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REVIEW ARTICLE

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Harnessing magnetic forces: Discovery and development of biliary strictures treatment with compression anastomosis

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Abstract

Magnetic compression anastomosis (MCA) is emerging as a promising alternative that uses magnetic force to create an anastomosis bypassing the stenosis in biliary strictures (BSs) where techniques such as percutaneous transhepatic biliary drainage and endoscopic retrograde cholangiopancreatography with stent placement are inadequate in the presence of complete obstruction or severe stenosis. MCA offers potential benefits such as less operative trauma, shorter hospital stay and lower complication rates. By placing magnets proximal and distal to the stenosis, necrosis of fibrotic tissue occurs, creating a new anastomosis. Investigating the role of MCA in the treatment of BS is crucial because of its potential to revolutionize care, improve outcomes and reduce healthcare costs. It offers an alternative for patients who are not suitable for conventional surgery. A comprehensive review of the principles, techniques, outcomes and applications of MCA is essential to inform clinicians, researchers and policy makers and to guide future research and clinical practice to optimize patient care for BSs.

Keywords: Benign; malign; biliary strictures; magnetic compression anastomosis

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Introduction

Biliary strictures (BSs) cause significant difficulties in clinical management and often require invasive procedures with associated morbidity and mortality. The development of percutaneous transhepatic biliary drainage (PTBD) as an interventional radiological procedure has allowed recanalisation of severe BSs, whether due to benign or malignant strictures or postoperative strictures [1]. The placement of multiple plastic stents or metal stents with or without balloon dilatation via endoscopic retrograde cholangiopancreatography (ERCP) has also shown good results in the treatment of BSs [2]. However, endoscopic or percutaneous treatment is not successful when it is not possible to place a guidewire percutaneously or endoscopically due to complete obstruction and severe stenosis in the bile duct. In these cases, patients require the use of an external PTBD catheter to drain bile, which places a great burden on the patient by decreasing quality of life and creating a high risk of infection [3]. Traditionally, surgical interventions such as hepaticojejunostomy or endoscopic stenting have also been used to address these strictures. However, these approaches are not without limitations, including complications such as anastomotic leakage, stricture recurrence and patient discomfort. Consequently, there is a growing interest in exploring alternative, less invasive techniques for the treatment of BSs. One such promising approach is magnetic compression anastomosis (MCA), which has emerged as a novel and minimally invasive method for the creation of biliary anastomoses. MCA involves the use of magnetic force to create an anastomosis between two biliary segments, bypassing the area of stenosis. This technique offers several potential advantages over conventional surgical methods, including less operative trauma, shorter hospital stay and lower complication rates. For MCA, a daughter magnet is placed percutaneously at the proximal end of the stricture and a master magnet is placed endoscopically at the distal end of the stricture. The attraction force between the two magnets leads to necrosis of the fibrotic stricture tissue and formation of a new transmural anastomosis [4].

The importance of investigating MCA in the context of BSs is based on its potential to revolutionise the treatment of these challenging conditions. MCA has the potential to improve patient outcomes, enhance quality of life and reduce healthcare costs by offering a less invasive alternative to traditional surgical interventions. In addition, the development of MCA techniques holds promise for expanding the pool of patients who may benefit from biliary reconstruction, including high-risk or unsuitable candidates for conventional surgery.

In light of the growing interest and expanding clinical applications of MCA in the treatment of BS, a comprehensive review of the available literature on this topic is imperative. This review aims to provide a comprehensive overview of the principles, techniques, outcomes and current clinical applications of MCA in the treatment of BSs. By synthesising the available evidence, identifying areas of consensus and debate, and highlighting future directions for research and clinical practice, this article aims to inform clinicians, researchers and health policy makers about the potential role of MCA in optimising patient care for BSs.

Types and Causes of Biliary Stricture

BSs can be broadly divided into two categories: benign and malignant. Benign BSs can arise from various factors leading to secondary scarring and fibrosis due to inflammation in the affected area. The most common causes of benign strictures include those following surgery and inflammatory conditions. These include postoperative strictures and postoperative complications, especially after Roux-en-Y reconstruction, the most common anastomosis method in biliary surgery. Laparoscopic cholecystectomy stands out as the primary procedure associated with postoperative BSs, with a higher incidence observed in laparoscopic surgeries compared to open cholecystectomy [5]. The development of postoperative BSs during laparoscopic procedures can be attributed to factors such as inadvertent partial or complete incisions in the biliary duct, thermal injuries during tissue dissection, vascular injuries resulting in ischemic damage, or adhesions forming post-surgery. Additionally, anatomical variations, local inflammation, and inadequate surgical expertise are recognized as significant risk factors for the development of postoperative BSs [6]. Liver transplantation, especially living donor liver transplantation (LDLT), is the second most common surgical procedure associated with postoperative BSs [7]. The occurrence of benign BSs following LDLT surpasses that observed after orthotopic liver transplantation (OLT), with reported prevalence rates ranging from 8.3% to 31.5%. [8,9]. Cholangiocarcinoma is the predominant malignancy found in strictures affecting the proximal and middle sections of the bile ducts, in contrast to pancreatic adenocarcinoma, which typically leads to strictures in the

distal bile duct. Other less common causes of malignant BSs include metastatic cancer, lymphoproliferative disorders, gallbladder carcinoma, and hepatocellular carcinoma [10].

Historical Development

Denan pioneered the concept of compression anastomosis in 1826, describing the formation of sutureless anastomotic fistulae through ischaemic compression of tissue [11]. Murphy later refined Denan's spring device in 1892, resulting in the renowned Murphy's buton [12]. This device facilitated the creation of circular gastrointestinal anastomoses by applying ischaemic compression between two buttons held together by a spring. In 1991, compression buttons and modified Murphy buttons were utilized for endoscopy-assisted gastrojejunostomy in an animal study. The evolution of compression anastomosis continued with the introduction of magnetic attraction as a means of achieving tissue compression [13]. Jansen et al. conducted pioneering human experiments in 1980, demonstrating successful mucosa-to-mucosa anastomosis using magnetic attraction [14]. Subsequent studies by Saveliev et al. in 1993 further validated the clinical feasibility of MCA, establishing successful anastomoses in various gastrointestinal locations [15]. Yamanouchi et al. expanded the application of modern MCA in 1998, successfully creating bile duct-small bowel fistulae and introducing new avenues for its utilization [16].

MCA Mechanism and Process

MCA involves the use of magnetic force to create an anastomosis between two luminal structures. In the context of BSs, MCA typically involves the placement of magnetic rings or capsules across the stricture site using endoscopic or percutaneous techniques. Once positioned, the magnets exert a compressive force on the tissue, leading to apposition and eventual formation of a natural anastomosis. Unlike stent placement, MCA does not rely on the presence of luminal tissue to maintain patency, potentially reducing the risk of stent-related complications [17].

Preliminary evaluation before MCA is performed is essential for placement of magnets and prediction of outcomes. Success factors for MCA include the length and shape of the bile duct stricture, magnetic power and alignment of the bile duct axis. MCA may fail in long strictures or irregularly shaped and tortuous bile ducts. Longer strictures typically result in weaker magnetic forces between the magnets. Insufficient magnetic force can inhibit tissue necrosis and prevent the formation of a new fistula. Therefore, accurate assessment of stricture length and shape is imperative for optimal magnet alignment prior to MCA. For example, strictures are usually longer and more tortuous in LDLT recipients than in OLT recipients. The level of post-OLT strictures is more distal in the common bile duct compared to post-LDLT strictures. Post-OLT strictures are intermediate benign BSs, whereas post-LDLT strictures are high-grade benign BSs. Furthermore, the intrahepatic ducts are more dilated but less angulated and tortuous in post-OLT strictures than in post-LDLT strictures. Therefore, MCA is more feasible in post-OLT stenoses and has a high success rate. However, non-invasive radiologic modalities such as computed tomography, ultrasonography, and magnetic resonance cholangiopancreatography (MRCP) have limitations in identifying suitable candidates for MCA, as they cannot fully assess stenosis length, shape, and bile duct axis. ERCP or PTBD provide detailed information on stricture characteristics, including length, shape and duct alignment, but these are invasive methods [18].

Magnets and MCA Device

The strength of magnets plays a pivotal role in the success of MCA. Rare earth magnets, such as neodymium iron-boron and samarium-cobalt (Sm-Co) magnets, are commonly utilized due to their high magnetic flux densities and robust holding forces, which are crucial for MCA procedures. Notably, Sm-Co magnets exhibit a greater holding force compared to neodymium iron-boron magnets, rendering them preferred in many cases [19, 20]. To assess magnetic strength accurately, studies often employ a magnetic force determination algorithm (MAGDA), which calculates the magnetic strengths of the magnets utilized in MCA. This calculation aids in predicting the likelihood of MCA success. MAGDA considers various factors including magnet shape, dimensions, magnetic material composition, degree of magnetization, and experimentally determined or estimated in vivo magnetic separation forces [21].

The MCA device typically comprises two identical nickel-coated NdFeB magnets (grade, N45), referred to as the main magnet and the daughter magnet. Each magnet is cylindrical in shape, featuring a tail at one end for silk thread attachment. Different magnet sizes (with diameters ranging from 2 to 5 mm and heights of

10 mm) can be manufactured to accommodate various clinical scenarios. Selection of an appropriate magnet for a specific patient depends on factors such as canal diameter and stenosis characteristics [22].

Procedure

MCA is a non-surgical alternative treatment method that can improve the long-term prognosis as a result of biliobiliary and bilioenteric anastomoses in the treatment of severe or completely obstructed benign BSs that cannot be resolved by conventional endoscopic or percutaneous methods [23]. The feasibility and safety of biliobiliary and bilioenteric anastomoses created using MCA have been confirmed in both human and animal studies [18]. MCA is not normally indicated to treat malignant biliary strictures, which can usually be treated with conventional peroral or percutaneous methods [24]. In the literature, Avaliani et al [25] reported the use of magnets for bilioenteric anastomosis in patients with malignant obstruction in contrast to other investigators. However, these investigators used magnets to create a fistula between the intact bile duct and the duodenal wall, not for recanalisation of malignant obstruction.

Biliobiliary Anastomosis

The MCA procedure can be divided into four steps as follows:

1. Tract formation for magnet delivery: Common routes of magnet delivery are percutaneous and peroral. Using a 16 or 18 Fr catheter, the PTBD tract is created for magnet delivery. The PTBD catheter is replaced with a 16 or 18 Fr sheath prior to the MCA approach to allow proper magnet placement through the PTBD tract and reduce duct damage. In the common bile duct route, full endoscopic sphincterotomy and balloon dilatation or temporary placement of a retrievable, fully covered, self-expandable metal stent (FCSEMS) is used to facilitate magnet delivery and dilate the papilla [18, 24].
2. Magnet approach: A thread attached to a magnet is fixed to a polypectomy trap and the magnet is transported via the PTBD pathway to the anastomosis site. The polypectomy trap is passed through the channel of an ERCP scope and the other magnet is fixed in front of the scope. The magnet is moved to the anastomosis site via FCSEMS and the attraction between the two magnets results in the approach of the MCA. A balloon catheter can be used to advance the magnets through both PTBD and ERCP pathways to better approximate the magnets. Approximation of the two magnets is confirmed radiographically. The distance between the approximated magnets is 2-15 mm for biliobiliary anastomoses. The long sheath tube is then removed and the indwelling PTBD catheter is placed. The FCSEMS placed in the common bile duct is removed immediately after the magnet is approximated. Doppler ultrasound-based scanning and follow-up is frequently performed because of the possibility of rupture during MCA if blood vessels are placed between two magnets [26, 27].
3. Magnet removal: When a fistula forms due to ischaemic necrosis caused by approximated magnets, the magnets migrate spontaneously into the duodenum. However, if spontaneous migration does not occur after about 8-10 weeks, the magnets can be pushed out using a guide wire or catheter. Magnets can also be removed from the PTBD duct via percutaneous transhepatic cholangioscopy (PTCS). The median time to successful magnet removal after the magnet approach has been reported to be 53.3 days (range, 9-181 days) for biliobiliary strictures [24]. Factors for successful magnet removal include the distance between the two magnets, the magnetic strength of the two magnets and the histological characteristics of the stenosis site.
4. Maintenance and removal of the internal catheter: After removal of the magnet, a 12-16 Fr internal catheter, FCSEMS or double pigtail plastic stents are inserted into the fistula. The recanalised fistula is endoscopically confirmed under fluoroscopy after magnet removal. The average length of stay of the PTCS catheter or FCSEMS to maintain the new fistula tract is 4-6 months. The PTCS catheter and FCSEMS have demonstrated similar safety and efficacy for fistula maintenance. However, FCSEMS is more convenient for patients because the PTCS catheter has a longer indwelling time and requires a greater number of replacements [28].

Table 1. Results of Magnetic Compression Anastomosis for Benign Biliary Strictures after Liver Transplantation

Study	Year	Type of article	Reason for operation	Patients (n)	Number of successful patients (n)	Complication/ Restenosis (n)
***Muraoka et al.** [27]	2005	Case report	LDLT	2	2	-
Okajima et al. [30]	2005	Case report	LDLT	1	1	-
Akita et al. [31]	2008	Case report	LDLT	1	1	-
Matsuno et al. [32]	2009	Case report	LDLT	1	1	-
Itoi et al. [26]	2010	Case report	LDLT	1	1	-
Jang et al. [33]	2011	Retrospective study	LDLT	12	10	Cholangitis (1) Restenosis (1)
Oya et al. [34]	2012	Case report	LDLT	1	1	-
Akira et al. [35]	2014	Case report	LDLT	1	1	-
Ersoz et al. [36]	2016	Case report	LDLT	6	6	-
Jang et al. [37]	2017	Retrospective study	LDLT	39	35	Cholangitis (1) Restenosis (1)
***Ryusuke et al.** [38]	2017	Case report	LDLT	1	1	-
Parlak et al. [39]	2017	Retrospective study	LDLT	7	6	-
Parlak et al. [39]	2017	Retrospective study	OLT	2	1	-
Nakaseko et al. [40]	2017	Case report	LDLT	1	1	-
***Masahiko et al.**	2018	Case report	LDLT	1	1	-
Li et al. [22]	2020	Retrospective study	OLT	9	9	Cholangitis (1) Biliary bleeding (1)
Bülent et al. [23]	2022	Retrospective study	LDLT	6	5	Cholangitis (1) Magnet migration (1) Magnet entrapment (1)
Bülent et al. [23]	2022	Retrospective study	OLT	2	2	-
Erkan et al. [41]	2022	Retrospective study	LDLT	26	20	-

Those marked with * indicate patients who underwent bilioenteric anastomosis. The other patients are those who underwent biliobiliary anastomosis.

Table 2. Results of Magnetic Compression Anastomosis in Postoperative Benign Biliary Strictures

Study	Year	Type of article	Reason for operation	Patients (n)	Number of successful patients (n)	Complication/ Restenosis (n)
***Takao et al.**[19]	2001	Case report	Gastric cancer	1	1	-
Mimuro et al. [43]	2003	Case report	Pancreatic cancer	1	1	-
Itoi et al. [44]	2005	Case report	Bile duct cancer	1	1	-
***Yukawa et al.** [45]	2008	Case report	Gastric and gallbladder cancer	1	1	-
***Suyama et al.** [46]	2010	Case report	Gallbladder cancer	1	1	-
***Itoi et al.** [47]	2011	Case report	CCC	1	1	-
Itoi et al. [47]	2011	Case report	Liver metastasis from colon cancer	1	1	-
***Jang et al.** [3]	2014	Case report	Pancreatic NET Choledochal cyst Pancreatic NET	3	3	-
Jang et al. [3]	2014	Case report	Abdominal trauma (1) Gallbladder stone (2) Hepatic CAC (1)	4	2	-
Jiang et al. [48]	2018	Case report	Liver metastasis from rectal cancer	1	1	-
***Liu et al.** [49]	2019	Case report	Peri-ampullary carcinoma	4	4	Restenosis (1)
Bülent et al. [23]	2022	Retrospective study	Cholecystectomy	11	10	Magnet migration (1) Magnet entrapment (2)
Min Young et al.[50]	2022	Case report	Cholecystectomy	1	1	-

Those marked with * indicate patients who underwent bilioenteric anastomosis. The other patients are those who underwent biliobiliary anastomosis.
CCC, cholangiocellular carcinoma; NET, neuroendocrine tumor; CAC, cystadenocarcinoma.

Table 3. Results of Magnetic Compression Anastomosis in Malignant Biliary Strictures

Study	Year	Type of article	Causes of stricture	Patients (n)	Number of successful patients (n)	Complication (n)
Avaliani et al.[25]	2009	Retrospective study	Tumors of VA (7) Pancreatic cancer (21) CCC (6)	34	34	Cholangitis (2) Restenosis (3)

VA, Vater's ampulla; CCC, cholangiocellular carcinoma.

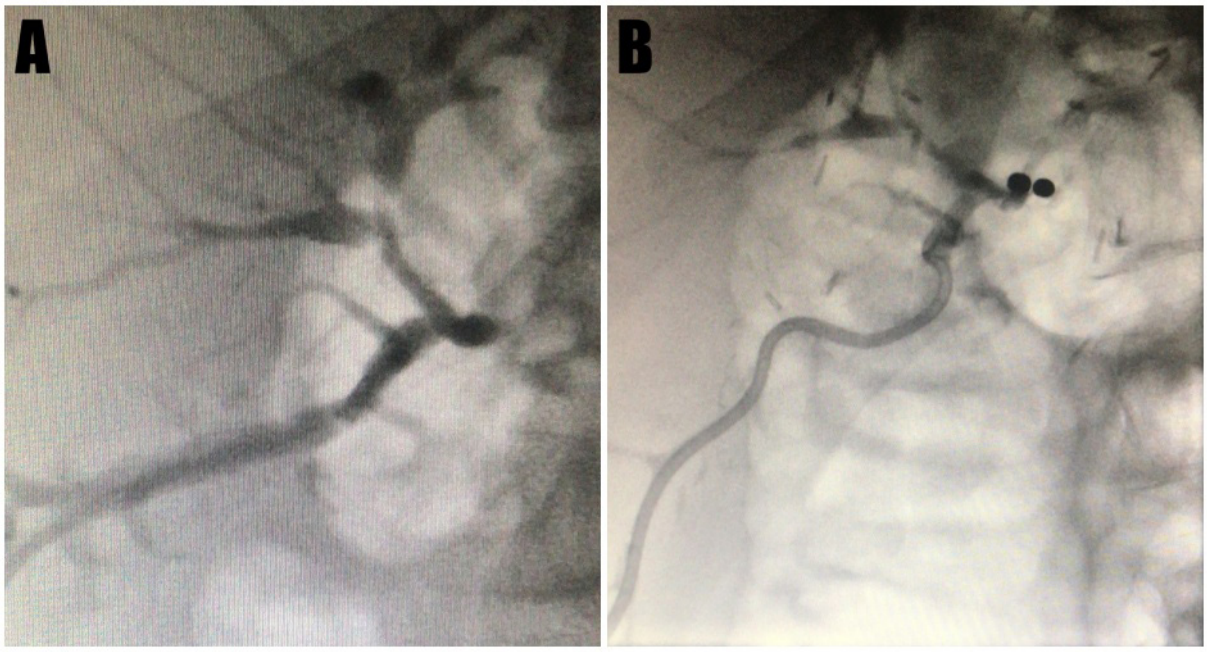

Figure 1. Cholangiogram showing indications for MCA. MCA is applicable for refractory benign biliary stricture that cannot be resolved using conventional endoscopic or percutaneous methods due to complete obstruction (A and B) where neither a guidewire nor dye can pass.

