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Comparison of early and late term results of onlay and sublay mesh approaches in open incisional hernia surgery

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ABSTRACT

Aims: Despite the increase in minimally invasive techniques, open techniques continue to be frequently used in incisional hernia repairs. In open incisional hernia surgeries, onlay and sublay techniques are the most frequently preferred depending on the area where the mesh is placed. In this study, we aimed to compare these two techniques by analyzing perioperative findings.

Methods: Data from elective open incisional hernia surgeries (onlay and sublay) performed by the same surgical team in the general surgery clinic between 01.01.2023 and 31.12.2023 were retrospectively reviewed. Emergency surgeries, laparoscopic or combined surgeries, patients who did not undergo mesh repair, patients who received preoperative botulinum toxin due to “loss of domain”, patients with missing data, and patients who did not continue their follow-up were excluded from the study.

Results: The data of a total of 74 patients who met the inclusion criteria were analyzed in the study. Onlay procedure was performed in 53 (71%) patients and sublay procedure was performed in 21 (19%) patients with a retromuscular approach. No intraoperative complications were detected in any of the patients. There were statistically significant differences between the groups in terms of female gender ($p: 0.007$), duration of surgery ($p < 0.001$) and duration of hospital stay ($p < 0.001$). There were no statistically significant differences between the groups in terms of complications ($p: 0.42$), unexpected re-admission ($p: 0.779$) and six-month recurrence ($p: 0.779$).

Conclusion: Onlay or sublay techniques can be safely applied in open incisional hernia surgery because they have acceptable complication and recurrence rates. Surgical experience and patient factors are the main determinants of which technique to apply.

Keywords: Incisional hernia, mesh repair, onlay, sublay

INTRODUCTION

The use of minimally invasive techniques for abdominal surgery has been increasing in recent years. However, laparotomies continue to be performed in many abdominal surgeries, especially emergency procedures.¹ The incidence of incisional hernias (IH), a common complication after laparotomies, varies between 2% and 20%.^{2,3} Many risk factors have been reported for incisional hernias. Patient-related factors include age, obesity, malnutrition, anemia, diabetes, smoking, chronic obstructive pulmonary disease, and immunosuppression. Technical factors include the location of the incision, the type of suture material used, surgical site infection, and the type of fascial closure.^{1,4}

Incisional hernias, which are usually asymptomatic, can cause serious complications such as abdominal pain, intestinal obstruction, and enterocutaneous fistula. Therefore, there are studies recommending fascial closure with a small bite technique and prophylactic mesh reinforcement of

the midline to reduce the likelihood of incisional hernia development in laparotomy closure.^{5,6} Incisional hernias are associated with decreased quality of life and high socioeconomic costs. Patients who undergo IH repair may be exposed to the risks of reoperation due to the high recurrence rate. Recurrence rates after IH surgeries are reported to range from 23% to 50%.⁷ Surgical options for IH repair include primary repair with sutures without mesh or open or laparoscopic repairs with mesh. In mesh repairs, onlay and sublay repairs are frequently preferred procedures depending on the area where the mesh will be placed. However, there is no definitive consensus on which technique is superior.⁸

The main goal in all hernia surgeries should be to apply a method that minimizes the possibility of recurrence and has minimal complications. Therefore, in our study, we aim to compare onlay and sublay mesh placement techniques in open surgeries for incisional hernias.

METHODS

Ethics

The thesis study was initiated with the approval of the Başakşehir Çam and Sakura City Hospital Clinical Researches Ethics Committee (Date: 08/2024, Decision No: 197). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Due to its retrospective nature, only surgical informed consent forms were obtained from the patients.

Patient Selection

Patients who underwent open approach, onlay and sublay techniques in elective incisional hernia surgeries performed consecutively between 01.01.2023 and 31.12.2023 by the Surgery 3 Unit, which is a hernia-specific team within the general surgery clinic of our hospital, which is a tertiary health center, were retrospectively screened and included in the study. The technique to be used was determined by the surgeon's preference, without randomization based on the patient's characteristics and the size of the hernia.

Inclusion criteria: Patients over the age of 18 who have a hernia defect smaller than 10 cm, undergo elective incisional hernia repair (onlay or sublay) and are followed up for six months after surgery.

