinical Researches Ethics Committee (Date: 21.09.2023, Decision no:

2023-09/08).

Informed Consent
Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process
Externally peer-reviewed.

Conflict of Interest Statement
The authors have no conflicts of interest to declare.

Financial Disclosure
The authors declared that this study has received no financial support.

Author Contributions
All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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KASTAMONU MEDICAL JOURNAL

Case Report

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Unusual cervical involvement in psoriatic arthritis and the presence of cervical and facial dystonia: a case report

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ABSTRACT

Psoriatic arthritis (PsA) exhibits the most prevalent occurrence of cervical spine involvement within the spondyloarthropathies. The disease can progress and cause C1-C2 arthritis, erosions of the odontoid process, atlantoaxial instability, syndesmophytes, ankylosis, osteitis, ossifications, and spinal cord compression. Dystonia is a neurological movement disorder that causes involuntary and prolonged muscle contractions, twisting, repetitive movements, and atypical body positions. Cervical dystonia can predispose the atlantoaxial joint to unstable changes. Atlantoaxial degeneration has the potential to lead to cervical dystonia. This report presents a clinical case of an individual afflicted with PsA as well as cervical and facial dystonia, which includes the manifestation of atlantoaxial degeneration and pannus formation. The case was successfully managed through the administration of secukinumab and *Botulinum* toxin injections.

Keywords: Psoriatic arthritis, dystonia, *Botulinum* toxin

INTRODUCTION

Psoriatic arthritis (PsA) is a chronic inflammatory arthritis associated with psoriasis that exhibits many clinical similarities to other spondyloarthropathies and rheumatoid arthritis. This condition is classified as one of the seronegative spondyloarthropathies, as it exhibits negative serology for the rheumatoid factor and involves the axial skeleton.[1] Inflammatory symptoms include skin lesions, dactylitis, nail dystrophies, enthesitis, peripheral arthritis, and axial skeletal involvement.[2] Within the category of spondyloarthropathies, it has been observed that PsA exhibits the most prevalent occurrence of cervical spine involvement.[3] Dystonia is a neurological condition that manifests as a movement disorder characterized by the presence of involuntary and prolonged muscle contractions, resulting in twisting, repetitive movements, and atypical body positions. The occurrence of these muscular contractions can lead to atypical, frequently distressing, and sporadically incapacitating movements. In this report, we present a clinical case of cervical involvement in psoriatic arthritis, along with cervical dystonia, oromandibular dystonia, and blepharospasm.

CASE

A 55-year-old male patient presented with complaints of inability to move his neck, a right neck pulling sensation, head tilting to the right side, facial contractions, inability to eat due to contractions, and decreased quality of life. His symptoms persisted for two years. He had a medical history of diabetes mellitus, hypertension, smoking (40 packs/year), and psoriatic arthritis, but no family history of PsA or dystonia. He was diagnosed with psoriasis 7 years ago and PsA 1 year prior. Tests were negative for rheumatoid factors, anti-CCP antibodies, antinuclear antibodies, and HLA B27 antigen. Physical examination revealed facial asymmetry, with a noticeable contraction around the chin and eyes. Additionally, the right rotation of the neck and the left rotation of the chin were observed (Figure 1). The range of active cervical extension was restricted to 20 degrees, whereas left lateral flexion and rotation were limited to 30 degrees. The right sternocleidomastoid, right trapezius, and left splenius capitis exhibited hypertonicity and hypertrophy. The application of the Soto-Hall test, which involves approximating the chin to the chest, resulted in the replication of neck pain. During the neurological examination, it was observed that the pupils were of equal size (isochoric), the cranial nerve examination yielded normal results, the deep tendon reflexes were within the expected range of activity (normoactive), the cerebellar tests were performed with proficiency, and the upper and lower extremity muscle strength was found to be within normal limits. The diagnosis of dystonia was conclusively established, and the dystonic muscles were identified through the utilization of electrophysiological studies. The patient was treated with methotrexate for PsA. No active rashes were observed. However, the patients also had inflammatory back and neck pain. The results for other systemic investigations including cardiovascular, pulmoner,