Bilioenteric Anastomosis

In both biliary-enteric and biliary-biliary anastomosis procedures, the methods and principles of MCA share similarities. However, the approach for delivering magnets varies depending on the specific route chosen. Options include surgically created percutaneous-jejunum, percutaneous-percutaneous, or percutaneous-peroral routes, with the latter being the most commonly employed [27]. The process of magnet delivery via the percutaneous route mirrors the previously described method, albeit utilizing a forward-facing endoscope in peroral approaches. Notably, endoscopic delivery may pose challenges in patients with elongated afferent loops, necessitating an alternative approach through a surgically established skin/intestinal fistula [3]. In the context of biliary-enteric anastomoses, magnets are typically spaced 2-7 mm apart [18]. The average duration for successful magnet removal post-approach in cases of biliary-enteric strictures ranges from 7 to 40 days [24].

Follow-up after MCA

After 4-6 months post-MCA, patients undergo a comprehensive evaluation including assessment

of clinical symptoms, laboratory parameters and

Complications

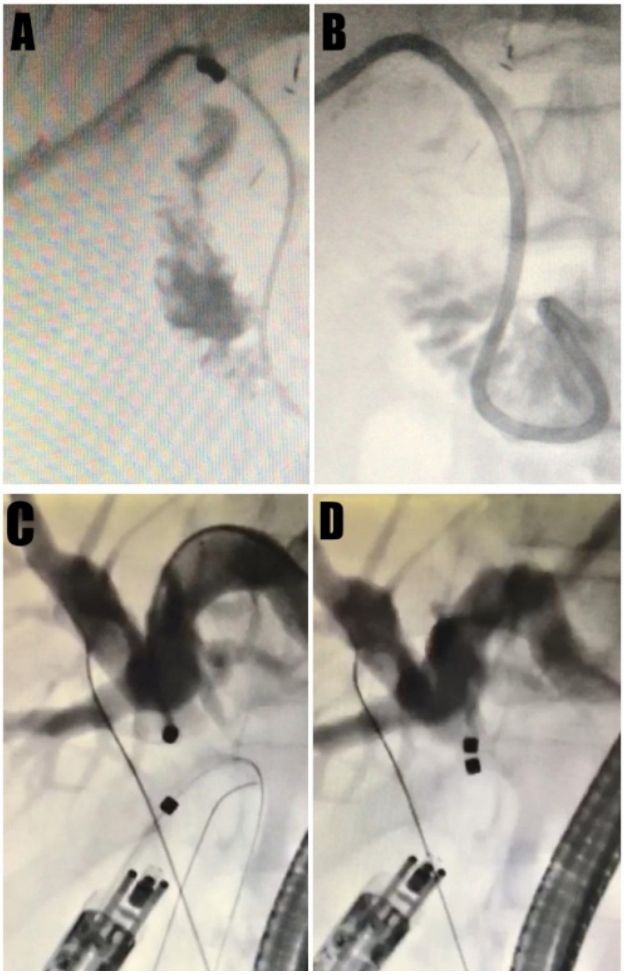

Figure 2. Magnetic compression anastomosis for stricture after cholecystectomy. (A and B) A percutaneous transhepatic biliary drainage (PTBD) catheter was placed and dilated to 16 Fr. One magnet was passed through the PTBD duct and the other magnet was passed through the common bile duct using an endoscopic retrograde cholangiopancreatography (ERCP) scope. Approximation of the magnets was successful. C and D show the approximated magnets. After adhesion was completed on day 5, percutaneous 10 Fr and endoscopic 7 Fr double pigtail plastic stents were implanted after removal of the magnets.

(Pictures taken from Associate Professor Dr. Emre Unal from Hacettepe University Department of Interventional Radiology).

abdominal ultrasonography imaging following removal of the PTCS catheter or transcutaneous FCSEMS. The reported recurrence rate of post-MCA stenosis is very low compared to recurrence rates after ERCP and PTBD [8, 29]. If recurrence is suspected, further diagnostic procedures such as MRCP or cholangiographic examination may be required [18]. In cases of restenosis, recanalization can be achieved by PTBD or balloon dilatation [27].

The primary adverse event associated with MCA is typically mild cholangitis, which can usually be effectively managed with conservative treatment [3]. To mitigate the risk of cholangitis, ensuring adequate biliary drainage before and after the procedure is essential. Additionally, there is a possibility of bile hemorrhage resulting from PTBD duct injury by the sheath [22]. The only adverse event reported to occur from magnet approach to indwelling catheter removal was mild fever [24]. Follow-up assessments have not revealed any

late adverse events or mortality directly linked to the MCA procedure. Given that magnets are aseptic devices that do not trigger inflammatory or immune responses within the bile duct, only cases of magnet migration and entrapment in the bile or hepatic ducts during magnet placement have been reported. In such cases, balloon or bougie dilation distal to the magnets, percutaneous pressurization, manipulation of the magnets with various tools, and percutaneous cholangioscopic intervention can solve the problem in most cases. When magnets cannot be removed with all these attempts, surgery may be considered [23]. Consequently, MCA appears to be a safe option even for patients undergoing liver transplantation or those who are immunocompromised [18].

Clinical Evidence and Results

In 107 patients with benign BS after LDLT, 93 (86.9%) successful anastomoses were performed, 89 biliobiliary and 4 bilioenteric anastomoses. In 13 patients with benign BS after OLT, 12 successful (92.3%) biliobiliary anastomoses were performed. In 15 patients with benign BS after liver transplantation, 14 of which were LDLT and 1 OLT, the anastomosis was unsuccessful. In 31 patients with postoperative benign BS other than liver transplantation, 28 successful (90.3%) anastomoses, 17 biliobiliary and 11 bilioenteric, were performed. In 34 patients with malignant BS, bilioenteric anastomosis was performed successfully (100%) in all patients. In total, 167 of 185 patients with biliary stricture were successful (90.2%).

After successful biliobiliary anastamosis in 118 patients with benign strictures, cholangitis was observed in 4 patients, biliary bleeding in 1 patient, magnet migration in 2 patients and magnet entrapment in 3 patients. Restenosis developed in 2 patients. In 15 patients with benign BS who underwent bilioenteric anastomosis, no complications were observed and restenosis developed in only 1 patient. After successful bilioenteric anastomosis in 34 patients with malignant strictures, cholangitis was observed in 2 patients. Restenosis occurred in 3 patients during follow-up. In total, cholangitis was observed in 6 patients (3.5%), biliary bleeding in 1 patient (0.5%), magnet migration in 2 patients (1.1%) and magnet entrapment in 3 patients (1.7%) after successful MCA in 167 patients. In 6 patients, restenosis (3.5%) developed during follow-up. The results of our extensive literature review are shown in tables 1, 2 and 3.

In result, many studies investigating the efficacy and safety of MCA in the treatment of enignant and malignant BSs have shown promising results, and the clinical feasibility, safety and usefulness of MCA have been proven in many cases of stenosis and obstruction without the need for surgery.

Challenges and Future Directions

While MCA holds great promise, several challenges remain to be addressed. Technical considerations such as optimal magnet design and placement technique require further refinement to improve outcomes and minimize complications. Additionally, comparative studies are needed to directly compare the efficacy of MCA with traditional interventions, particularly in specific patient populations such as those with benign vs. malignant strictures. Future research should also explore the potential role of adjunctive therapies, such as tissue engineering or drug-eluting coatings, to further enhance the efficacy of MCA in biliary stricture management.

Conclusion

MCA represents a promising and innovative approach for the treatment of BSs, offering advantages such as durable patency, reduced risk of stent-related complications, and feasibility in complex anatomies. While further research is needed to optimize technique and clarify long-term outcomes, MCA holds the potential to revolutionize the management of BSs and improve patient outcomes. Since MCA is an interventional procedure, the burden on the patient is extremely low and it can be performed in elderly patients or those with poor systemic status. MCA is emerging as a non-surgical alternative for recanalisation of biliobiliary and bilioenteric strictures and offers a safe and feasible option with high success rate, minimal stricture recurrence and reduced trauma.

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CERASUS JOURNAL OF MEDICINE

ORIGINAL ARTICLE

Understanding diaper dermatitis: What parents of 0-36 month olds need to know and the key factors influencing it's development

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Abstract

Objective: Diaper dermatitis, commonly known as diaper rash, is a frequent skin concern for families with infants. This study explores the knowledge levels of parents with children aged 0-36 months regarding diaper rash and the factors influencing its development.

Methods: The survey- based study involved 300 parents who participated in a survey designed to measure their knowledge and attitudes about diaper rash. The survey also inquired about their babies' diaper care routines and preferred sources of information on diaper rash.

Results: A positive correlation was found between the education levels of the parents and knowledge of diaper rash. Parents with university degrees had a higher median awareness score [9 (3-12)] compared to parents with high school [8 (4-12)] and primary school diplomas [7 (3-12)] ($p=0.009$ and $p<0.001$, respectively). Interestingly, parents whose children experienced diaper rash within the past 3 months displayed a slightly lower median awareness score [8 (3-12)] compared to those without recent experience [9 (3-12)] ($p=0.009$). The use of wet wipes did not show a significant association with diaper rash occurrence ($p=0.898$). Creams emerged as the most common treatment method for diaper rash. The primary source for obtaining these creams was doctor recommendations.

Conclusion: This study suggests a link between parental knowledge of diaper rash and its frequency. The development of educational programs for parents could be a valuable strategy in preventing diaper rash.

Keywords: Diaper dermatitis; diaper rash; parental knowledge; infant care

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Introduction

Diaper dermatitis (DD), commonly known as diaper rash, is an inflammatory reaction of the skin in the genital and perianal areas (diaper area) [1]. It is particularly prevalent during the 9–12-month period and often presents as irritant contact dermatitis. Candida infection, seborrheic dermatitis, and psoriasis can also cause diaper rash [2]. Increased moisture, pH rise, prolonged contact with urine or feces, and detergents all contribute to the development of irritant substances [1]. Several factors contribute to diaper rash formation, including fungal infections, irritation from wet wipes, sensitive skin, maternal diet during breastfeeding, and antibiotic use. Diaper dermatitis is the most common skin problem encountered during infancy. The majority of children are expected to experience at least one episode before toilet training [3]. Clinical signs vary with disease severity. Bright erythema, scaly papules, and superficial erosions are more common, while pseudo verrucous papules are less frequent. The rash typically occurs in areas with the most diaper contact, such as the convex surfaces of the buttocks, inner thighs, mons pubis, scrotum, and labia majora. Intertriginous areas are generally spared [4]. Treatment varies depending on dermatitis severity, but preventive measures are the first step. Increasing diaper change frequency and using super-absorbent diapers are effective methods [5]. Preventive measures and treatment include ventilation of the diaper area, effective cleaning, barrier creams, and parental education [6]. Diaper dermatitis is a common problem for babies in the first months after birth, requiring proper parental management. Therefore, parental knowledge is crucial for effective prevention and treatment [6]. This study aimed to investigate the knowledge levels of parents with children up to 36 months old regarding diaper dermatitis and to identify factors causing it.

Materials and Methods

All procedures of this survey- based study were conducted in accordance with the dictates of Helsinki declaration and the research protocol was approved by Balıkesir University, Ethics Committee of Non-Interventional Researches (Number: 327258-2023/129).

A self-administered questionnaire was developed using Google Forms, consisted of validated questions to assess parents' knowledge and attitudes about diaper dermatitis. The questionnaire was developed after reviewing relevant literature.

The study recruited a total of 300 parents with children aged 0-36 months who visited the dermatology outpatient clinics of three tertiary institutions between December 25, 2023, and January 31, 2024.

The questionnaire included:

- Sociodemographic characteristics of the parents
- Birth method of the children
- Health status of the children
- Feeding methods of the children
- A three-response Likert-type test measuring parental knowledge about diaper dermatitis
- Questions about the diaper care routine applied to the children
- Sources of information utilized by the parents

Statistical Analysis

Descriptive data were presented as number (percentage) and mean ± standard deviation. Awareness score data were presented as median (min-max). Assuming a normal distribution based on the central limit theorem (due to the sample size of 300 parents), student T-tests were used to compare awareness scores between parents whose children had experienced diaper rash in the last 3 months and those who had not. One-way ANOVA was employed to compare awareness scores by education level, with Levene's test for homogeneity of variance and Tukey's test for post hoc analysis. Categorical variables were analyzed using the chi-square test.

All statistical analyses were performed using the SPSS (SPSS Inc., Chicago, IL, USA) software. A p-value less than 0.05 was considered statistically significant.

Results

Epidemiological Data

A total of 300 parents were reached. All participant were females (mothers). The mean age of the parents was 31.5 ±5 (18-45). The mean age of the children was 15.3 ±10 (1-36) months. The number of babies who had diaper dermatitis in the last 3 months was 197 (65.6%). A total of 156 (52%) children were breastfed, while 144 (48%) were fed with cow's milk and formula. There were 94 (31.3%) children born by normal vaginal delivery, while 276 (91.6%) children were born at term.

Median Awareness Score

The median awareness score, measured by a three-response Likert-type test, was higher among university

graduate parents [9 (3-12)] compared to high school [8 (4-12)] and primary school graduates [7 (3-12)] (p=0.009 and p<0.001, respectively). The median awareness score of parents whose children had experienced diaper dermatitis in the last 3 months [8 (3-12)] was significantly lower than that of parents whose children had not [9 (3-12)] (p=0.009).

Likert Test Responses

Diaper Change Routine

The practices in the diaper change routines of the parents were given in **Table 1**. In total, 207 (73%) parents used wet wipes, 146 (46%) used cream during diaper changes,

Table 1: Practices of the parents in diaper changing routine

Diaper changing routine	n (%)
Using wet wipes	207 (73%)
Applying cream	13 (46%)
Washing with water	125 (41.6%)
Using cotton	74 (24.6%)
Air drying	56 (18.6%)
Applying olive oil	19 (6.3%)

and 125 (41.6%) cleaned the diaper area with water. A total of 111 (37%) parents stated that washing the baby's bottom with soap was the best method of cleaning, while 201 (67%) parents believed that the baby's or mother's diet could cause diaper rash. Forty parents (42.3%) stated that an antifungal cream should always be used in the treatment of diaper rash, and 34 (11.3%) parents believed that powder should be used during every diaper change. The most commonly used methods during diaper rash episodes were presented in **Table 2**. A total of 224 (74.6%) parents used cream, while 116 (38.6%) used olive oil. In the event of diaper rash, 103 (34.3%) parents changed the diaper brand, while 25 (8.3%) parents changed the brand of wet wipes. The sources for choosing creams for diaper dermatitis were shown in **Table 3**. A total of 224 (74.6%) parents bought creams based on doctors' recommendations, 51 (17%) based on internet research, 38 (12.6%) based on pharmacists' recommendations, and 25 (8.3%) based on the advice of relatives and neighbors. The frequency of diaper rash in the last 3 months was similar between the parents used wet wipes and those who did not (p=0.898).

Table 2: Methods used when diaper dermatitis occurs

Methods	n (%)
Cream	224 (74.6%)
Olive oil	116 (38.6%)
Trying a different brand of diapers	103 (34.3%)
Trying a different brand of wet wipes	25 (8.3%)
Using baby powder	20 (6.6%)

Discussion

The diaper area requires meticulous cleaning due to skin folds, sensitive skin composition, and elevated pH levels. Water and cloth/cotton wipes, or wet wipes, are the most common cleaning methods employed. While water and cloth/cotton offer a natural and gentle clean, wet wipes provide practicality and superior effectiveness in removing stool's fat content. Therefore, wet wipes present a convenient cleaning option. Previous studies in the literature corroborate our findings, reporting wet wipes as the most frequently used method for cleaning this area [7-9].

Table 3 Responses to the question 'Who recommended your diaper rash cream?'

Resource	n (%)
Doctor	162 (54%)
Internet	51 (17%)
Pharmacy	38 (12.6%)
Relatives/Neighbors	25 (8.3%)

The current study identified wet wipes as the predominant diaper area cleaning method, used by 73% of participants. However, we observed no significant difference in diaper dermatitis rates between those using wet wipes and those who did not. Similar to our findings, Adalat et al. also reported no significant association between cleaning methods and diaper dermatitis [7]. Furthermore, studies comparing alcohol-free wet wipes with water-cotton for diaper area cleaning found no significant discrepancies in terms of trans epidermal water loss, erythema, skin moisture, and pH levels [4, 10]. The absence of an association between wet wipe use and diaper dermatitis development in the current study might be attributable to the lack of alcohol and derivatives in the wet wipes used, which can cause contact dermatitis and alter pH levels. While Adalat et al. identified an inverse association between diaper change frequency and diaper dermatitis incidence in their study, we did not observe a correlation between diaper change

frequency and the occurrence of diaper dermatitis within the last three months in our participants [7]. This discrepancy could be attributed to a sufficiently high diaper change frequency even among the least frequent group in in the current study.

Many parents turn to traditional methods for treating diaper rash. In the current study, 116 parents (38.6%) reported using olive oil when a rash developed. Biltekin et al. also documented olive oil as the most common traditional practice for diaper dermatitis treatment, with a prevalence of 56% [11]. However, literature suggests that olive oil disrupts the skin barrier and potentially induces dermatitis [12]. Nevertheless, we did not find a correlation between olive oil use and diaper dermatitis development in the current study.

An analysis of parental responses regarding diaper dermatitis knowledge revealed that parents with university degrees possessed a higher median awareness score compared to parents with high school and primary school education. Prior studies have also shown a lower incidence of diaper dermatitis in babies of mothers with higher education levels [13]. This suggests that education fosters improved awareness and access to accurate information about diaper dermatitis.

Inquiring the participants about the source of recommendations for diaper creams revealed that 162 parents (54%) indicated following doctor's recommendations, while 51 parents (17%) reported relying on online research. A previous study by Arıkan et al. reported that parents primarily purchased diaper creams based on pharmacist recommendations, with only 15.8% relying on doctor recommendations [13]. This variation might be attributed to regional differences, evolving parental awareness over time, and the growing influence of the internet.

Conclusion

Diaper dermatitis, a frequent and preventable childhood condition, can lead to unnecessary healthcare visits, causing strain on both time and resources. The current study revealed a positive correlation between parental knowledge levels and educational attainment regarding diaper dermatitis.

Like the successful promotion of breastfeeding through baby-friendly initiatives, a targeted diaper dermatitis education program could be implemented. This program should prioritize parents with primary and secondary education backgrounds. By enhancing parental awareness, we can potentially decrease the incidence of diaper dermatitis and promote the responsible utilization of healthcare services.

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Ethical Declaration: Ethics approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Balıkesir University with decision number 2023/129

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CERASUS JOURNAL OF MEDICINE

ORIGINAL ARTICLE

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Classification of histological subtypes of non-small cell lung cancer using computerized tomography texture analysis

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Abstract

Objective: This study aimed to differentiate between the two main histological subtypes of non-small cell lung cancer using a non-invasive technique, computerized tomography texture analysis.

Method: We included 53 patients. All patients were histopathologically proven non-small cell lung cancer cases. All patients underwent thorax CT scans. In CT images, the differences present in the texture features of adenocarcinoma and squamous cell carcinoma, which are the two main histological subtypes of non-small cell lung cancer, were determined by the consensus of two radiologists for computerized tomography-based texture analysis.

Results: A total of 44 texture features were extracted, including 12 first-order features and 32 second-order features derived from gray-level co-occurrence matrix (GLCM), gray-level run-length matrix (GLRLM), neighborhood gray-level different matrix (NGLDM), and gray-level zone length matrix (GLZLM) features in 51 CT images. None of the evaluated texture parameters were statistically significant. However, in patients with squamous cell lung cancer, the values of Intensity Histogram, NGTDM Complexity, and Intensity Based Robust Mean Absolute Deviation higher from adenocarcinoma patients and had the highest area under the curve in ROC analyses (0.727, 0.664, 0.666 respectively). We consider that the high values of these parameters in the squamous cell subtype, due to high intratumoral heterogeneity.

Conclusion: Intensity Histogram, NGTDM Complexity, and Intensity Based Robust Mean Absolute Deviation features can be used to differentiate between the subtypes of non-small cell lung cancer, adenocarcinoma and squamous cell carcinoma. These features were highly associated with the high intratumoral heterogeneity of squamous cell lung cancer.

Keywords: Artificial intelligence; CT; non-small cell lung cancer; radiomics; texture analysis

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Introduction

Non-small cell lung cancer (NSCLC) is the leading cause of cancer-related deaths worldwide[1]. Non-small cell lung cancer has two main histological subtypes: adenocarcinoma and squamous cell carcinoma. These two subtypes exhibit different cellular structures and characteristics, thus requiring different treatment approaches [1, 2]. The accurate diagnosis of these subtypes is important for determining appropriate treatment options. Adenocarcinoma, typically develops in the peripheral lung tissue and is more commonly seen in non-smokers. Adenocarcinoma can often be surgically removed, but radiation and chemotherapy are also among the treatment options [2]. Additionally, targeted therapies are available for some cases of adenocarcinoma. Squamous cell carcinoma, on the other hand, generally develops in the central bronchi or large airways and is more frequently observed in smokers[2]. Surgery, radiation, and chemotherapy can be used in the treatment of squamous cell carcinoma. its nonspecific symptoms and the necessity of invasive procedures for diagnosing the specific subtypes of non-small cell lung cancer, which require different treatment approaches, complicates the process of diagnosis. Non-small cell lung cancer (NSCLC) are typically noticed in advanced stages, and the symptoms often vary depending on the size, location, and extent of tumor spread [3-5]. Because of this many patients receiving a diagnosis at advanced stages when treatment options are limited. Therefore, there is an urgent need for continued research efforts aimed at unraveling the complexities of NSCLC and developing innovative strategies for early detection, personalized treatment, and improved outcomes[4, 5]. Currently the invasive methods are preferred for the identification of NSCLC subtypes but they carry a high risk of complications such as pulmonary hemorrhage and pneumothorax. Therefore, the need for non-invasive methods that can use for the NSCLC diagnosis is increasing[4,5]. Texture analysis (TA) is an emerging technique that allows for the analysis of the distribution of pixel intensities and transforms digital medical images into mineable data by extracting quantitative features mathematically[6]. TA is a promising method, and the texture data obtained can be used in deep learning algorithms for diagnosis of NSCLC subtypes. NSCLC , in contrast , is a difficult process to diagnose and the fact that the subtypes of NSCLC can be differentiated by TA can provide early diagnosis and treatment of NSCLC. We think that TA may help differentiate adenocarcinoma and squamous cell carcinoma based on legion texture characteristics in CT. Accordingly, we aimed to investigate the feasibility and accuracy of TA for differentiating NSCLC's subtypes adenocarsinoma and squamous cell carcinoma on CT images [6-8].

Materials and Methods

Radiomics workflow

The radiomics flow of this study included: (1) images acquisition, (2) image segmentation, (3) feature extraction, (4) data analysis. All the steps are shown in Fig. 1.

Patients

This retrospective study obtained approval from the institutional review board of our hospital, and written informed consent was waived [GEAH/KAEK-216]. Patients with histopathologically confirmed lung cancer who underwent CT examinations before biopsy procedure between January 2020 and April 2023 were identified from our hospital's database. Inclusion criteria comprised histopathologically confirmed lung cancer and preoperative CT examination. Exclusion criteria included CT images affected by motion artifacts.

CT Image Acquisition and Tumor Segmentation:

All CT images were obtained on a 128-Slice GE Revolution EVO CT Scan Machine with a breath-held helical acquisition of the entire thorax. CT parameters were as follows: tube voltage = 120 kVp; tube current = 150 mAs; detector collimation = 0.5 mm × 64; pitch = 0.625; rotation time = 0.5 s; reconstruction slice thickness = 1 mm; matrix = 512 × 512; field of view = 407 mm. All CT images were analyzed by two radiologists independently. Both radiologists were informed of the location of each lesion but were blinded to the pathological diagnosis. Tumor segmentation was performed manually by two radiologists with 11 and 4 years of experience in thoracal imaging using LIFEx software [www.lifexsoft.org] [9]. CT images were exported in Digital Imaging and Communications in Medicine (DICOM) format from the hospital database to LIFEx software. The region of interest encompassed the largest cross-sectional area of tumors in axial planes selected on CT images (Figure 1). All tumoral tissue, including necrosis, was included. Following tumor segmentation, texture feature extraction was performed.

Texture Feature Extraction:

Texture Analysis (TA) was conducted on two-dimensional images of segmented tumoral lesions on axial planes using LIFEx software. All CTs were

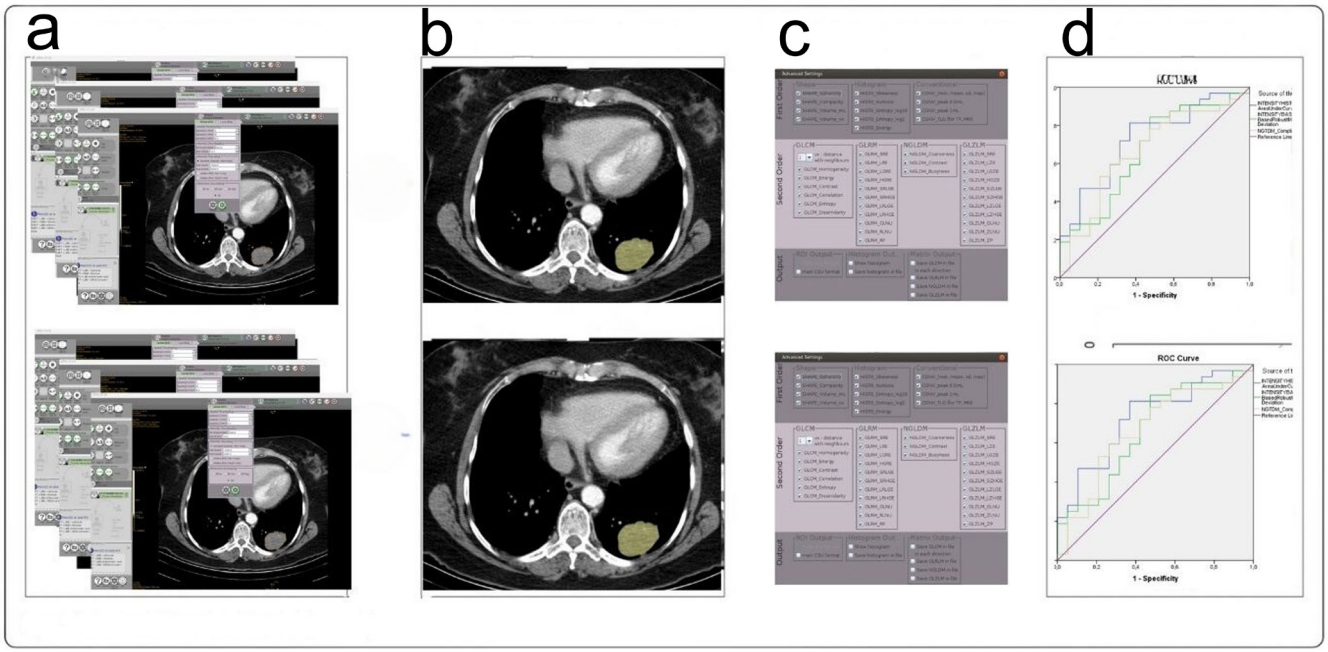

Figure 1. The radiomics flow of this study included: (a) images acquisition, (b) image segmentation, (c) feature extraction, (d) data analysis.

resampled to a voxel size of 1 × 1 × 3 mm (X spacing, Y spacing, Z spacing). A total of 44 texture features were extracted, including 12 first-order features and 32 second-order features derived from gray-level co-occurrence matrix (GLCM), gray-level run-length matrix (GLRLM), neighborhood gray-level different matrix (NGLDM), and gray-level zone length matrix (GLZLM) features.

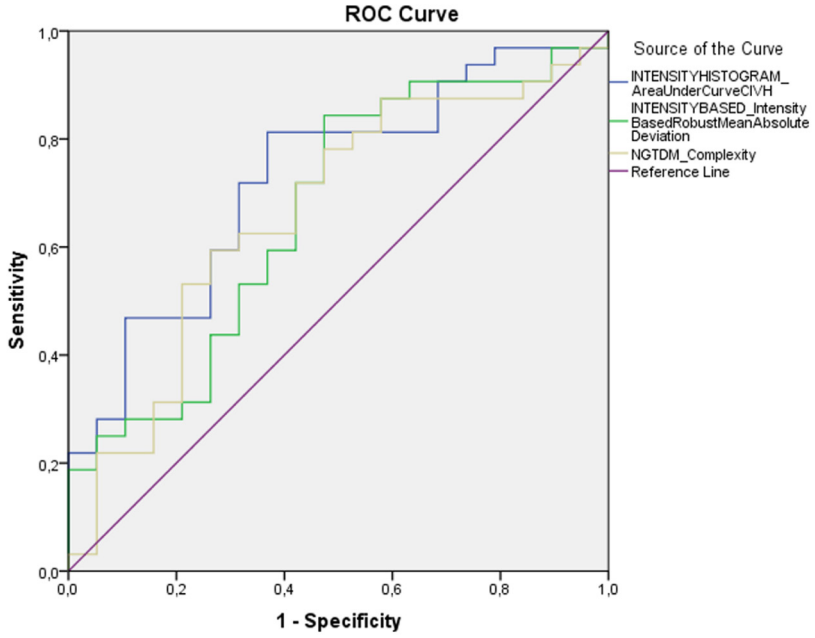

Figure 2. In patients with squamous cell lung cancer, the values of Intensity Histogram, NGTDM Complexity, and Intensity Based Robust Mean Absolute Deviation higher from adenocarcinoma patients and had the highest area under the curve in ROC analyses.

Statistical Analysis:

IBM SPSS V23 was used for statistical analyses. Normality distributions of quantitative parameters were assessed using the Shapiro-Wilk test. The Mann Whitney U test compared data not conforming to normal distributions. Receiver Operator Characteristic (ROC) analysis evaluated diagnostic test performance, and sensitivity and specificity were assessed. Data are presented as mean [95% CI]. A p value < 0.05 was considered statistically significant.

Results

Patient Characteristics:

53 of 51 patients (14 females and 37 males; mean age, 64 years; maximum age, 85; minimum age, 37;) affected by histologically confirmed NSCLC were retrospectively enrolled. 2 patients with motion artifacts excluded from the study. 32 patients had lung adenocarcinoma and 19 had squamous cell lung adenocarcinoma.

Texture Features:

None of the evaluated texture parameters were statistically significant. However, in patients with squamous cell lung cancer, the values

of Intensity Histogram, NGTDM Complexity, and Intensity Based Robust Mean Absolute Deviation higher from adenocarcinoma patients and had the highest area under the curve in ROC analyses (0.727, 0.664, 0.666 respectively) (Figure 2).

Discussion

In our study assessing the feasibility of using radiomics-based texture parameters for subtype recognition of non-small cell lung cancers, including adenocarcinoma and squamous cell carcinoma, we found that in squamous cell carcinomas, the values of Intensity histogram, NGTDM Complexity, and Intensity Based Robust Mean Absolute Deviation were high, with the highest area under the curve in ROC analyses (0.727, 0.664, 0.666 respectively).

It is known that squamous cell lung cancer is the tumor type with the highest genetic heterogeneity among non-small cell lung cancers. Squamous cell lung cancer exhibits heterogeneity associated with its genetic structure. Common genetic alterations include mutations in the TP53 gene, frequently observed in squamous cell lung cancer, contributing to tumor heterogeneity and resistance to treatment [1-4]. Fang et al. [5] reported that p53 is the most frequently mutated gene; KRAS, EGFR, MLL3, and STK11 the most frequently mutated genes in adenocarcinomas; PI3KCA, SOX2, CDK2, P63, and FGFR1 the most frequently mutated genes in squamous cell carcinomas; and RB1, MLL2, SMO, and PI3KCA the most frequently mutated genes in small cell lung cancer. Copy number variations (CNVs) are also prevalent in squamous cell lung cancer, indicating the presence of diverse subpopulations of tumor cells and contributing to intratumoral heterogeneity[1-4]. Short tandem repeats (STRs) may also display heterogeneous distribution in squamous cell lung cancer, with variations in length or number contributing to genetic diversity among tumor cells. Furthermore, epigenetic changes, such as DNA methylation, histone modifications, and non-coding RNAs, can contribute to heterogeneity by regulating gene expression differently in distinct subgroups of tumor cells [8-9]. Clonal evolution, characterized by genetic changes over time and the emergence of various subclones, further contributes to intratumoral heterogeneity in squamous cell lung cancer. These genetic alterations and clonal evolution serve as the basis for heterogeneity in squamous cell lung cancer, influencing its biological behavior and response to treatment[1-4]. In this context, it has been demonstrated that texture analysis parameters can be effectively used to indicate intratumoral heterogeneity. In our study, we believe that the parameters with the highest area under the ROC curve, namely Intensity histogram, NGTDM Complexity, and Intensity Based Robust Mean Absolute Deviation, are effective parameters for demonstrating heterogeneity. We consider that the high values of these parameters in the squamous cell subtype, with high intratumoral heterogeneity, are consistent with the texture features represented by these parameters

NGTDM is a feature set that measures the relationships between grayscale pixels in an image. Complexity denotes the complexity of the NGTDM matrix, reflecting the complexity of relationships between grayscale pixels. Elevated NGTDM Complexity values may indicate high complexity in the relationships between different grayscale pixels, thereby expressing intratumoral heterogeneity, as the complexity of relationships between grayscale pixels may vary across different regions[8-10].

Intensity histogram is a graphical representation illustrating the distribution of pixel intensities within an image. Typically, the intensity values of pixels are displayed in a histogram, which indicates the frequency of intensity values, i.e., the number of pixels at each intensity level. A high intensity histogram in a tumor may indicate variations in intensity among different regions, which can be associated with intratumoral heterogeneity. Robust Mean Absolute Deviation term is a measure of the average absolute difference of each value from the mean of the values in a dataset. The term ‘robust’ indicates resistance to outliers, meaning that the influence of outliers is minimized [8-10]. Thus, this feature can be used to measure the variance or distribution of a specific point or region based on the intensity of an image or dataset. This feature is particularly important in fields such as image processing or analysis, as it can help measure changes in intensity within a specific region. The association of high values of these parameters with high intratumoral heterogeneity in squamous cell lung carcinomas may be logical. This is because these parameters can quantitatively assess intratumoral heterogeneity by measuring the complexity of intensity or grayscale pixel relationships between different regions. These findings indicate that intratumoral heterogeneity is high in squamous cell lung carcinomas and that the parameters used to analyze this heterogeneity are clinically relevant. The use of these parameters can play a critical role in areas such as better

patient classification, prediction of treatment response, and prognosis determination.

Although our study has some limitations likely limited by the small size of the patient cohort, resulting in the inability to identify a statistically significant texture parameter we think that this study provides important findings that will guide future research. Particularly, with larger patient cohorts and analyses supported by clinical data, it will be possible to better understand the impact of these parameters on clinical outcomes. Additionally, the potential of these parameters in personalized treatment strategies should be evaluated.

In conclusion, the use of texture parameters as an indicator of intratumoral heterogeneity with CT texture analysis in squamous cell lung carcinomas is an important step in the diagnosis and development of more effective and personalized treatment approaches.

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Conflict of Interest: None of the authors have a conflict of interest.

Authors' contribution: Concept: M.N.T, Design: T.B, E.C, Data Collection or Processing: T.B, E.C, D.S, Literature Search: M.N.T, D.S, E.K, S.A, S.N.C, Writing: T.B.

Ethical Declaration: Ethics approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Giresun Training and Research Hospital with decision number 23.10.2023/24.

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CERASUS JOURNAL OF MEDICINE

ORIGINAL ARTICLE

Evaluation of patients who re-admitted to the emergency department within 24 hours

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Abstract

Objective: It was conducted to investigate the demographic and clinical characteristics of patients who re-admitted to the emergency department within 24 hours and to contribute to studies on reducing the re-admission rate.

Methods: The data of patients who re-admitted to the emergency department within 24 hours between November 2021 and September 2023 in a secondary level public hospital were retrospectively examined. Data regarding the patients' demographic information, admission dates and times, clinical characteristics, examinations, diagnoses, consultations, hospitalization and referral status were obtained from the hospital automation system.

Results: 496270 patients admitted to the emergency department during the study period. 6991 (1.4%) of the patients were admitted to the emergency department again within 24 hours. 40.3% of these patients were between the ages of 19-35 and 52.4% were women. The most common reason for re-admission to the emergency department was upper respiratory tract diseases. It was determined that 66.7% of the patients applied to the emergency department again 13-24 hours after their first admission. In their second admission, 43 patients were hospitalized or transferred for various reasons; It was determined that 1 of these patients died 5 months after being admitted to the intensive care unit.

Conclusion: Effective triage practices, directing green area patients to family physicians, making the referral chain effective, increasing health literacy, making an accurate diagnosis, allocating appropriate time to patients and explaining the treatment and expectations from treatment, ensuring that patients referred to outpatient clinics are evaluated as soon as possible and returned to the emergency department will significantly reduce applications.