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Figure 1. Image depicting the pre-treatment condition of the patient, demonstrating spasmodic torticollis, oromandibular spasm, and blepharospasm

gastrointestinal, renal systems' physical examination and laboratory test results were normal. Cranial and cervical magnetic resonance imaging (MRI), which was requested for the preliminary diagnosis of dystonia, showed sclerosis in adjacent bone structures, calcifications, and ossifications in the joint space and a 4.5x3 cm pannus formation extending to the clivus at the level of the C2 vertebral base, leading to atlantoaxial distention (Figure 2). An MRI of the sacroiliac joint performed six months previously showed marked narrowing of the inferior sacroiliac joints, increased sclerosis in the surfaces adjacent to the joint, and bone marrow edema (Figure 3). Due to the failure of other treatments, secukinumab was started. In addition, *Botulinum* toxin injections into the dystonic muscles identified by electromyography (EMG) and clinical examination were planned for symptomatic relief. Ultrasound-guided *Botulinum* toxin (BoNT) injection into the right sternocleidomastoid, right trapezius muscle, right and left semispinalis and capitis, right and left masseters, right and left temporal muscles and blind injection into the right and left orbicularis oculi, the procerus, and corrugator supercilii muscles was performed. A decrease in the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) score from 7 to 2 after the administration of the treatments showed a regression in inflammatory back and neck pain. Additionally, no active rash was observed, and both blepharospasm and oromandibular dystonia exhibited complete resolution. The hypertonicity in the sternocleidomastoid (SCM) muscle and its impact on cervical rotation have not been fully resolved. However, significant improvements were observed in terms of reduced rotation angle and alleviation of cramping (Figure 4).

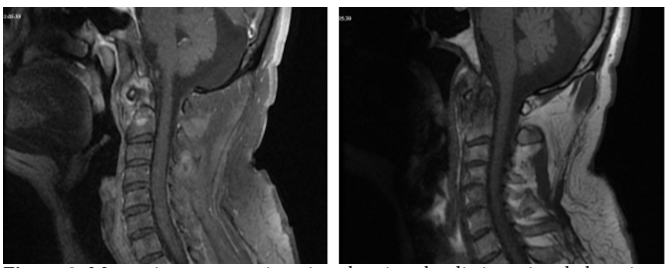

Figure 2. Magnetic resonance imaging showing the distinct signal alterations at the C2 vertebra level and atlantoaxial distention These alterations are evident in both the sagittal short tau inversion recovery and sagittal T1 fast recovery fast spin echo images

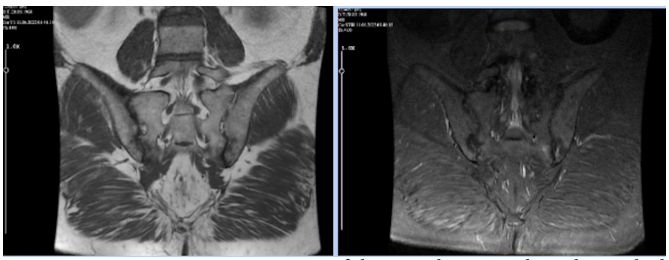

Figure 3. Magnetic resonance images of the sacroiliac joint show the marked narrowing of the inferior sacroiliac joints, increased sclerosis in the surfaces adjacent to the joint, and bone marrow edema on short tau inversion recovery and coronal T1 sections

Figure 4. Image depicting the patient clinic during the ninth month of the treatment period

DISCUSSION

PsA is likely to affect the cervical spine in the initial phase of the disease, and compared to other spondyloarthropathies, it has the highest rate of cervical involvement. The majority of patients experiencing cervical symptoms show severe and long-lasting disease.[4] C1-C2 arthritis, odontoid erosions, atlantoaxial instability, syndesmophytes, ankylosis, osteitis, ossifications, and spinal cord compression are cervical lesions that are linked to PsA.[5] Radiological involvements of the cervical spine in PsA have been reported in 35-75% of cases.[3,6,7] Lesions in the upper cervical spine are similar to the changes seen in rheumatoid arthritis, which include a periodontoid synovial pannus mass and a few cases of atlantoaxial subluxation.[3,6] We observed sclerosis, calcifications, and ossifications in the joint space in this case, where the pannus in the cervical spine extends to the clivus and widens the atlantoaxial joint. Consistent with the literature, the patient's medical history indicated a seven-year period of inflammatory back and neck pain that did not respond to treatment.