Key words: emergency service; readmission; 24 hours

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Introduction

Emergency departments are designed to intervene quickly for patients, utilizing triage systems to prioritize care. In Turkey, the number of emergency department visits has grown significantly faster than the population. The national population increased by 6% from 79.8 million in 2016 to 84.6 million in 2021. However, emergency department visits surged by 39.8%, rising from 92.6 million to 129.5 million during the same period. Conversely, outpatient clinic visits decreased

Table 1. Number and Rates of Patient Applications

History	November 2021-December 2021	January 2022 December 2022	January 2023-September 2023	Total
Hospital Application (ES +OPC) (n)	88860	647998	541314	1278172
ES Application (n)	33612	281751	180907	496270
Number and percentage of ES Re-Applications (n,%)	243 (0.72%)	3457 (1.22%)	3291 (1.81%)	6991 (1.4%)

Table 2. Demographic Information of Patients Who Re-Admitted to the Emergency Department Within 24 Hours

	Number	Percentage (%)
Gender		
Male	3330	47.6
Female	3661	52.4
Age group		
0-18 years old	632	9.1
19-35 years old	2817	40.3
36-50 years old	1700	24.3
>50 years old	1842	26.3

Table 3. Clinical Characteristics of Patients Who Re-Admitted to the Emergency Department Within 24 Hours

	Number (n)	Percentage (%)
Re-Application Period		
0-12 hours	2330	33.3
13-24 hours	4661	66.7
Observation in-patient	671	9.6
Lab	3215	46
Ultrasonography	42	0.6
CT	860	12.3
MRI	8	0.1
Consultation	103	1.5
Service or Intensive Care Hospitalization	16	0.2
Service Hospitalization	7	0.1
Intensive Care Hospitalization	9	0.1
Referred another hospital	27	0.4
Service Referral	3	<0.1
Intensive Care Referral	24	0.3
Exitus	1	<0.1

Table 4. Diagnoses of Patients Who Re-Admitted to the Emergency Department within 24 Hours			
	Diagnosis	**Number(n)**	**Percentage (%)**
ICD-10 Code			
J00-J06	Upper Respiratory Diseases	1001	26
M79.1	Myalgia	736	19.1
M70-73-79	Soft Tissue Disorders	564	14.6
R10	Stomach ache	559	14.4
N30-39-23	Acute Cystitis, Urinary Tract Infection, Renal Colic	534	14.5
A04-08 K52	Gastroenteritis, Diarrhea	443	11.4

Table 5. Relationship of the Most Common Patient Diagnoses with Second Application Time Intervals				
	Reapplication Deadlines			
	0-12 Hours	13-24 Hours	Total	
Diagnosis				P value
Upper Respiratory Dis.	356 (35.5%)	645(64.4%)	1001	p<0.001
Myalgia	220(29.9%)	516(30.1%)	736	p<0.001
Soft Tissue Disorders	168(29.8%)	396(30.2%)	564	p<0.001
Stomach ache	190(34%)	369(66%)	559	p<0.001
Acute Cystitis, Urinary Tract İnfections, Renal Colic	171(32%)	363(68%)	534	p<0.001
Gastroenteritis, Diarrhea	198(44.7%)	245(55.3%)	443	p=0.122
Total	**1303(34%)**	**2534 * (66%)**	**3837**	p<0.001

*p<0.001; Patients admitted between 13-24 hours and those admitted within the first 12 hours were compared with the chi-square test.

from 199.5 million to 136.9 million [1].

This overcrowding in emergency departments leads to several problems: reduced physician time per patient, increased risk of errors, longer wait times, and a higher frequency of violent incidents [2-5]. The rate of readmission to the emergency department within 24 hours is a recognized indicator of patient care quality [6]. Additionally, readmissions contribute to the rising workload in emergency departments [7, 8].

This study aimed to investigate the demographic and clinical characteristics of patients readmitted to the emergency department within 24 hours. Our goal is to contribute to research focused on reducing readmission rates.

Methods

This retrospective study examined data for patients readmitted to the emergency department within 24 hours at Mamak State Hospital, a secondary healthcare institution, between November 2021 and September 2023. Data obtained from the hospital's electronic system included patient demographics (name, surname, age, gender), admission details (date, time), International

Classification of Diseases (ICD-10) diagnosis codes, examination findings, consultations performed, service admissions, and referral statuses.

Table 6. Relationship between Age Groups and Second Application Time Intervals

	Reapplication Deadlines			p
	0-12 Hours	13-24 Hours	Total	
Age Groups				
0-18 years old	237	395 *	632	p <0.001
19-35 years old	981	1836 *	2817	p <0.001
36-50 years old	563	1137 *	1700	p <0.001
>50 years old	549	1293 *	1842	p <0.001
Total	**2330**	**4661**	**6991**	

Data analysis was performed using IBM SPSS Statistics for Windows Version 21 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.). Descriptive statistics (frequency distribution, percentages) were used to analyze the research data. Chi-square tests were employed to analyze the created cross-tables. A p-value less than 0.05 ($p<0.05$) was considered statistically significant.

The research ethics committee approval was obtained from Yildirim Beyazit University Yenimahalle Education and Research Hospital Clinical Research Ethics Committee. (Decision No: E-2023-77 Date: 20.12.2023)

Results

During the study period, a total of 1,278,172 patients were admitted to the hospital (emergency department and outpatient clinics combined). Emergency department admissions accounted for 38.8% (n=496,270) of all admissions, while outpatient clinic visits comprised the remaining 61.2% (n=781,902). We found that 1.4% (n=6,991) of patients seen in the emergency department were readmitted within 24 hours (Table 1).Among the readmitted patients, 47.6% (n=3,330) were male and 52.4% (n=3,661) were female. Regarding age distribution, 9% (n=632) were aged 0-18, 40.3% (n=2,817) were aged 19-35, 24.3% (n=1,700) were aged 36-50, and 26.3% (n=1,842) were over 50 years old (Table 2).For patients readmitted within 24 hours, 33.3% (n=2,330) returned within the first 12 hours, and 66.7% (n=4,661) returned between 13-24 hours. Among the readmitted patients, 9.6% (n=671) were placed under observation, 46% (n=3,215) required various laboratory tests, 0.6% (n=42) underwent ultrasonography, 12.3% (n=860) underwent computed tomography (CT), 1.5% (n=8) underwent magnetic resonance imaging (MRI), and 1.5% (n=103) required consultation. Notably, 0.2% (n=16) of readmitted patients were admitted to the ward or intensive care unit (ICU), and 0.4% (n=27) were transferred to another hospital. One patient admitted to the ICU with COVID-19 pneumonia and pulmonary embolism unfortunately died five months later (Table 3).The most frequent diagnoses for patients readmitted within 24 hours were: upper respiratory tract infections (14.3%, n=1001), myalgia (muscle pain) (10.5%, n=736), soft tissue disorders (8.1%, n=564), abdominal pain (8.0%, n=559), acute cystitis and renal colic (7.6%, n=534) gastroenteritis (6.3%, n=443) (Table 4). The first 5 diagnoses of patients who were re-evaluated after re-admission and hospitalized or referred to another center were acute myocardial infarction (n=10), pneumonia (n=6), cerebrovascular diseases (n=3), pulmonary embolism (n=2), hemothorax and pneumothorax (n=2), respectively. When the relationship between the diagnoses, which are the most common reasons for recurrent admission, and the application time was examined, it was determined that 66% of the patients made their second application 13-24 hours after their first application. It was determined that statistically more patients were readmitted in the second 12 hours compared to the first 12 hours for all the most common patient diagnoses ($p<0.001$) (Table 5). When the relationship between age ranges and second application times was examined, it was determined that the re-admission rates were statistically more significant in the second 12 hours compared to the first 12 hours in all age groups ($p <0.001$) (Table 6).

Discussion

Studies consistently report a rise in emergency department admissions each year, with repeat visits contributing significantly to this increased workload. Beştemir et al. [1] demonstrated a 39.8% surge in emergency department admissions from 2016 to 2021, despite a population increase of only 6%. In our study, conducted between November 2021 and September 2023, emergency department visits accounted for 38.8% of all hospital admissions. It is generally considered concerning when emergency departments manage more than 35% of a hospital's overall patient volume [9]. There is a clear need for well-designed and sustainable healthcare policies to decrease unnecessary emergency department visits.

Our analysis revealed a higher rate of re-admissions among females compared to males. This finding aligns with similar studies in the literature, which also report a higher frequency of emergency department visits by female patients in general [10-12]. This trend might contribute to the observed high rate of repeat visits.

The re-admission rate in our study ranged from 0.72% to 1.81% across the given timeframe (November 2021-September 2023), with an average of 1.40%. One potential explanation for the year-over-year increase in re-admission rates could be related to our hospital being newly established in July 2021. As equipment and staffing deficiencies were addressed over time, it's possible that patients returned to our facility for repeat visits in subsequent years. When compared to existing literature, emergency department re-admission rates typically fall between 1.4% and 7.8% [13, 14]. The lower re-admission rate observed in our study might be due to the presence of other hospitals in close proximity, leading patients to seek care at alternative facilities for their second visits.

Recurrent emergency department visits can be attributed to various factors, including those related to the patient, the disease itself, the physician involved in the initial care, and systemic issues within the healthcare system. Kelly et al. [15] identified disease-related causes as the most prominent factor (61%), followed by patient-related factors (27%), physician-related factors (11%), and systemic issues (1%). Akyol et al. [16] reported that 16.2% of re-admissions were attributable to physician-related factors, and that one-third of these re-admissions could have been prevented. While the general reasons for re-admission remain consistent across studies, the specific percentages vary. Common characteristics of patients who re-admit include persistent or worsening complaints, or the development of new symptoms.

In our study, 66.7% of patients who returned to the emergency department did so within 13-24 hours of their initial visit. Possible explanations for this high number of applications in the second 12 hours could be the ineffectiveness of the initial treatment, incompatibility between the treatment and the patient's condition, or inadequate information provided by the physician during the first visit. Thoroughly explaining the disease course, the planned treatment, situations that warrant a return visit to the emergency department, and recommending appropriate follow-up appointments with outpatient clinics when necessary can potentially reduce the number of repeat visits to the emergency department.

A review of the literature reveals that the most common diagnoses associated with repeat emergency department visits include abdominal pain, dyspnea (difficulty breathing), musculoskeletal disorders, and hypertension [14, 17, 18]. In our study, the most frequent diagnoses were upper respiratory tract infections, musculoskeletal disorders, abdominal pain, urinary tract infections/renal colic, and gastroenteritis. Similar to our findings, other studies conducted in Turkey have identified upper respiratory tract infections as the leading cause of re-admission [16, 19].

Our study has limitations. Firstly, it was conducted at a single center. Secondly, as a retrospective study, it lacks data to investigate the specific reasons behind re-admissions. Finally, the possibility exists that patients may have sought care at other nearby hospitals for their second visits.

Conclusion

Enhancing health literacy among the population, implementing appropriate triage systems, directing non-emergency cases to primary care physicians, ensuring a well-functioning referral network, establishing accurate diagnoses and initiating appropriate treatment, providing patients with sufficient information about their condition and its management, and promptly referring patients from the emergency department to outpatient clinics for follow-up care can all contribute to reducing emergency department workload and the frequency of re-admissions.

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CERASUS JOURNAL OF MEDICINE

ORIGINAL ARTICLE

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Joint hypermobility in rheumatoid arthritis: A case-control study

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Abstract

Objective: To evaluate the presence of joint hypermobility (JH) in rheumatoid arthritis (RA) patients and the relationship between JH and disease activity, hand functions, and quality of life.

Methods: Thirty-four seropositive RA patients and 34 controls were included. Demographic data, body mass index, and state of JH (Beighton scores) of all participants were recorded. Two groups were compared in terms of JH. In RA patients, the Disease Activity Score-28 (DAS-28) was used to evaluate disease activity, the Duruöz Hand Index (DHI) for hand functions, and the Nottingham Health Profile (NHP) for quality of life. A correlation analysis was performed to evaluate the relationship of these data with JH in RA patients.

Results: In the RA group, there were no patients with JH. No significant difference was found in the Beighton scores compared to the control group ($p=0.383$). The Beighton score showed a statistically significant negative correlation with DAS-28, DHI, NHP total, NHP pain, NHP physical activity, and NHP energy level. ($p=0.026$, $p=0.015$, $p=0.003$, $p<0.001$, $p=0.007$, $p=0.001$, respectively).

Conclusion: JH was not detected in patients with RA. Decreased joint mobility may be associated with high disease activity, poor quality of life, and poor hand function.

Key words: rheumatoid arthritis; joint hypermobility; hand function

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Introduction

Rheumatoid arthritis (RA) is a chronic, systemic, inflammatory, autoimmune disease that primarily affects the joints, but also has extra-articular involvement. The most characteristic feature of RA is inflammatory synovitis, which is generally distributed symmetrically in peripheral joints. Cartilage damage, bone erosions, joint destruction and ligament laxity/disintegration caused by synovial inflammation are the most prominent features of the disease. It predominantly affects the smaller joints of the hands and feet [1,2].

Joint hypermobility syndrome (JHS), also known as benign hypermobility syndrome, is a soft tissue disorder characterized by chronic musculoskeletal pain due to excessive stretching of the joints. Biomechanical overload and repetitive microtraumas are known to be important environmental factors in pathogenesis. Beighton criteria are used in diagnosis. In order to clarify the diagnosis, collagen tissue diseases such as Ehlers-Danlos and Marfan syndrome should be excluded. Symmetric polyarthralgia is present among the clinical findings, but unlike RA, morning stiffness is short-lived and the pain increases with physical activity [3]. Although it has a high prevalence of 3% due to the lack of specific laboratory and clinical findings, it is rarely noticed by physicians interested in rheumatology [4].

In this study, it was assumed that the tissue damage caused by the continuous inflammation in the joints in RA may cause changes in joint laxity. The aim was to evaluate the presence of joint hypermobility (JH) in RA patients and its differences from the control group, as well as the relationship between JH and disease activity scores, quality of life, and hand functions.

For this purpose, the presence of JH in RA patients was examined and compared with a control group of similar age and gender without known systemic disease. In addition, the relationship between JH and RA disease activity scores, quality of life, and hand functions was evaluated.

Material and Method

The study was performed according to the Helsinki Guidelines and approved by the ethical committee of the Giresun Training and Research Hospital (approval date: 25.12.2023 / approval number: KAEK-323). A written informed consent was obtained from each patient.

The GPower 3.1 program was used to calculate the sample size. According to a two-sided hypothesis with a 5% Type I error rate, 0.7 effect size, and 80% power, the required number of participants for each group was calculated as 34, totaling 68.

This study is a descriptive case-control study conducted in a tertiary care hospital. Thirty-four patients aged 18 and over, previously classified as seropositive RA, and 34 individuals aged 18 and over, with no known neuromusculoskeletal or systemic disease, who applied to the Physical Medicine and Rehabilitation Clinic in Giresun University Giresun Training and Research Hospital between January 2024 and July 2024, were included in the study.

Inclusion criteria:

RA group

• Being 18 years of age or older

• Being classified as seropositive RA according to ACR/EULAR 2010 criteria [5]

Control group

• Being 18 years of age or older

Exclusion criteria:

RA group

• Having joint deformities

• History of musculoskeletal surgery

• History of additional systemic diseases

Control group

• History of neuromusculoskeletal or systemic disease

Outcome Measures:

Disease Activity Score-28 (DAS-28) score is the most commonly used scoring method to show RA disease activity. It is calculated using the number of tender and swollen joints (in 28 joints), the visual analogue scale score of the patient's global health, and erythrocyte sedimentation rate (ESR) or C-reactive protein (CRP) values. It is calculated with the formula DAS-28 = (0.56 x tender joint number/2) + (0.28 x swollen joint number/2) + (0.7 x ESR/CRP) + (0.014 x VAS). Disease activity is classified according to the DAS-28 calculation result [6]. **Beighton score** is one of the most preferred scorings for JH evaluation due to the bilateral evaluation of joints and its easy applicability. It was created by Beighton in 1973 by modifying the Carter and Wilkinson criteria. Passive

dorsiflexion of the fifth fingers of the hand exceeding 90 degrees, the thumbs touching the forearm flexor surface with apposition, hyperextension of the knees and elbows more than 10 degrees, and knees extended, flexion forward from the waist, and palms touching the ground are the criteria that bring points for the test. It is evaluated out of a total of nine points [7]. In this study, scoring 5 out of 9 was considered JHS. **Duruöz Hand Index** is used to evaluate the hand functions of patients with RA. The test includes 18 questions. It is divided into categories of daily life functions (kitchen, clothing, cleaning, workplace, and other daily life activities). It takes two to three minutes to administer, and it does not require any additional training or equipment. It is a simple and understandable test where questions are answered according to the Likert scale. One can receive a minimum of 0 points and a maximum of 90 points, and a lower score indicates a better functional status [8]. **Nottingham Health Profile (NHP)** is a general quality of life questionnaire that evaluates patients' perceptions of health problems and the impact of these problems on their daily activities. The questionnaire consists of 38 items; pain (8 items), emotional reactions (9 items), sleep (5 items), social isolation (5 items), physical activity (8 items), and energy (3 items) subscales are evaluated. Patients are asked to answer each item with yes or no. Each subtest is evaluated between 0 and 100 points. A score of 0 reflects the best health profile, while a score of 100 reflects the worst health profile. The total NHP score is obtained by adding the scores on the subscales [9]. A validity and reliability study has been conducted on Turkish people [10].

Statistical analysis: The results of demographic data and group comparisons were presented as mean ± standard deviation and median (interquartile range) for continuous variables and as numbers (n) for categorical variables. The distribution of variables across groups was tested using the Shapiro-Wilk tests. To compare two independent groups with non-normally distributed variables, the Mann-Whitney U test was applied, while the Student's t-test was used for the comparison of two normally distributed groups. The chi-square and/or Fisher's exact test were applied to examine relationships or differences between groups for categorical variables. To assess the correlation between variables, Spearman correlation analysis was used for data without a normal distribution. A p-value of less than 0.05 was considered statistically significant.

Table 1. Comparisons of demographic data, body mass index and Beighton Scores

		Rheumatoid Arthritis n=34	Control n=34	p
Age	**Mean ± SD**	54.82 ± 13.35	49.11 ± 11.67	0.065[t]
	Median (IR)	55.50 (18.25)	48.50 (16.25)	
Sex	**Female (n, %)**	30 (%88.2)	31 (%91.2)	1.000[f]
	Male (n, %)	4 (%11.8)	3 (%8.8)	
Body Mass Index	**Mean ± SD**	28.70 ± 4.83	26.74 ± 4.55	0.061[m]
	Median (IR)	28.27 (6.34)	25.81 (7.24)	
Beighton Score	**Mean ± SD**	0.85 ± 1.32	1.35 ± 2.13	0.383[m]
	Median (IR)	0.00 (2.00)	0.00 (2.00)	

SD: Standard Deviation; IR: Interquartile Range; t: Student's T Test; f: Fisher's Exact Test ; m: Mann Whitney U test

Results

The RA and control groups were similar in terms of age, gender, and body mass index (p=0.065, p=1.00, p=0.061, respectively). No statistically significant difference was found in terms of Beighton scores (p=0.383) (Table 1). The median disease duration of RA patients was 72 months (interquartile range=114 months).

No patients were found in the RA group who met the JHS criteria (Beighton score ≥5/9). JHS was detected in two patients in the control group. The Beighton score was found to be greater than "0" in eight RA patients. When the Beighton criteria were examined separately regarding the hand joints, three of these patients had passive extension greater than 90 degrees in both fifth fingers. There was no patient with hypermobility in the thumb.

Table 2. Correlation analysis of Beighton Score with DAS-28, DHI and NHP scores in the rheumatoid arthritis group.

	Beighton Score[s]	
	Rho	**p**
Age	-0.226	0.199
Disease duration	0.199	0.502
DAS-28	-0.381	***0.026***
DHI	-0.413	***0.015***
NHP total score	-0.497	***0.003***
NHP – pain	-0.584	***<0.001***
NHP - emotional reaction	-0.295	0.090
NHP – sleep	-0.312	0.072
NHP - social isolation	0.03	0.871
NHP - physical abilities	-0.455	***0.007***
NHP - energy level	-0.551	***0.001***

DAS-28: Disease Activity Score-28; DHI: Duruöz Hand Index; NHP: Nottingham Health Profile; s: Spearman korelasyon analizi

Fifty percent (n=17) of the RA patients were using biological DMARDs. There was no statistically significant difference in terms of the Beighton scores between RA patients who used and did not use biological agents [*median (interquartile range)* 0.00(2.5) vs 0.00 (1.00), p=0.339)].

In the RA group, the Beighton scores showed a statistically significant negative correlation with DAS-28, DHI, NHP total, NHP pain, NHP physical activity, and NHP energy level (p=0.026, p=0.015, p=0.003, p<0.001, p=0.007, p=0.001, respectively) (Table 2).

Discussion

In this study, which aimed to investigate the presence of hypermobility in RA patients and its relationship with disease data, no patients who met the hypermobility criteria were detected in the RA group. It was observed that the Beighton scores used to evaluate the presence of hypermobility did not differ from the control group. However, it was determined that JH was negatively correlated with disease activity, quality of life, and hand functions. These results were interpreted as indicating that the decrease in joint laxity negatively affects the patients. Although patients with joint deformity were not included in the study, it was thought that such a result was obtained due to the decrease in joint flexibility as a result of disease activity in the pre-deformity period. And it was shown that the decrease in mobility negatively affected the patient's quality of life and hand functions.

Exercise and physical activity are important for RA patients to relieve arthritis symptoms, support functional capacity and psychological health, and reduce pain, rheumatoid cachexia, and cardiovascular risk [11-13]. Exercises of various types, lengths, and intensities have been shown to be helpful in the treatment of RA. Also, it was stated that regular exercise could help lower disease activity considering immunity, inflammatory response, oxidative stress, and epigenetic mechanisms [14]. The 2022 American College of Rheumatology Guideline recommends personalized aerobic, aquatic, resistance, or mind-body exercises; comprehensive occupational and physical therapy, and hand therapy to improve pain and physical function [15].

In RA, autoimmune cell activation and immune complex accumulation occur in the joints. Due to these accumulations, capsule thickening and tendon and ligament ruptures develop as a result of cartilage and bone damage. Consequently, joint deformities emerge in patients [16]. Unlike Jaccoud's arthropathy, which

is seen in connective tissue diseases, especially SLE, and can be reduced passively [17], hand deformities developing in RA are fixed and non-correctable with the existence of bone erosions. The variables that have the greatest impact on hand function in RA patients include pain, grip strength, and disease activity [18]. Similar to the negative correlation between the Beighton score and DHI scores in the current study, in a previous study identified deficits in flexion and extension of digits II through V as the most reliable indicators of actual hand performance [19]. Intensive hand exercise therapies have an important role in maintaining hand functions in RA [20].

In a study conducted at the University of Missouri-Columbia, 130 adult patients who applied to the outpatient rheumatology clinic with musculoskeletal problems or connective tissue complaints were evaluated, and the Beighton criteria were used in the evaluation of hypermobility. Among them, only one patient diagnosed with RA had a joint mobility score of 5. It was determined that this patient had a history of hypermobility in the hands and wrists before the onset of RA. Hypermobility was not detected in the MCP and 1st finger joints within the Beighton score parameters of this patient [21]. Similarly, there were no RA patients who met the hypermobility criteria in this study. The Beighton score used in this study to detect hypermobility only evaluates a limited number of joints and does not measure the degree of mobility in these joints. It assigns a positive score only if the joint exceeds the required threshold of range of motion. Joints with borderline hypermobility may be scored differently by various examiners or in different situations [22]. In addition, although in this study there was no relationship found between joint mobility and disease duration or age, it is known that JH decreases with age [23]. Therefore, both the Beighton scoring is not a sensitive assessment and the high average age of the patients may have caused hypermobility not to be detected in RA patients in the study.

Previous studies have shown that high disease activity, pain, functional disability and depression negatively affect health-related quality of life (HRQoL) in patients with RA [24-26]. No study has been found investigating the relationship between joint mobility and quality of life. In this study, a negative correlation between the Beighton score and quality of life was found. With this result, it cannot be determined precisely whether the Beighton score directly affects the quality of life. However, it is thought that it may be due to the relationship between high disease activity and pain with low HRQoL shown in previous studies.

Considering all these results, it should be emphasized that RA treatment should not be limited to medical treatment only, exercise programs should definitely be recommended to the patient in order to maintain optimum joint functions, and the importance of including patients in need in rehabilitation programs should be emphasized.

The most important limitations of this study were its cross-sectional design and small sample size. The median disease duration was six years, and due to the design of the study, the changes in the joints over time couldn't be evaluated. It is believed that this issue will be clarified with future longitudinal studies that will specifically evaluate the joint laxity in RA.

In conclusion, hypermobility was not detected in RA. JH scores were similar to those in the control group and were not associated with age or disease duration. Decreased joint mobility was found to be associated with high disease activity, poor quality of life, and poor hand function. It is believed that patients' hand functions and quality of life can be improved by optimizing joint mobility with effective medical treatment and exercise programs.

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ORIGINAL ARTICLE

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Forensic medical assessment of amusement park injuries

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Abstract

Objective: Amusement park injuries can cause significant harm, especially in children and adolescents. This study aims to evaluate the cases of amusement park injuries presented to the Forensic Medicine Department in Eskişehir/Turkey over a 10-year period, to publish the characteristics of the injuries and demographic data with the literature.

Methods: Cases of amusement park injuries presented to the Forensic Medicine Department of Eskişehir Osmangazi University Faculty of Medicine(Turkey) between 2014-2023 were retrospectively evaluated. Age, gender, injury patterns, and the content of forensic reports of the cases were assessed.

Results: Over the 10-year period, 12 cases of amusement park injuries were reported to our department. Eight cases were male and four were female, with the youngest case being 13 and the oldest 23 years old. Nine cases involved falls and dragging, two involved falls and being trapped under objects, and one involved being crushed. Six cases sustained injuries that could be managed with simple medical intervention, six required more extensive medical care, and one was life-threatening.

Conclusion: Amusement park injuries are forensic cases. There is confusion regarding responsibility and legislation. Legal regulations and more effective inspections are needed for the legal process in injury cases. It is essential for physicians in emergency departments to recognize that amusement park injuries are forensic cases and report them accordingly.

Keywords: Amusement park; injury; forensic medicine

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Introduction

Injuries occurring at amusement parks can result in significant harm and even death, particularly among children and adolescents [1-8]. Numerous fatalities due to injuries such as falls, ejections, and crushes from/by amusement park rides have been reported in the literature [1,4]. The nature of injuries varies depending on the type, speed, and mechanism of the amusement park rides [4]. Injuries can result from neglected maintenance, technical faults, or user non-compliance with safety rules [9].

Amusement parks are equipped with a variety of complex mechanical systems designed to ensure the safety of their users. These systems include seat belts, emergency brakes and safety barriers, all of which require regular maintenance and inspection. Failure to follow these safety protocols can lead to serious accidents. Inspections of technical, hygiene and safety procedures in amusement parks are carried out by various agencies such as the municipal police, engineering chambers, the Ministry of Health and law enforcement agencies under the Ministry of Interior. This creates a complex situation. A more organized inspection system should be developed.

This study aims to evaluate the cases of amusement park injuries presented to the Forensic Medicine Department in Eskişehir over a 10-year period, publish the characteristics of the injuries and demographic data with the literature, and draw attention to the issue.

Materıals and methods

Cases of amusement park injuries presented to the Forensic Medicine Department of Eskişehir Osmangazi University Faculty of Medicine between 2014-2023 were retrospectively evaluated. Age, gender, injury patterns, injury locations, treatment methods, and the content of forensic reports were assessed. Health problems arising from fights, food stand poisonings, or other incidents in the amusement park were excluded from the study. Only injuries sustained on amusement rides were included.

Forensic reports were prepared by evaluating examination findings, all hospital documents related to the incident, and necessary consultations with relevant departments. Initial forensic examination reports prepared in emergency departments were reviewed for accuracy. Data were loaded into a statistical package for evaluation and analysis.

Ethics approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Eskişehir Osmangazi University.

Statistical analysis

IBM-Statistical Package for Social Sciences (IBM-SPSS Inc., Chicago, IL, USA) 22.0 programme was used to analyse the data obtained in the study. The conformity of the data to normal distribution was analysed by “Kolmogorov Smirnov test”. Continuous variables were expressed as mean ± standard deviation and categorical variables were expressed as number and percentage. ‘One-Way ANOVA test’ was applied in the analysis of continuous variables. Chi-square test or Fisher’s exact test was used to analyse categorical variables. Statistical significance level was accepted as $p<0.05$.

Results

In the 10-year period, 12 cases of amusement park injuries were reported to our department. All cases were classified as accidents in investigation files. The gender, age, injury characteristics, and forensic report contents of the cases are presented in Table 1. Four cases were injured on ballerina rides, three on Ferris wheels, two on roller coasters, two on carousels, and one on bumper cars. Eight cases were male and four were female, with the youngest case being 13 and the oldest 23 years old. Nine cases involved falls and dragging, two involved falls and being trapped under objects, and one involved being crushed.

According to the forensic evaluation guidelines of the Injury Crimes in Turkish Penal Code, six cases sustained injuries manageable with simple medical intervention, six cases required more extensive medical care, and one case was life-threatening [10]. Six cases had fractures: two had tibia and fibula fractures, two had radius fractures, one had a phalanx fracture, and one had a temporal bone fracture. The life-threatening case involved a temporal bone fracture and brain hemorrhage due to a fall from a ballerina ride. Six cases were treated as outpatients, and six were hospitalized: five in the orthopedic ward and one in

the neurosurgery ward. One case with tibia and fibula fractures underwent surgery, while others were treated conservatively. The neurosurgery case underwent surgery and was treated in intensive care for three days. No fatalities were reported.

Discussion and conclusion

Amusement park injuries are forensic cases. No other studies evaluating the forensic medical aspects of amusement park injuries have been found in our country. Males are more frequently injured in forensic cases [11-15]. A study in Bolu (Turkey) reported that 66.4% of forensic cases presented to emergency services were male [13]. In Bursa (Turkey), this rate was 68.4% [14]. In Sivas (Turkey), 76.8% of forensic cases presented to Cumhuriyet University Faculty of Medicine Forensic Medicine Department were male [11]. In Eskişehir (Turkey), 79.7% of life-threatening forensic injury cases were male [12]. Consistent with the literature, two-thirds of the cases in our study were male.

Table.1 Distribution of age, gender and injury characteristics of the cases

		Gender	
		Male	Female
Age Group	< 18 years old	7	3
	18 years and over	1	1
Instrument That Caused The İnjury	Ballerina Ride	2	2
	Ferris wheel	2	1
	Roller Coster	2	0
	Carousel	1	1
	Bumper car	1	0
Type of Injury	Falling and dragging	6	3
	Falling and being trapped under objects	1	1
	Crash	1	0
Can Be Resolved With Simple Medical Intervention	Yes	4	2
	No	4	2
Life Threatening	Yes	1	0
	No	7	4
Bone Fracture	Yes	4	2
	No	4	2
Injured Body Part*	Head and neck	3	2
	Thorax	1	1
	Abdomen	1	0
	Extremities	5	2

* More than one body part was injured in 3 cases.

Amusement park injuries can lead to severe injuries and fatalities [1-8]. Between 1990 and 2010, 92,885 children under 18 years old were reported to have presented to emergency services in the United States due to amusement park injuries [16]. Olympia and colleagues reported 95 cases of amusement park injuries in Eastern Pennsylvania between May and September 2006 [2]. Braksiek et al. reported subdural hematomas, internal carotid artery dissections, vertebral artery dissections, subarachnoid hemorrhages, intraparenchymal hemorrhages, and carotid artery thrombosis-related strokes in amusement park injuries between 1979-2001 [1]. Deniz et al. reported three cases of amusement park injuries, one of which was fatal [9]. In Canada, 13,770 injuries and 128 serious injuries related to amusement parks were reported in 2010 [17]. A study in South Korea reported 3,608 amusement park injuries in 2008, with two-thirds being soft tissue injuries [4]. Eid et al. presented a case of spinal cord infarction due to an amusement park injury [18]. Our study did not report any fatalities. Six cases had injuries that could not be managed with simple medical intervention, and one case was life-threatening, involving a temporal bone fracture and intraparenchymal brain hemorrhage due to a fall from a ballerina ride.

There are insufficient scientific studies on amusement park injuries in our country. Multi-center studies on the subject would be beneficial for understanding the importance, raising awareness, and taking necessary precautions. It is believed that amusement park rides are only used in specific seasons, resulting in insufficient mechanical maintenance. There is confusion regarding responsibility and legislation. Legal regulations and more effective inspections are needed for the legal process in injury cases. It is crucial for physicians in emergency departments to recognize amusement park injuries as forensic cases and report them accordingly. Forensic reports should be meticulously prepared following the "Guidelines for the Forensic Medical Evaluation of Injury Crimes in the Turkish Penal Code."

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Ethical Declaration: Ethics approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Eskişehir Osmangazi University with decision number 02/05/2024 -153.

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CERASUS JOURNAL OF MEDICINE

ORIGINAL ARTICLE

Clinical outcomes of myelomeningocele infants without antenatal surgery: Mortality and morbidity in a tertiary ICU setting

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Abstract

Objective: To investigate the early clinical outcomes of infants with myelomeningocele

Material and methods: We included infants with myelomeningocele who had undergone treatment in our tertiary neonatal intensive care unit. We included all patients with myelomeningocele between 2016-2023. We retrospectively recorded data and assessed perinatal history, morbidity, and mortality status. A p-value of <0.05 was set for significance.

Results: Our study included 90 patients, with an equal distribution of males and females. The majority (87.4%) were delivered by cesarean section, while 12.6% were delivered vaginally. Chiari malformation was present in 7.8% of patients. The average gestational age was 38 weeks, birth weight was 3070 ± 520 grams, birth length was 48 cm, and head circumference was 35 cm. Clubfoot was observed in 31.5% of patients, and scoliosis/kyphoscoliosis in 13.3%. The average sac width was 7 cm and sac length was 6 cm. Normal foot movements were noted in 11.1% of patients. The average surgery time was 49 hours postnatally. Meningitis/CSF infection developed in 28.9% of patients, and convulsions occurred in 23.3%. Hydrocephalus was detected in 72.2% of patients. During follow-up, 59% required a VP shunt. The mortality rate was 18.9%, with an average hospital stay of 41 days.

Conclusion: The poor prognostic factors were lower gestational age, longer sac length and width for lower extremity tonus, scoliosis for mortality, and head circumference, sac length, and sac width for shunt needs.

Keywords: Myelomeningocele; hydrocephalus; ventriculoperitoneal shunt; neural tube defects

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Introduction

Spina bifida is a type of congenital spinal dysraphism, which can be simplified as an unclosed spine with two parts. The main pathology is a neural tube defect, which may contain neural tissue and meninges [1]. Myelomeningocele, a subgroup of congenital spinal dysraphism, involves the herniation of neural tissue through a congenital spinal defect [2]. Open myelomeningocele defects cause morbidity and pose a serious mortality risk. It is the most common type of spinal dysraphism, accounting for 80% of congenital neural tube defects [3]. Myelomeningocele occurs due to impaired cell migration of the neural tube, resulting in defective neural tube differentiation on the 27th day of embryogenesis, which is when the last caudal part closes during primary neurulation. Mesodermal and ectodermal cells form the posterior vertebra and skin [3]. The rate of spinal dysraphism ranges between 0.5-8 per 1,000 live births, with higher rates in developing countries [4]. The incidence has decreased with folic acid supplementation in the preconception period [1].

The treatment of infants with an open myelomeningocele defect requires a multidisciplinary approach, starting with intravenous antibiotic therapy, although some patients may still encounter life-threatening problems. Surgical closure should be performed within two days to prevent infections due to exposed neural tissue [5]. Infants with myelomeningocele may have concomitant hydrocephalus [3]. Some patients who develop hydrocephalus may need a ventriculoperitoneal shunt insertion (5), and some may even require shunt revisions [6]. Myelomeningocele can also be associated with Chiari type II malformation [3], and these infants may need suboccipital decompression [6].

The complications of a myelomeningocele defect can have devastating effects on multiple systems, such as the urinary and neurocognitive systems, as well as the extremities [3]. In-utero surgery is a secondary option for families that refuse pregnancy termination. Families must be informed about the advantages of in-utero surgery, such as the potential decrease in shunt requirements for infants who undergo the procedure [7]. However, in-utero surgery may not prevent the need for untethering operations [8], and the risk of severe complications during the surgery cannot be disregarded [9]. Consequently, families are often confused about in-utero surgery, and some may change their minds about proceeding with the surgery after being informed of the potential complications and surgical process [10].

In our homeland, in-utero surgery has recently become available for families who refuse pregnancy termination. In this study, we aimed to present the mortality and morbidity outcomes of infants who did not undergo in-utero surgery and received treatment in our tertiary intensive care unit. We believe the results will provide families and clinicians with valuable insights into the early rates and potential postnatal complications.

Materials and Methods

The study included all infants treated for an open myelomeningocele defect in a tertiary intensive care unit between 2016 and 2023. It was conducted retrospectively. We documented perinatal history, anthropometric measurements, birth week, delivery type, defect dimensions, operation timing, Chiari type II

Table 1. Desciptive status and clinical outcomes of the patients

Delivery	Vaginal delivery: 12.6% (n=11) Cesarean section: 87.4% (n=76)
Gestational age at birth	38 weeks (38-39)
Birth weight	3070 ± 520 grams
Birth length	48 cm (46-50)
Head circumference	35 cm (34-37)
Width of the sac	7 cm (6-9)
Length of the sac	6 cm (5-8)
Surgery time	49 hours (40-72)
Chiari malformation	7.8% (n=7)
Clubfoot	31.5% (n=28)
Scoliosis/Kyphoscoliosis,	13.3% (n=12)
Impaired/No foot movements	88.9% (n=80)
Meningitis/CSF infection	28.9% (n=26)
Convulsions	23.3% (n=21)
Hydrocephalus	72.2% (n=65)
VP shunt requirement	59% (n=49)
Mortality	18.9% (n=17)
Length of hospital stay	41 days (25-80)

Data is presented as %(n), mean±sd, and median (interquartile range)

defect status, congenital scoliosis and pes equinovarus deformities, hydrocephalus, meningitis, seizure status, and mortality. All patients who underwent treatment for congenital myelomeningocele were included.

Study permission was obtained from the Marmara University Ethical Committee, file number 09.2023.213.

Statistical analysis

We evaluated the normality of continuous data with the Shapiro-Wilk test, kurtosis, skewness, and Q-Q plots. We used the Mann-Whitney test to compare two groups with non-normal distributed continuous data and the chi-square test for categorical data. We presented the data as mean+/-standard deviation, median (interquartile range), and % (n). Additionally, we assessed the correlations using Kendall's tau test. We set the alpha error rate significance at $p < 0.05$. We used the Jamovi 2.3.18 software package.

Results

Our study included 90 patients. Of these patients, 50% were female and 50% were male. The descriptive features and clinical outcomes are described in table 1.