For patients with active PsA, who have not experienced relief with conventional synthetic disease-modifying antirheumatic drugs, it is recommended to switch to either a tumor necrosis factor antagonist (TNF-a), an interleukin-17 inhibitor, or an interleukin-12/23 inhibitor biologic.[8] A connection between TNF inhibitors and demyelinating diseases has been reported.[9] Additionally, there have been case reports or case series linking TNF to movement disorders, including Parkinsonism and dystonia.[10,11] Based on the current case, inhibition of IL-17 is preferred over TNF-a inhibitors.

Dystonia is a syndrome that is characterized by frequent contractions resulting in repetitive movements or abnormal postures that may be sustained or intermittent.[12] Movement patterns and postures resulting from dystonia are often highly variable and unusual, which makes it one of the most challenging movement disorders to identify. Spasms of the neck muscles or abnormal head movements occur intermittently due to contractions of the sternocleidomastoid, trapezius, and posterior cervical muscles.[12] The most frequent cause of dystonia is central nervous system pathology. However, non-neurological conditions, such as atlantoaxial subluxation and cervical degeneration, are also linked with dystonia, and they contribute to the ailment.[13] Long-term cervical dystonia was also reported to lead to craniovertebral junction narrowing, bulging, atlantoaxial joint malalignment, and myelomalacia.[14-16] A case series from 2023, including 3 patients, asserted that dystonia could lead to atlantoaxial instability through the development of the acquired os odontoideum.[17] Kawanishi et al.[18] reported that the quadriparesis of a patient with cord compression due to long-term cervical dystonia improved with repeated *Botulinum* toxin injections within 2 years. In this scenario, cervical dystonia might have worsened the atlantoaxial degeneration. Thus, the treatment methods were scheduled for both psoriatic arthritis and dystonia.

Other movement disorders, such as cranial dystonia, blepharospasm, bruxism, and burning spasms, may accompany cervical dystonia.[13] In this case, the patient had blepharospasm and oromandibular dystonia that accompanied cervical dystonia and contributed to a reduced quality of life. Primary cranial or cervical focal dystonia is commonly treated with BoNT type A.[19,20] To relieve symptoms, the patient received BoNT type A injections. Significant improvement was achieved after three seasons of BoNT injections at 3-month intervals and nine months of secukinumab treatment. As far as we know, this is the first case report of atlantoaxial involvement in PsA and its coexistence with cervical and facial dystonia.

CONCLUSION

To our knowledge, this is the first case report that describes the coexistence of PSA with dystonia. Dystonic characteristics could be explained by disease involvement in the atlantoaxial region. In this scenario, IL-17 inhibition was favored over TNF inhibition, as anti-TNF medication has been linked to movement disorders. Blepharospasm, cervical, and oromandibular dystonia were treated with BoNT type A injections. Consequently, the implementation of an appropriate treatment regimen led to a notable improvement in the quality of life for this difficult case.

ETHICAL DECLARATIONS

Informed Consent

The patient signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Letter to the Editor

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Who first? Should the surgeon prioritize the patient's benefit or protect himself/herself?

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Dear Editor,

Some patients who present to the emergency department with specific health issues might lack the ability to provide legally acceptable, informed consent. Acquiring informed consent for potential interventions and surgical procedures may become challenging for physicians. The unique circumstances of the clinical emergency may present obstacles to achieving the main goals of the informed consent procedure, specifically the recognition of usefulness and patient autonomy.[1] In situations that require an urgent assessment and decision-making process, physicians may unfortunately find themselves alone in making choices.

Drug abuse is a situation that has an impact on healthcare communication between patients and medical professionals. The use of these substances, which affect a person's level of consciousness, results in impaired cognitive function and suppresses conscious awareness. This raises concerns about the patient's ability to make informed decisions and the doctor's legal protection.[2] Refugees who settle as a result of population circulation for a variety of reasons (food, war, political reasons) require health services. Irregular refugee influxes, which have recently impacted the world, may disrupt communication between patients and doctors. Here, we will discuss the problem based on two case examples we encountered.