We assessed the correlations between lower extremity tonus, survival status, and shunt need. Lower extremity tone showed a positive correlation with gestational age (r=0.225, p=0.019) and a negative correlation with sac length (r=-0.213, p=0.022), sac width (r=-0.210, p=0.023), and pes equinovarus deformity (r=-0.241, p=0.024). Survival status was negatively correlated with scoliosis (r=-0.228, p=0.031). The need for shunting was associated with head circumference (r=0.225, p=0.024), sac length (r=0.244, p=0.012) and sac width (r=0.205, p=0.035) (Table 2).

The gestational age at birth was 1 week higher (39 weeks versus 38 weeks), and the sac length and sac width were each 2 cm smaller (5 cm versus 7 cm) in the normal lower extremity tonus group compared with the impaired/no tonus group (p = 0.019, p = 0.022, and p = 0.024)

Infants with scoliosis had a 58.3% survival rate, whereas those without scoliosis had an 84.6% survival rate (p = 0.03). Head circumference was 1 cm larger (36 cm versus 35 cm), sac length was 2 cm longer (7 cm versus 5 cm), and sac width was 1 cm larger (8 cm versus 7 cm) in infants who required a ventriculoperitoneal shunt compared to those who did not need a shunt (p = 0.025, p = 0.012, p = 0.035).

Table 2: Correlation results for lower extremity tonus, survival rates, and shunt need

	Lower extremity tonus		**Survival status**		**Shunt need**	
	Kendall's tau	*p*	Kendall's tau	*p*	Kendall's tau	*p*
Gestational week at birth	0.225*	0.019	-0.134	0.161	-0.152	0.125
Birth weight	0.057	0.525	0.01	0.914	-0.013	0.886
Birth length	0.175	0.069	0.097	0.315	-0.169	0.087
Head circumference	-0.017	0.863	0.005	0.957	0.225*	0.024
Sac length	-0.213*	0.022	-0.049	0.186	0.244*	0.012
Sac width	-0.210*	0.023	-0.051	0.585	0.205*	0.035
Gender (Females)	-0.141	0.182	-0.028	0.789	-0.137	0.215
Pes equinovarus deformity	-0.241*	0.024	-0.163	0.126	0.148	0.183
Scoliosis	-0.139	0.191	-0.228*	0.031	0.083	0.455

Kendall's tau test. * $p < .05$

Discussion

In this study, we aimed to present the mortality and morbidity of infants with spinal dysraphism who did not undergo in utero surgery in our tertiary intensive care unit. Our findings provide crucial insights into the early rates and possibilities of postnatal complications, aiding both families and clinicians in managing expectations and planning for postnatal care.

The rate of infant mortality linked to spina bifida has evolved over the years due to several factors, including the implementation of folic acid supplementation and food fortification programs, advancements in prenatal screening and treatments, as well as decisions regarding the termination of pregnancies. Our study found an 18.9% mortality rate, which is consistent with the higher end of the spectrum reported in previous studies on infants with spinal dysraphism [11]. The majority of our patients were delivered via cesarean section (87.4%), which is consistent with the current practice of opting for cesarean delivery in cases of severe congenital anomalies due to the reduced risk of birth trauma [12,13]. The average gestational age of 38 weeks and the average birth weight of 3070 ± 520 grams are comparable to those reported in similar studies, such as those described by Ilhan et al. (2017), who noted comparable gestational ages and birth weights in their study of infants with spinal dysraphism [14].

Our findings revealed that 31.5% of the infants had clubfoot, and 13.3% had scoliosis/kyphoscoliosis. These rates are in line with existing literature, which suggests a prevalence of orthopedic complications ranging from 30-50% for clubfoot spinal dysraphism cases [15,16]. However, contrary to the literature, our study found a lower rate of scoliosis [17].

We found that lower extremity tonus positively correlated with gestational age. This suggests that infants with more advanced gestational age might exhibit better lower extremity function. Conversely, lower extremity tonus negatively correlated with sac length, sac width, and the presence of pes equinovarus deformity. These findings indicate that more severe sac involvement and associated deformities may be linked to poorer lower extremity tonus.

Based on our findings, the association of shunt need with larger head circumference, longer sac length, and wider sac width suggests that more severe hydrocephalus and larger defects are linked to a higher likelihood of requiring a ventriculoperitoneal shunt. This emphasizes the role of these anatomical measurements in predicting the need for shunt placement and managing hydrocephalus in affected infants. Hydrocephalus was detected in 72.2% of our patients, which aligns with the high prevalence reported in the literature, where hydrocephalus affects approximately 60-80% of infants with spinal dysraphism [7]. The incidence of meningitis/CSF infection (28.9%) and convulsions (23.3%) is consistent with the rates reported in other studies, indicating significant postnatal risks [18].

The average surgery time of 49 hours postnatal is similar to that reported in other studies, suggesting that early surgical intervention remains crucial in managing spinal dysraphism [3,9]. The fact that 59% of our patients required a ventriculoperitoneal shunt further emphasizes the need for close monitoring and timely intervention for hydrocephalus, which aligns with findings from previous research indicating a high shunt requirement rate [7,19].

Conclusion

In conclusion, our study's findings contribute valuable data on the outcomes of infants with spinal dysraphism who did not receive in utero surgery. The mortality rate, prevalence of orthopedic and neurological complications, and postnatal treatment requirements are consistent with existing literature, reinforcing the need for ongoing research and improved management strategies to address the challenges faced by this vulnerable population.

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Ethical Declaration: Ethics approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Marmara University with decision number 09.23.213

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CERASUS JOURNAL OF MEDICINE

ORIGINAL ARTICLE

Is the trocar through which the gallbladder is removed during cholecystectomy important for potential complications?

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Abstract

Objective: Laparoscopic cholecystectomy is considered the gold standard for the treatment of gallstone disease and complications can develop at trocar sites following laparoscopic cholecystectomy. This study aims to evaluate the impact of extracting the gallbladder through either the umbilical or epigastric ports during laparoscopic cholecystectomy on the complications observed after gallbladder extraction.

Methods: Symptomatic cholelithiasis patients who had four port laparoscopic cholecystectomy included to the study. Individuals were divided into two groups based on gallbladder removal site: umbilical or epigastric. Medical records were reviewed for post-surgical complications within 30 days and incisional hernias within one year. The age, gender, operation duration, BMI, blood parameters and the largest stone sizes of the patients were also noted.

Results: A total of 112 patients were included in the study, with 45 patients in the umbilical group and 67 patients in the epigastric group. No significant differences were observed in age, gender, body mass index and stone sizes between groups. Port site hernia and port site infection developed more frequently but not significantly in umblical group. When examined the stone size and BMI based on the presence of a port site hernia and port site infection, BMI and stone size were significantly higher in port site infection and hernia patients.

Conclusions: Using umbilical port for removing gallbladder, carried a higher risk of infection and hernia development. Additionally, regardless of which trocar is used, patients with a high BMI and large stone size have a higher risk of port site infection and hernia. Patients should be informed about these risks during the preoperative period.

Keywords: Gallstone; laparoscopic cholecystectomy; port-site hernia; port-site infection

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Introduction

Laparoscopic cholecystectomy (LC) has revolutionized the field of minimally invasive surgery and is considered the gold standard for the treatment of gallstone disease [1]. Laparoscopic cholecystectomy offers advantages in terms of postoperative pain, hospital stay duration, and cosmetic outcomes, and it is widely performed worldwide. The popularity of LC is based on its quicker postoperative recovery, allowing patients to return to daily activities sooner, and its overall cost-effectiveness [2,3].

Removing the gallbladder constitutes the final step of LC, usually performed through either the epigastric or umbilical port [4]. Previous studies have indicated that both ports are recommended for extraction and are typically chosen based on the surgeon's preference [2-5]. Like any surgical method, LC has its own specific complications. Among the common ones are wound infections and port-site hernias (PSH) [4,5]. Each port used for gallbladder extraction has its advantages and disadvantages. The epigastric port may be advantageous for ease of access and shorter procedure time, while some studies have found the umbilical port to be more suitable [6,7]. However, the number of studies clearly delineating the performance differences between these two ports is limited.

Complications such as postoperative pain and port-site infections (PSI) may become more pronounced when the port site needs to be enlarged. Enlarging the port site can increase the risk of bleeding, infection, and PSH. It has been noted that the umbilical port is the most common site for port-site hernia, leading some authors to prefer extracting the gallbladder through the epigastric port [2-4]. Therefore, the choice of port site and extraction technique should be carefully considered to minimize postoperative complications.

This study aims to evaluate the impact of extracting the gallbladder through either the umbilical or epigastric ports during LC on the complications observed after gallbladder extraction.

Methods

This retrospective study enrolled 151 individuals who underwent LC for gallstones from January 2021 to January 2023 at the general surgery department, following local ethical committee approval (Date: 19.08.2024, No: 57). Participants were selected based on being 18-80 years old with confirmed gallstones. Reasons for exclusion included: postoperative gallbladder cancer diagnosis, any malignancy, acute gallbladder inflammation, gallbladder perforation, thickened gallbladder wall, pregnancy, severe obesity (BMI $\geq$ 40), compromised immune system, use of specimen retrieval bag during surgery, or antibiotic treatment within 30 days after surgery for any cause. Considering all exclusion criteria, the number of patients included in the study was determined as 121.

All subjects received 1 gram of Cefazolin Sodium before surgery. The laparoscopic procedure utilized four entry points: two 10 mm ports (umbilical and epigastric) and two 5 mm ports in the right upper abdomen. Umbilical port sites of all participants were closed with no 0 polypropylene suture. Individuals were divided into two groups based on gallbladder removal site: umbilical or epigastric. Medical records were reviewed for post-surgical complications within 30 days and incisional hernias within one year. The age, gender, operation duration, body mass index (BMI), hematocrit, leukocyte, sodium, potassium and the largest stone size of the patients were also noted. In addition, patients were grouped separately in terms of the development of port site infection and the factors affecting the development of port site infection were compared.

Data analysis was performed using SPSS 21.0 software, with a 95% confidence interval and $p < 0.05$ considered significant. Normality distribution of the data was performed using the Kolmogorov Smirnov test. Continuous variables with normal distribution were expressed as mean ± standard deviation and variables with non-normally distribution were expressed as median-IQR. Categorical variables were assessed using the Chi-square test, while the Mann-Whitney test was employed for qualitative variable comparisons. Cox Regression analysis used to determide the risk factors og PSH and PSI.

Results

A total of 112 patients were included in the study due to exclusion criteria, with 45 patients in the umbilical group and 67 patients in the epigastric group. The average age of the participants was 50.19±14.19 years, with a F/M ratio of 69/43. The distribution of demographic and operational characteristics by groups is provided in Table 1.

Table 1: Characteristics of patients by groups (BMI: Body mass index, IQR: Interquartile range).

		Umblical group (n:45)	Epigastric group (n:67)	P value
Age (year) (mean±SD)		51.58±13.03	49.27±14.91	0.400
Gender	**Female (n-%)**	29 (64.4%)	40 (59.7%)	0.613
BMI (median-IQR)		29.00-5.00	28.00-6.00	0.263
Operation duration (min) (median-IQR)		55.00-25.00	55.00-25.00	0.096
Stone size (mm) (median-IQR)		15.00-12.00	14.00-9.00	0.301
Hematocrit (%) (mean±SD)		34.88±4.24	33.12±6.80	0.124
Leukocyte (10^9/L) (median-IQR)		9.21-5.36	8.80-5.65	0.910
Sodium (mmol/L) (median-IQR)		139.00-4.50	137.00-6.00	0.109
Potassium (mmol/L) (median-IQR)		4.00-0.70	4.29-0.97	0.130

When comparing surgery times between the groups, it was observed that the surgery time was shorter, though not statistically significant, in the group where the gallbladder was extracted through the umbilicus (p:0.096). No significant differences were observed in the other evaluated parameters (Table 1). Additionally, when evaluating the frequency of port site infection and hernia, although no significant differences were observed between the groups for either parameter, there was a noticeable decrease in both parameters in the group using the epigastric port (p:0.095 and p:0.300, respectively) (Table 2).

It was noted that all patients who developed a PSH also experienced a PSI within the first 30 postoperative days. When examining the stone size and BMI based on the presence of a PSH, the average stone size and BMI were 13.95±5.73 mm and 28.21±3.48, respectively, in the group without hernia, and 26.25±2.06 mm and 34.50±2.64 in the group with hernia, with the differences being statistically significant (p:0.000 and p:0.001, respectively).

Additionally, when grouping patients based on the presence of PSI, those who developed PSI had significantly higher BMI and stone sizes (p:0.000 and 0.000, respectively) (Table 3). According to the Cox regression analysis, no risk factor was found for the development of PSH, while both BMI and stone size were determined as risk factors for the development of PSI (p: 0.043, Hazard Ratio: 1.388 and p: 0.044, Hazard Ratio: 1.121, respectively).

Discussion

Laparoscopic cholecystectomy as the preferred treatment for benign gallbladder disease according to current guidelines. However, there is still debate about

Table 2: Distribution of port site infection and port site hernia by groups.

		Umblical group (n:45)	Epigastric group (n:67)	P value
Port- Site Infection	**Yes (n-%)**	8 (17.8%)	5 (7.5%)	0.095
	No (n-%)	37 (82.2%)	61 (92.5%)	
Port-Site Hernia	**Yes (n-%)**	3 (6.7%)	1 (1.5%)	0.300
	No (n-%)	42 (93.3%)	66 (98.5%)	

Table 3: Evaluation of parameters based on the presence of port site infection (BMI: Body mass index, IQR: Interquartile range).

		Port site infection (-) (n:99)	Port site infection (+) (n:13)	P value
Age (year) (mean±SD)		49.91±14.14	52.38±14.76	0.556
Gender	**Female (n-%)**	61 (61.6%)	8 (61.5%)	0.996
BMI (median-IQR)		28.00-5.00	33.00-4.00	0.000
Operation duration (min) (median-IQR)		55.00-20.00	55.00-33.00	0.312
Stone size (mm) (median-IQR)		13.00-9.00	23.00-7.00	0.000
Hematocrit (%) (mean±SD)		34.12±6.11	31.63±4.06	0.157
Leukocyte (10^9/L) (median-IQR)		8.80-5.07	9.51-7.69	0.210
Sodium (mmol/L) (median-IQR)		139.00-4.00	136.00-4.00	0.093
Potassium (mmol/L) (median-IQR)		4.13-0.83	3.80-0.95	0.131

which port is best for gallbladder removal. In our study, it was determined that the use of an umbilical port to remove the gallbladder from the abdomen in patients who underwent laparoscopic cholecystectomy caused higher rates of PSI and PSH, although not significantly, and when the causes of PSI were examined, it was determined that high BMI and large stone size were risk factors for PSI development.

The overall incidence of PSI of our study was 11.6%, which is a little bit high to the previously reported rates of 1.3-6.7% [8]. Port site infections are typically caused by endogenous flora, often resulting from contamination with infected bile [9]. Laparoscopic cholecystectomy has higher rates of bile spillage and contamination due to gallbladder perforation, which can be as high as 25-36% [10,11]. Despite their widespread use, extraction bags have not been shown to reduce infection rates in uncomplicated elective cholecystectomy [12]. Research indicates that extraction through the epigastric port is easier and associated with fewer surgical site infections, while the umbilical port results in less postoperative pain but has a higher risk of incisional hernia and wound infection [3]. Although PSI rates in laparoscopic surgeries are generally low, they can still cause significant complications. Some studies reported PSI rates ranging from 5.07% to 6.3% [13-15]. Certain authors identified the epigastric port as the most common site for PSI [13,15,16], whereas others found that PSI was more frequent at the umbilical port [17,18]. In our study, a noticeably higher, though not statistically significant, PSI rate was observed in patients using the umbilical port. The higher PSI rate at the umbilical port site might be due to a potentially higher microbial load persisting even after antiseptic cleaning. Additionally, patients who developed PSI had significantly higher BMI and stone sizes compared to those who did not, regardless of the extraction port used. This suggests that the stretching and incisions made to enlarge the trocar site, which result in microhematomas, may predispose patients to developing PSI.

Some studies suggest that removing the gallbladder through the umbilical port takes longer and can extend the overall surgery time [3,19]. However, in our study, there was no significant difference in total surgery time between the two groups. Extracting the gallbladder through the epigastric port can sometimes be time-consuming, particularly in obese patients, due to the slanted path and its close association with or traversal of

the falciform ligament fat. Additionally, umbilical port removal requires repositioning the camera and does not offer direct access to the gallbladder.

Current evidence on causative risk factors is weak; however, age over 70, BMI greater than 30, longer surgery duration, diabetes mellitus, incision enlargement, using trocars larger than 10 mm, and wound infection appear to be the main risk factors for PSH [20]. The umbilical and para-umbilical region is naturally a weak area in the abdominal wall. Additionally, intra-abdominal contents such as the small intestine and omentum are closer to the umbilical port compared to the epigastric port, making herniation more likely [21]. Hernia formation can also be influenced by repeated stretching, fascial dilation, and enlargement of the incision at the umbilical site to remove large stones or a thick-walled, swollen gallbladder [22]. Memon et al. reported a PSH rate of 3.66% in the umbilical port extraction group, compared to 0.11% in the epigastric port extraction group in a large comparative study [23]. Nofal et al. found that two-thirds of the PSH in their series of 2930 patients who underwent LC occurred at the umbilical port extraction site [24]. In our study, the overall incidence of PSH was 3.5%. The incidence was 6.7% in the umbilical extraction group and 1.5% in the epigastric group. Although not statistically significant, the incidence was noticeably higher when the umbilical port was used for gallbladder extraction. In patients who developed trocar site hernias, the average stone size was significantly larger, suggesting that fascia dilation and excessive stretching of the fascia are important factors in the development of trocar site hernias, regardless of the extraction site.

The limitations of our study include the limited number of cases and the exclusion of patients with acute cholecystitis and those using endobags.

Conclusion

It should be kept in mind that complications can develop at trocar sites following LC, which is considered the gold standard for patients with symptomatic cholelithiasis. Our study found that the use of the umbilical port, although not significantly, carried a higher risk of infection and hernia development. Additionally, regardless of which trocar is used, patients with a high BMI and large stone size have a higher risk of PSI and PSH. Patients should be informed about these risks during the preoperative period.

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Authors' contribution: Surgical and Medical Practices: E.E, F.T, Concept: E.E, Design: E.E, Data Collection or Processing: E.E, F.T, Analysis or Interpretation: E.E, F.T, Literature Search: E.E, F.T. Writing: E.E, F.T.

Ethical Declaration: Ethics approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of S.B.Ü İstanbul Training and Research Hospital with decision number 09/08/2024 - 57

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CERASUS JOURNAL OF MEDICINE

ORIGINAL ARTICLE

Perceptions of adults in selected family health centers in Samsun Çarşamba District towards breast milk: A regional study

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Abstract

Objective: This study was carried out to determine the educational needs of not only the mothers but also the whole society about breast milk and breastfeeding.

Methods: The study was conducted in three family health centers at similar socio-economic levels between March and June 2015. The sample of the study consist of 1750 adult individuals. The research data were collected by a questionnaire and a 5-point Likert scale titled "Perceptions of Adults in Selected Family Health Centers in Samsun Çarşamba District towards Breast Milk: A Regional Study Abstract" prepared by the researchers in line with the literature. Kruskal - Wallis H Test and Mann - Whitney U Test was used in the evaluation.

Results: It was determined that the total score average of the adults participating in the study was 120.94 ± 16.74. According to the results of the total score averages obtained from the "Perceptions of Adults in Selected Family Health Centers in Samsun Çarşamba District towards Breast Milk: A Regional Study Abstract and the age variable; The scores in the 33-39 age group were significantly higher than the scores in the 19-25, 26-32 and 47-53 age groups.

Conclusions: It was concluded that the scores obtained by the participants from scale were above the average, but their perceptions about breast milk should be improved.
Keywords: Adults; breast milk; breast-feeding; perception.

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Introduction

The future of society is determined by the presence of healthy individuals [1]. The importance and place of breastfeeding in laying the foundations of healthy lives cannot be discussed [2]. When the historical development of practices related to infant nutrition is examined, it is seen that breast milk has been the most important food until today.

Breast milk is a unique food that provides optimum growth of the baby and meets all the needs of the baby by itself, and the milk of each creature is unique to itself and its baby [3]. Breast milk is the most ideal food for infants because it reduces infant morbidity and mortality rates, provides optimal growth and development, and provides economic benefits to the family and the country [4]. The World Health Organization and the American Academy of Pediatrics follow a policy encouraging breastfeeding of term and premature infants and recommend exclusive breastfeeding for the first 6 months and continuation of breastfeeding with complementary foods until the age of 2 years [5].

Breastfeeding is a common practice in our country; according to the 2013 Turkish Demographic and Health Survey (TDHS), 96% of all children have been breastfed for some time. Information on the timing of initiation of breastfeeding shows that the initiation of breastfeeding is quite late in our country. 50% of breastfed children started breastfeeding within the first hour after birth [6]. According to TDHS 2018 data, seven out of ten children (71%) were breastfed within the first hour after birth and 86% were breastfed within the first day after birth [7].

Information on the time of initiation of breastfeeding shows that the initiation of breastfeeding is quite late in our country. Among breastfed children, 50% of breastfeeding was initiated within the first hour after birth [6]. According to TDHS 2018 data, seven out of ten children (71%) were breastfed within the first hour after birth and 86% were breastfed within the first day after birth [7].

Contrary to the recommendation that children under six months of age should be exclusively breastfed, 23% of children receive other non-breast milk and 12% of children receive supplementary foods in addition to breast milk [7]. In summary, although breastfeeding is a common practice in Turkey, exclusive breastfeeding is not widely practiced as recommended. Exclusive breastfeeding in children was 42% in TDHS 2008 and this rate decreased to 30% in TDHS 2013. According to TDHS 2018 data, the rate of exclusive breastfeeding in children was 41% [6-8].

It is the most fundamental right of the newborn to be fed with breast milk in order to maintain a healthy life. The benefits of breast milk are not only limited to the mother and the baby, but also provide numerous benefits to the family, environment, society and the national economy. Therefore, in initiating and maintaining a healthy breastfeeding process, the mother should be supported by her spouse, friends, family elders, relatives and health professionals, and the awareness of the society about the advantages and benefits of breast milk should be increased.

'This study was carried out to determine the Perceptions of Adults in Selected Family Health Centers in Samsun Çarşamba District towards Breast Milk, to determine the educational needs of not only mothers but also other members of the society on breast milk and breastfeeding and to contribute to the society to become more conscious about breast milk and breastfeeding.

Materials and Methods

The population of the study consisted of individuals living within the borders of Carsamba district of Samsun province between March and June 2015. The sample of the study consisted of 1750 volunteer individuals between the ages of 19-65 who came to the family health centers where the study was conducted between March-June 2015. In forming the sample, 10 times the number of items in the 33-item scale was taken into consideration. The test-retest method was performed with 70 adult individuals. Without sample selection, the relevant ASMs adult individuals admitted to the hospital were included in the study.

In our study, data collection was carried out through the Questionnaire for Descriptive Characteristics of Adult Individuals consisting of 16 questions and the Perception Scale of Adults Regarding Breast Milk developed by the researcher. The Adult Perception Scale on Breast Milk was developed by Eren and Çınar (2016) and a validity and reliability study was conducted [9]. In the validity study of the scale, the opinions of a total of 14 experts in the evaluation, the content validity ratio (CVR) for each item was calculated. The content validity index (CVI) was determined by taking the average of the calculated CVIs, and the CVI greater than 0.51. It is concluded that the content validity of the items with the same value is ensured (Table 1).

The scale is a 5-point Likert-type scale consisting of 30 positive items. Each item is scored from 1 to 5 and the scores vary according to the responses. The minimum score is 30 and the maximum score is 150. A high score indicates that adults have a good perception of breast

milk. The scale is in a form that can be easily filled in by literate individuals.

Table 1: Minimum values for CSOs at α =0.05 significance level

Number of experts	Minimum value	Number of experts	Minimum value
5	0.99	13	0.54
6	0.99	14	0.51
7	0.99	15	0.49
8	0.78	20	0.42
9	0.75	25	0.37
10	0.62	30	0.33
11	0.59	35	0.31
12	0.56	40+	0.29

Before the application, the appropriate days for data collection were determined by contacting the family health centers where the study would be conducted. The data related to the study were collected by the researcher by going to family health centers two days a week and interviewing volunteer individuals face-to-face. Data collection continued until the determined sample size was reached.

The data of the study group were

Table 2: Distribution of Participants' Descriptive Characteristics

Identifying features		n	%
Gender	Female	1360	77.7
	Male	390	22.3
Age	19-25 age between	411	23.5
	26-32 age between	513	29.3
	33-39 age between	371	21.2
	40-46 age between	262	15.0
	47-53 age between	112	6.4
	54-60 age between	66	3.8
	60-65 age between	15	.9
Education Status	Illiterate	91	5.2
	Primary School	428	24.5
	Middle School - High School	626	35.8
	University	584	33.4
	Other	21	1.2
Employment Status	Unemployed	893	51.0
	Continuous Operation	707	40.4
	Part-time Work	150	8.6
Income Level	Good	696	39.8
	Middle	939	53.7
	Bad	115	6.6
Family Type	Extended family	707	40.4
	Nuclear family	1043	59.6
Child Status	Yes	1344	76.8
	No	406	23.2
Status of Receiving Information on Breast Milk	Taking	1119	63.9
	Non-taking	631	36.1
Information Source *	Nurse	350	31.3
	Doctor	493	44.1
	Midwife	328	29.3
	Family elders	295	26.4
	Friend	99	8.8
	Health education materials	277	24.8
	Radio, television, newspaper, internet	197	17.6
	Other**...	30	2.7

*Since there was more than one response, percentages were taken over the total number of participants,

**Other (While studying during training, Congress, In-service training)

analyzed using SPSS 21 package program in computer environment. Normality tests of the data were evaluated by Kolmogorov-Simirnov Test. After examining the normal distribution of the data, Mann-Whitney U test was used for two-group comparisons and Krsukall-Wallis H test was used for comparisons with three or more groups because the scores were not normally distributed. When interpreting the results, 0.05 was used as the significance level and it was stated that there was a significant relationship if $p < 0.05$ and there was no significant relationship if $p > 0.05$.

Table 3: Distribution of Breastfeeding Status of Children of Parents with Children

		n	%
Children's Breastfeeding Status	Breastfed	1255	93.4
	Not breastfed	53	3.9
	Does not remember	36	2.7
	Total	1344	100.0
Duration of Breast Milk Intake	Less than 3 months	187	14.9
	4-6 months	312	24.9
	1 year	357	28.4
	2 years	329	26.2
	Other	70	5.6
	Total	1255	100.0
Receiving Support for Breastfeeding	Taking	970	73.2
	Non-taking	285	26.8
	Total	1255	100.0

Ethics

Before starting the study, approval was obtained from the Sakarya University Faculty of Medicine Non-Interventional Ethics Committee dated 09.12.2014 and numbered 16214662/050.01.04/137. Necessary written permissions were obtained from the administration of the hospital where the study was conducted. Verbal and written informed consent was obtained from the individuals who volunteered to participate in the study.

Results

Of the individuals included in the study, 77.7% were female and 22.3% were male. While 23.5% of the individuals were in the 19-25 age group, 29.3% were in the 26-32 age group, 21.2% in the 33-39 age group, 15% in the 40-46 age group, 6.4% in the 47-53 age group, 3.8% in the 54-60 age group and 9% in the 60-65 age group. 63.9% of the participants reported receiving education about breastfeeding.

It was observed that health professionals constituted the majority of the source of information (Table 2). Among the individuals included in the study, 73.2% reported receiving support for breastfeeding (Table 3). The status of receiving information about breastfeeding in all participants is shown in Table 3.

According to the results of the Kruskall-Wallis H Test between the mean total scores obtained from the 'Perception of Breastfeeding Scale for Adults' and the age variable; it was found that the scores in the 33-39 age group were significantly higher than the scores in the 19-25, 26-32 and 47-53 age groups ($p<0.05$) (Table 4). As seen in Table 3, there was no significant difference between the mean total scores of the adults on the Perception Scale about Breast Milk and gender and educational status ($p>0.05$).

According to the results of the Mann-Whitney U Test between the mean total scores of the adults on the Perception Scale for Breastfeeding and their family type, the scores of nuclear family were significantly higher ($p < 0.05$) (Table 4).

According to the results of the Kruskall-Wallis H Test between the mean total scores of the adults on the Perception Scale for Breastfeeding and their employment status, it was determined that the scores of those who had a permanent job were significantly higher than those who were unemployed and part-time workers ($p<0.05$) (Table 4).

According to the results of the Kruskall-Wallis H Test performed between the mean total scores of the adults on the Perception Scale about Breast Milk and income level, the breast milk perception scores of those with poor income level were significantly higher than those with good and medium income level ($p<0.05$) (Table 4). As shown in Table 4, there was no significant difference between the mean total scores of the adults on the Perception Scale Related to Breast Milk and the status of having a child and receiving information about breast milk ($p>0.05$) (Table 5). According to the results of the Kruskall-Wallis H Test performed between the mean total scores of the adults on the Perception Scale Related to Breast Milk and the duration of breastfeeding of their children, those who received less than 3 months of breast milk were significantly lower than those who received 4-6 months of breast milk and the other group ($p<0.05$) (Table 5).

Discussion

In the validity study of the scale, the opinions of a total of 14 experts in the evaluation, the content validity ratio (CVR) for each item was calculated. The content validity

Table 4: The Relationship Between Participants' Descriptive Characteristics and 'Perception Scale of Breastfeeding in Adults' Scores

Identifying features		Adults' Perception Scale on Breast Milk				
		N	**Mean ± SS**	**Rank Mean**	**Test statistic**	Pairwise Comparison
Age	19-25age between	411	119.95 ±16.73	811.9	χ^2_{KW}=27.7 p=0.0001[a]	3-1 3-2 3-5
	26-32 age between	513	121.46±17.19	860.9		
	33-39 age between	371	125.63±15.29	980.9		
	40-46 age between	262	122.62±17.25	893.0		
	47-53 age between	112	119.07±17.23	784.4		
	54-60 age between	66	121.27±18.01	855.8		
	60-65 age between	15	124.13±19.88	972.1		
Gender	Female	1360	121.79±16.89	868.0	Z=-1.2 p=0.248[b]	
	Male	390	122.86±16.78	901.5		
Family Type	Extended family	707	119.33 ±17.88	798.9	Z=-5.2 p=0.0001[b]	
	Nuclear family	1043	123.86±15.90	927.4		
Education status	Illiterate	91	121.34±15.05	840.0	χ^2_{KW}=4.7 p=0.322[a]	
	Primary School	428	121.54±17.15	859.9		
	Middle School - High School	626	121.60±16.80	866.9		
	University	584	122.73±16.98	895.1		
	Other	21	128.10±16.94	1058.5		
Employment status	Unemployed	893	121.27±16.66	849,6	χ^2_{KW}=6.6 P=0.036[a]	2-1 2-3
	Continuous work	707	123.13±17.25	913.3		
	Part-time job	150	121,32±16,10	851.8		
Income Level	Good	696	120,67±17,39	836.4	χ^2_{KW}=8.1 P=0.018[a]	3-1 3-2
	Middle	939	122.71±16.61	895.5		
	Bad	115	124.66±15.09	948.7		

[a]Kruskall-Wallis H T Test, [b]Mann-Whitney U Test

index (CVI) was determined by taking the average of the calculated CVIs, and the CVI greater than 0.51. It is concluded that the content validity of the items with the same value is ensured.

In a study in which breastfeeding attitudes were evaluated, the mean age of mothers was 27.29±4.82 and 36.6% were in the 22-26 age group [10]. It is thought that the fact that the majority of the individuals in the age group of 30 years and above in the region where the study was conducted had more children and therefore

Table 5: Comparison of the Data Related to Breast Milk and the Mean Scores of the Perception Scale Related to Breast Milk of Adults

		Adults' Perception Scale on Breast Milk				
		N	Mean ± SS	Rank Mean	**Test statistic**	Pairwise Comparison
Having children	Yes	1344	121.88±16.82	869.3	Z=-0.93	
	No	406	122.52±17.03	896.1	P=0.349[b]	
Receiving information about breastfeeding	Yes	1119	122.01±17.04	874.5	Z= -0.115	
	No	631	122.06±16.58	877.3	P=0.909 [b]	
Breastfeeding status of their children	Yes	1255	121.82±16.91	671.9	χ^2_{KW}=0.04	
	No	53	122.57±16.04	678.5		
	Don't remember	36	122.92±15.29	683.0	P=0.981[a]	
Duration of breastfeeding for their children	Less than 3 months	187	117.12±17.05	525.4	χ^2_{KW}=29.9	
	4-6 months	312	124.75±15.89	689.3	P=0.0001[a]	1-2
	1 year	357	121.38±17.57	624.5		1-4
	2 years	329	121.19±16.78	610.8		
	Other	70	126,50±14,74	727,7		

[a]Kruskall-Wallis H T Test, [b]Mann-Whitney U Test

these individuals had more experience in breast milk and breastfeeding increased their perception scores regarding breastfeeding.

It was emphasized that in developed countries, the duration of breastfeeding is prolonged as the mother's education level increases, whereas in developing countries, the continuation of breastfeeding is inversely proportional to the level of education [4]. When the literature is examined, there is no study showing the perceptions of individuals about breastfeeding in our country. In this study, only education level was found to prolong the duration of breastfeeding. In another study conducted in our country, it was found that breastfeeding behavior was positively affected positively as the educational level of mothers increased and breastfeeding duration was prolonged in parallel [10].

In another study, it was found that mothers' working in an additional income-generating job contributed positively to their level of knowledge about breast milk and breastfeeding [11]. In this study, the breast milk perception scores of those who stated that their income level was 'poor' were significantly higher than those who stated that their income level was 'good' and 'moderate'. Contrary to the results of this study, there are studies indicating that economic status does not affect breastfeeding self-efficacy, and there are also studies reporting that mothers with good economic status have higher breastfeeding self-efficacy than those with poor economic status [12-14]. In addition to the numerous advantages of breastfeeding for mother and baby, it is also thought to contribute to the family economy [15-16].

In TDHS 2018 data, the median duration of breastfeeding was determined according to maternal education level. The median breastfeeding duration was found to be 19.3 months for mothers with no education/ no primary school education, 12.0 months for mothers with primary school education, 15.9 months for mothers with secondary school education, and 17.8 months for mothers with high school education and above [7]. In this study, the fact that there was no significant difference between those who received information from various sources, especially health workers, and those who did not receive information on this issue is a result that should be taken into consideration. This result obtained in our study is interesting. Studies should be conducted on what can be done to make the trainings given to the mother and the community on the subject more effective, and it should be ensured that the trainings of health professionals on the subject for the community are more effective. In order to achieve this goal, it is thought that reviewing the training techniques and methods related to the subject, taking care to ensure that the visual and written materials prepared for the community meet the needs of the community and are comprehensible (brochures, handbooks, public service

announcements, etc.), determining whether the training tools are comprehensible by people from all educational levels while preparing them with pilot applications and then offering them to the service of the community will make this training more effective.

Limitations

Since the study was conducted in three family health centers, the results obtained can only be generalized to this group.

Conclusion

In line with these results; the benefits of breastfeeding are not only limited to the mother and the infant, but also provide numerous benefits to the family, society, the environment and the national economy. Therefore, it is important that the mother is supported by her partner, friends, family elders, relatives and health professionals in initiating and maintaining a healthy breastfeeding process. Therefore, it is necessary to raise public awareness about the advantages and benefits of breast milk. When studies and scales related to breastfeeding were examined, it was observed that these were mostly directed towards breastfeeding mothers and women. No scale was found to determine the perceptions of adult individuals constituting the society about breast milk. Based on this deficiency, this study is thought to contribute to the literature in this sense. At the same time, the developed scale can be used in our society and other cultures by adapting it. The scale can be used in more comprehensive surveys in our society to determine the educational needs of the society on the subject and trainings can be provided using methods in this direction. The support to be given to breastfeeding mothers can be increased by improving the perceptions of the society about breast milk and breastfeeding in a positive way.

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Ethical Declaration: Ethics approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Sakarya University Faculty of Medicine with decision number 02/12/2014 - 13

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CERASUS JOURNAL OF MEDICINE

CASE REPORT

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An unusual vascular complication in ankylosing spondylitis: Isolated thrombosis of the celiac trunk and it's branches

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Abstract

A 37-year-old woman with a history of ankylosing spondylitis (AS) presented to the emergency department with acute abdominal pain. Imaging tests including ultrasonography and computed tomography (CT) angiography revealed non-occlusive thrombosis of the celiac trunk and its branches. Laboratory tests showed normal ranges for most parameters, except for mild elevation in white blood cell count and platelet count. No predisposing factors were detected through hematological investigations. The patient was started on heparinization, and surgical intervention was not required. The association between AS and thrombosis is discussed, with chronic inflammation being a possible contributing factor. This case highlights the importance of considering celiac trunk thrombosis as a cause of abdominal pain in patients with inflammatory rheumatic diseases like AS.

Keywords: Celiac trunk; thrombosis; ankylosing spondylitis; computed tomography angiography.

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Introduction

Thrombosis of the celiac trunk and its branches is a rare cause of acute abdominal pain. Inflammatory rheumatic diseases, such as ankylosing spondylitis (AS), are also very rare causes of celiac trunk thrombosis. We report the case of a 37-year-old woman with AS who presented to our emergency department with acute abdominal pain and was diagnosed with non-occlusive celiac trunk thrombosis by ultrasonography and computed tomography (CT) angiography scan.

Case Presentation

A 37-year-old woman presented to the emergency department with sudden onset of abdominal pain. Her medical history revealed that she was diagnosed with HLA-B27 (+) AS and was receiving sulfasalazine treatment. She also had mild abdominal pain from time to time. On clinical examination, the patient appeared pale, painful and had no fever. Pulse rate was 88/minute and blood pressure was 115/65. There was no defence and rebound on abdominal examination. Bowel sounds were normal. Direct abdominal radiography was normal. Laboratory tests revealed a hemoglobin level of 12.1 g/dL, white blood cell count of 7.8 10^9/L, platelet count of 489.000/mm3, international normalised ratio of 1.20 and activated partial thromboplastin time of 33.21 s (Table 1). Liver function tests, urea, creatinine, troponin, d-dimer, fibrinogen, electrolytes, serum lipase and amylase were within normal limits. Abdominal ultrasonography revealed thrombotic filling defects in the celiac trunk and its branches (Figure 1). CT angiography of the abdominal aorta showed thrombotic plaques and wall thickening extending from the proximal celiac trunk to the levels of the main hepatic artery and splenic artery without occlusion of the lumens (Figure 2). The left gastric artery originated directly from the aorta and the mesenteric arteries were normal. Upon these findings, echocardiography performed to investigate cardioembolic events was normal. No thrombocytosis, protein S, protein C, antithrombin III deficiency was detected and the patient was not taking oral contraceptives, hormone replacement therapy, tamoxifen or other drugs that may increase the risk of thrombosis. Full heparinisation dose (5000 units bolus and 1000 units per hour continuous infusion) was started after hospitalisation. The hematologist and rheumatologist then saw him and he was switched to enoxaparin and aspirin. He started to tolerate oral feeding without abdominal pain 5 days after admission and was discharged on day 10. Follow-up ultrasound at 1 and 3 months showed a marked regression of the thrombus.