CASES

In the first case, a 34-year-old male patient was admitted to the emergency department with complaints of swelling in the tongue and floor of the mouth, difficulty breathing, and an inability to feed. The refugee patient, who presented with no apparent medical condition, received intramuscular analgesics for toothache in the emergency room 7 hours ago. During the patient's physical examination, a swelling in the sublingual area forced the tongue to elevate towards the hard palate. The patient's mouth opening was limited, and there was only minor swelling in the submental region. The patient received contrast-enhanced neck computed tomography (CT). Despite extensive and severe swelling in the tongue and tissues beneath it, we did not detect any pouches of abscess. We decided to intubate the patient and closely observe them in the intensive care unit to ensure the airway remained secure, given the potential for the disease to advance quickly and the necessity of an immediate tracheotomy. We concluded that the patient, who had a preliminary diagnosis of Ludwig's angina or allergic drug reaction and who was determined to have Ludwig's angina during follow-up, should be intubated and kept under observation in the intensive care unit. During the laboratory examination, we detected amphetamine in the patient's blood. Several factors made obtaining consent for the patient's transfer to the intensive care unit challenging. The patient was a refugee, unfamiliar with the spoken language, had no family members present, and was under the influence of drugs. Additionally, obtaining informed consent for potential tracheotomies and subsequent surgical interventions was necessary.

The second case is a 42-year-old male patient who presented to the emergency department with self-inflicted gunshot wounds resulting from a suicide attempt that occurred one hour ago. A rifled gun bullet entered the patient's left buccal area, exited through the left cheek, and severely damaged the soft tissues. The patient exhibited a distinct circular defect measuring 2x2 cm when observed from inside the mouth. However, the bullet left extensive damage to the left half of the face, including tissue destruction and impairment of the left parotid gland, stenon duct, and facial nerve. The bone structures and teeth were well preserved. According to the drug panel, the patient's blood test indicated a significant presence of amphetamine. What is the appropriate method for obtaining informed consent before surgery for a patient with no family members present?

DISCUSSION

Informed consent forms prioritize a patient's awareness of the treatment procedure, knowledge of their health condition, potential predicted complications and alternative treatment options, collaboration between the patient and healthcare provider, mutual respect, and patient autonomy. These forms guarantee that patients provide informed consent for treatment. Traditional medical decision-making methods, which follow

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a paternalistic approach, may not adequately address these principles. In contrast, informed consent provides a more comprehensive approach.

The process of obtaining informed consent from a patient with cognitive impairment starts by evaluating their cognitive ability to provide consent.[2] Only after establishing the patient's cognitive capacity can, we acquire consent. Suppose the patient is determined to be incapable of providing consent. In that case, it is necessary to obtain consent from the patient's legal proxies or based on advance directives, in addition to patient consent, a simplified form of consent. It is important to continuously assess patients' cognitive abilities, desires, and consent during their treatment.

Physicians, however, encounter difficulties obtaining informed consent in situations where factors like drug abuse or language barriers impede effective communication. Obtaining informed consent for surgery has become an essential element of surgical practice. Patient information and the associated documentation are subject to specific legal requirements.[3] While vital situations are not a matter for discussion, there is a gray zone on applying informed consent procedures in situations where some capacity is questionable. Critical surgical emergencies that ENT surgeons frequently encounter include facial and neck traumas as well as deep neck infections. These conditions pose a significant threat to the patient's life. Because there are so many critical structures in this area, it has the potential to develop into clinical scenarios that could result in mortality. We contacted the refugee patient through the hospital's translator and obtained his consent. For both patients, we asked for a psychiatrist's opinion to determine whether the patients could assess reality because they were drug-positive.

CONCLUSION

When faced with issues related to the validity of a signature for informed consent, physicians should seek interdisciplinary assistance from other departments and health professionals to strengthen their medicolegal defenses while safeguarding patients' rights to information and treatment.

ETHICAL DECLARATIONS

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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