Discussion

The celiac artery, also known as the celiac trunk, is a short blood vessel that arises from the aorta and runs beneath the median arcuate ligament at the T12 vertebral level. It supplies blood to the foregut structures, including the distal esophagus, stomach, the second part of the duodenum, liver, pancreas, gallbladder, and spleen. The celiac artery is typically divided into three major branches: the left gastric artery, common hepatic

Table 1. Laboratory tests

	Results	Normal values
Hemoglobin	12.1 g/dL	12-16 g/dL
White blood cells count	7.8 10^9/L	4-10.5 10^9/L
Platelets	489,000/mm3	150-450/mm3
International normalized ratio (INR)	1.20	0.9-1.1
Activated partial thromboplastin time (aPTT)	of 33.21s	10.1-12.8
Troponin	0.002 ng/ml	<0.04 ng/ml
D-dimer	0.1 mg/mL	<0.5 mg/mL
Fibrinogen	244 mg/mL	193-412 mg/mL

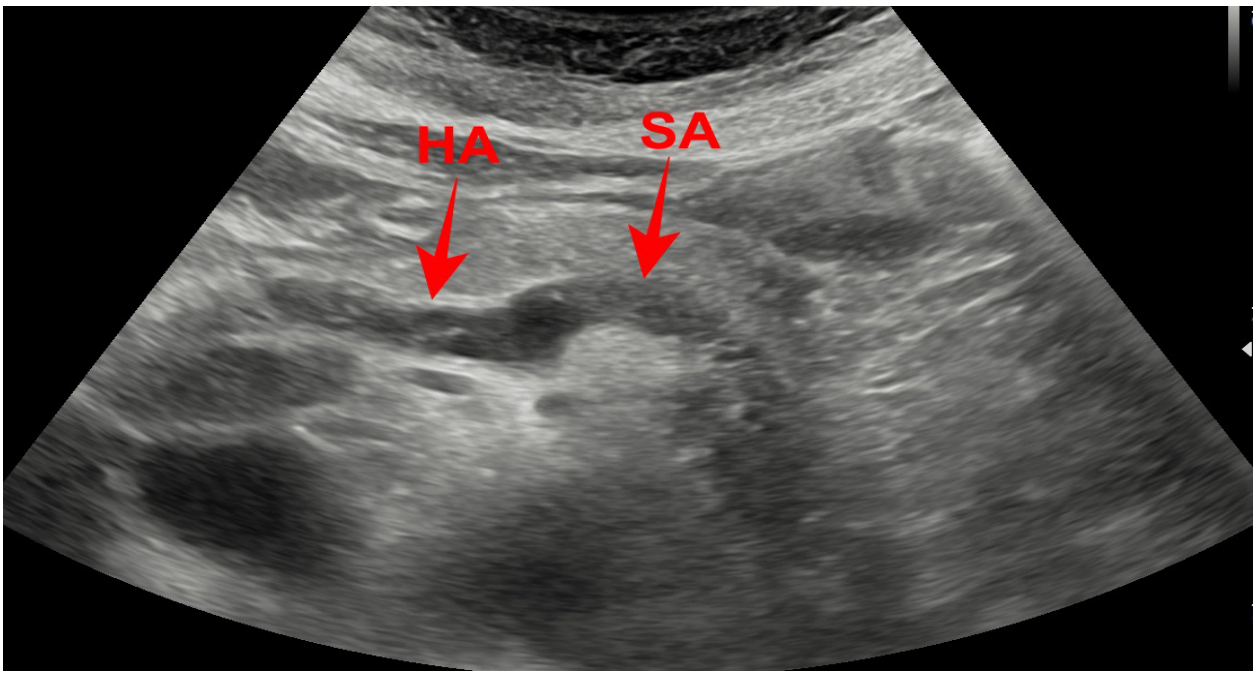

Figure 1. Ultrasonography shows thrombus appearances in the main hepatic artery (HA) and splenic artery (SA).

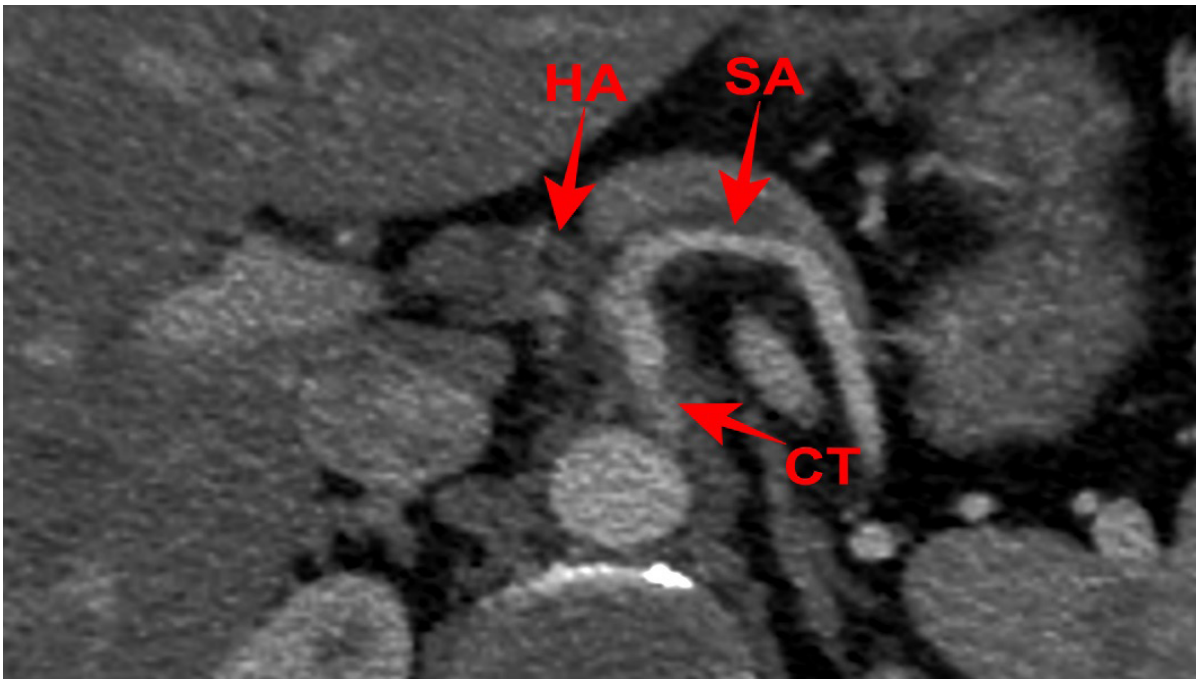

Figure 2. CT angiography of the abdominal aorta showing celiac trunk (CT), main hepatic artery (HA), and splenic artery (SA) demonstrating thrombotic appearances and wall thickening.

artery, and splenic artery [1]. Celiac trunk thrombosis is commonly associated with conditions that increase the risk of blood clotting, such as atherosclerosis, Behcet's disease, thrombocytosis, and deficiencies in proteins S, C, and antithrombin III [2]. Malignancies can also increase the likelihood of celiac artery thrombosis. Other contributing factors may include acute pancreatitis, antiphospholipid syndrome, the use of oral contraceptives, hypercoagulable disorders, and surgical trauma [3].

AS is a type of chronic inflammatory arthritis that primarily affects the spine but can also involve other joints and organs. Common treatments for AS

typically include a combination of nonsteroidal anti-inflammatory drugs (NSAIDs), sulfasalazine and physical therapy. In some cases, tumor necrosis factor inhibitors (TNF inhibitors) may be considered as first-line treatment. These drugs have traditionally been reserved for cases where standard therapies have been ineffective, but their current role in the management of refractory cases is unclear due to insufficient evidence [4]. A possible association between sulfasalazine and thrombotic events has not been consistently observed in the literature. Recent studies suggest that individuals with AS may be at an increased risk of developing thrombosis, a condition where a blood clot forms inside a blood vessel. The exact mechanisms underlying the association between AS and thrombosis are not fully understood, but it is thought to be related to the chronic inflammation that characterizes AS. Inflammation can lead to damage to the lining of blood vessels, making them more prone to clot formation. Additionally, inflammation can lead to changes in the composition of blood, making it more likely to clot [5, 6]. Very rarely, inflammatory rheumatic diseases such as AS can also cause celiac trunk thrombosis, and celiac trunk thrombosis should be considered as a cause of abdominal pain in these patients.

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CERASUS JOURNAL OF MEDICINE

LETTER TO THE EDITOR

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Weight and muscle strength loss after bariatric surgery

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Dear Editor,

A 22-year-old female patient had applied to the physical medicine and rehabilitation outpatient clinic for foot drop. It was learned that she had had bariatric surgery for obesity treatment three months ago and vitamin and mineral supplements were administered in the postoperative period. The patient started to feel weakness in her left big toe two months after the surgery, but she ignored it. Then, she noticed that her left foot was falling off three weeks later without any trauma. She had no systemic disease. She had lost nearly twenty kilograms within three months after surgery. In the physical examination, it was observed that she could not dorsiflex her left big toe and left foot, but deep tendon reflexes were maintained. Laboratory data at this time were as follows: serum albumin 46.2 g/L, folic acid 6.5 ng/mL (2-20), vitamin B12 261 ng/L (197-771), vitamin 25-hydroxi-D 33 ng/ml (30-100). The electroneuromyogram evidenced focal left peroneal mononeuropathy at the level of the fibular head. There was no compressive lumbar disc hernia and no lesion around the fibula head on the MRI images. Parenteral glucocorticoid therapy and oral vitamin B complex therapy were ordered for the patient and she was involved in a rehabilitation program including therapeutic electrical stimulation and exercise therapy. In the second week of treatment, dorsiflexor muscle strength increased from 1/5 to 3/5.

Rapid weight loss due to bariatric surgery, which has become widespread in recent years for the treatment of obesity, has also brought medical complications [1]. Among these complications, neurological complications have an important place and both the central and peripheric nervous systems can be affected [2]. Foot drop is also considered an important peripheral complication that may develop due to peroneal nerve palsy after this surgery and a rapid decrease in body weight is associated with

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a higher risk of foot drop. Although the exact cause of nerve palsy caused by weight loss is unclear, it is accepted that conditions such as low albumin levels or osmotic stress may cause intraneural edema and nerve damage due to intraneural edema is also often observed in anatomical tunnel areas [3]. Another possible cause of peroneal nerve mononeuropathy is that the peroneal nerve becomes more sensitive to external pressure as a result of the decrease in the fatty tissue around the fibular head [4].

In conclusion, as bariatric surgery becomes more common, complications are frequently encountered. Complications that may develop in patients due to insufficient nutritional intake after this surgery can be eliminated with supplements. However, different complications such as peripheral neuropathy may be encountered and it is important to follow the patients in this regard.

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LETTER TO THE EDITOR

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Home hemodialysis

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Dear Editor;

Chronic kidney disease (CKD) is a public health problem with increasing prevalence worldwide and is associated with significant morbidity and mortality [1]. According to 2022 data, there are a total of 13725 patients receiving renal replacement therapy (RRT) for end-stage renal disease (ESRD) in Turkey. Hemodialysis (HD) accounts for a large proportion of patients receiving RRT with 10287 patients [2]. Although kidney transplantation is the best treatment option for patients with ESRD, the majority of patients do not have access to this treatment for various reasons. Most patients are treated with HD and peritoneal dialysis (PD), which are traditional methods of RRT. HD has two modalities: conventional HD and home hemodialysis (HHD) [3].

Compared to conventional center-based HD, HHD offers patients more liberal treatment options, such as frequency of administration, long hours of administration (6-8 hours), and the ability to be administered at night. In conventional HD, patients can receive 4-hour dialysis three days a week, while in HHD, patients can receive 6–8-hour dialysis six nights a week or daily short dialysis treatments. HHD is also known to be less expensive than other RRT modalities [1]. In addition to its cost advantage, several studies have shown that HHD has advantages over conventional HD, such as improved blood pressure control, better fluid and phosphate control while allowing a more liberal diet, regression of left ventricular hypertrophy, improvement in obstructive sleep apnea, and reduction in maternal and fetal complications in pregnant women. HHD has also been shown to be associated with improved quality of life [4]. However, as with any treatment modality, HHD has drawbacks such as vascular access complications and patient/caregiver burnout symptoms. Vascular access remains essential for HD patients. The main reason why

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patients do not prefer HHD is the fear of not being able to perform vascular cannulation. Patients should be supported in this regard, and daily personal hygiene, use of appropriate antibiotic ointment for vascular access, and signs and symptoms of infection should be explained to all patients [4].

Patient selection is an important issue in HHD. Patients with ESRD should be told about the HHD option along with other RRT options. Preferably, they should be medically stable patients with learning ability and motivation. In addition, these patients should not have severe cardiovascular disease, should not have visual impairment, and should not have an obstacle to heparin use [5]. The frequency and duration of the HHD method can be tailored by the patient and nephrologist according to the patient's residual renal function, employment status and biochemical parameters. Studies have also shown that dialysis sessions of 6-8 hours 5-7 days a week regress left ventricular hypertrophy and improve ejection fraction, stabilize left ventricular remodeling and reduce or eliminate the need for antihypertensive drugs [4].

The patient planned for HHD has a training process that varies between 3-6 weeks. In this training process, the patient/assistant is first trained at the center. This training includes intravenous access, initiation and termination of dialysis, administration of heparin and serum, monitoring of vital signs, and documentation of the procedure. In addition, the patient/assistant is informed about the storage of the material, what to do in case of an emergency, and how to contact the technical team. The patient who has completed the training process performs dialysis 1-2 times in the center under the supervision of the training nurse. After the patient starts dialysis at home, the group consisting of the training nurse and the technical team visits the patient's home every three months and performs the necessary checks. For these patients, the center is responsible for performing monthly routine biochemical tests and semi-annual bacteriological and chemical analyses of the water system, as in central HD. Home visits include assessment of personal hygiene, control of the water system, supplies, and treatment area [5].

In patients requiring RRT for ESRD, HHD, which provides a survival benefit similar to that of deceased kidney transplantation, should be made available to all patients and encouraged in appropriate patients. This study was written to raise awareness of this issue.

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CERASUS JOURNAL OF MEDICINE

LETTER TO THE EDITOR

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A comment on: "Survival-Effective prognostic factors of rectal cancer patients receiving neoadjuvant chemoradiotherapy."

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Dear Editor;

I would like to share my opinion on the article titled "Survival-effective Prognostic Factors of Rectal Cancer Patients Receiving Neoadjuvant Chemoradiotherapy," published in the Cerasus Medical Journal, Volume 1, Issue 2, pages 117-123, on June 14, 2024. The article was authored by Uzun et al [1]. Firstly, I want to thank the authors for their contribution to the field. The study's objective was clear: to identify survival-effective prognostic factors in this patient population. As mentioned by the researchers, they utilized a retrospective review of 102 patients who underwent surgery for rectal cancer at a single institution, ultimately including 84 patients in the analysis after applying exclusion criteria. While the study's objective is well-defined, its design and scope present certain limitations that affect the strength and applicability of its conclusions.

The methods of the study describes a thorough process for selecting the study cohort. Exclusion criteria were applied to ensure a homogeneous patient group, focusing on those who received neoadjuvant CRT and had sufficient lymph nodes removed during surgery. I believe this approach is appropriate for studying prognostic factors but raises concerns about the small sample size of 84 patients. Such a sample size, especially within a single-center study, may not provide sufficient power to detect subtle differences and limits the generalizability of the findings. Additionally, the retrospective nature of the study introduces potential biases related to data collection and patient selection that could influence the results [2]. Their results present comprehensive statistical analyses, including Kaplan-Meier and Cox regression analyses, to evaluate survival and identify significant prognostic factors. The finding that lymph node

positivity within the excised lymph nodes is a significant prognostic factor

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is consistent with existing literature, highlighting its importance in the context of neoadjuvant CRT. However, their study found no significant difference in overall survival between patients who received neoadjuvant CRT and those who did not, which is unexpected given the established benefits of neoadjuvant CRT in reducing local recurrence and improving surgical outcomes. This discrepancy suggests that additional factors, possibly related to patient selection, treatment protocols, or follow-up duration, might influence survival outcomes and should be explored in future studies.

The study's findings add valuable insights to the broader landscape of rectal cancer research. The authors acknowledge that gender and tumor stage were not significant prognostic factors in their study, which contrasts with some previous studies that have identified these factors as influential [3]. This divergence highlights the variability in prognostic factors across different populations and emphasizes the need for further research to clarify these relationships. Their study also addresses the implications of different surgical procedures and the role of lymph node dissection, which I believe are critical considerations in the management of rectal cancer. The authors candidly discuss the retrospective design, single-center setting, and small sample size as significant constraints. These limitations are important to consider when interpreting the findings, as they impact the study's external validity. Furthermore, the study period (2013-2019) does not include the most recent advancements in rectal cancer treatment, which could influence the relevance of the results. Future studies should aim to include more recent data to provide an updated perspective on the effectiveness of neoadjuvant CRT [4].

To enhance the robustness and applicability of future research, I have several constructive suggestions. Increasing the sample size and including patients from multiple centers would improve the generalizability of the findings and provide a more comprehensive understanding of prognostic factors. Additionally, prospective studies could mitigate the biases inherent in retrospective analyses and offer more reliable evidence on the prognostic significance of various clinical and pathological factors. Longer follow-up periods are also recommended to assess the long-term effects of neoadjuvant CRT on survival and quality of life. Incorporating recent technological advancements and treatment protocols in future studies would provide a more current evaluation of neoadjuvant CRT's effectiveness. Advances in imaging techniques, surgical procedures, and adjuvant therapies have significantly impacted rectal cancer treatment in recent years, and their inclusion in research would offer valuable insights into optimizing patient outcomes [5]. Furthermore, evaluating the impact of molecular and genetic markers on treatment response and survival could identify additional prognostic factors and personalize treatment strategies for rectal cancer patients. Finally, I believe the article contributes valuable knowledge about the prognostic factors affecting survival in rectal cancer patients receiving neoadjuvant CRT. The identification of lymph node positivity as a significant prognostic factor is particularly noteworthy. However, the study's limitations, including its small sample size, retrospective design, and single-center setting, necessitate cautious interpretation of the findings. Future research should address these limitations by employing larger, multicenter, and prospective studies, incorporating recent advancements in treatment, and exploring additional prognostic markers. Such efforts will enhance our understanding of survival-effective prognostic factors and improve the management of rectal cancer patients undergoing neoadjuvant CRT.

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