Exclusion criteria: Emergency surgeries, laparoscopic or combined surgeries, patients who did not undergo mesh repair, patients who received preoperative botulinum toxin due to "loss of domain", patients with missing data, and patients who did not continue their follow-up were excluded from the study.

Gender, age, body-mass index (BMI), comorbidity status, location of incisional hernia, applied surgical technique (onlay/sublay), duration of surgery, complication status, length of stay, unexpected admission and six-month postoperative recurrence status were analyzed from the data scanned retrospectively from the digital archive on the hospital information management system.

Surgical Method

Onlay technique: After the incisional hernia area is released and adhesions are removed, the abdominal defect is closed with a number 0 Polydioxanone (PDS) suture. A polypropylene mesh is prepared according to the size of the area and placed on the anterior abdominal aponeurosis, prefascial region. A hemovac drain is placed on the area above the mesh and the subcutaneous tissue and skin are closed.

Sublay technique: Also known as the Rives-Stoppa technique. After the hernia area is released and adhesions are removed, the plane between the rectus abdominis muscle and the posterior leaf of the rectus sheath is dissected. After the posterior defect is closed with a number 0 PDS suture, a polypropylene mesh is prepared according to the size of the area and laid on the retrorectus plane to fix it. Hemovac drains are placed and the midline defect is closed with a number 0 PDS suture. Finally, the subcutaneous and skin are closed.

In both procedures, vacuum drains were removed when daily drainage fell below 30 ml. Routine outpatient clinic checks were performed in the first and second weeks and the first, third and sixth months postoperatively.

Statistical Analysis

SPSS 25.0 (SPSS Inc, Chicago, IL, USA) analysis program was used for statistical evaluation of the data. Descriptive statistical methods (frequency, percentage, mean, standard deviation) and Pearson Chi-square, Fisher Chi-square or Yates Chi-square tests were used to compare quantitative data. The conformity of the data to normal distribution was performed with the KolmogorovSmirnow test. In the study, independent samples-t test was used in the evaluation of quantitative data showing normal distribution; values less than $p=0.05$ were considered significant and significant difference between groups.

RESULTS

The data of a total of 74 patients who met the inclusion criteria were analyzed in the study. In terms of gender distribution, 46 (62%) were female and 28 (38%) were male. The mean age was 55 ± 12 , and the mean BMI was 30 ± 3.8 . Twenty-five (33%) of the patients had comorbidities. Recurrent incisional hernia surgery was performed in 14 (19%) patients. Onlay procedure was performed in 53(71%) patients and sublay procedure was performed in 21 (19%) patients with a retromuscular approach. No intraoperative complications were detected in any of the patients. No postoperative complications were observed in 41 (78%) of the patients who underwent onlay repair and 18 (86%) of the patients who underwent sublay repair. Serous wound discharge and hematoma observation rates were 13%/7.5% in the onlay group and 5%/5% in the sublay group, respectively. All of these complications resolved with conservative follow-up. There were statistically significant differences between the groups in terms of female gender, duration of surgery and duration of hospital stay. There were no statistically significant differences between the groups in terms of complications, unexpected re-admission and six-month recurrence (Table). No re-intervention was performed in any patient during the follow-up period and no mortality was observed.

Table. Distribution of demographic data and perioperative findings between groups

	Group		p value
	Onlay (n=53)	Sublay (n=21)	
Age*	54.3 (44.5-64)	57.6 (51-65)	0.247
Gender (female), n (%)	38 (71.6)	8 (38)	0.007
Preoperative recurrence status, n (%)	9 (16.9)	5 (23.8)	0.499
Comorbidity (yes) %	14 (26.4)	11 (52.3)	0.063
BMI*	30.2 (28-32)	30.68 (28-33)	0.564
Duration of surgery (min)*	82.03 (52.5-95)	180.7 (140-217.5)	<0.001
Hospital stay (days)*	2.98 (2-4)	5.9 (5-6.5)	<0.001
Complication (yes)%	12 (22.6)	3 (14.2)	0.420
Unexpected re-admission, n (%)	4 (7.5)	2 (9.5)	0.779
Recurrence within 6 months, n (%)	2 (3.7)	1 (4.7)	0.846

BMI: Body-mass index, *mean (Q1-Q3)

DISCUSSION

In recent years, as in many other surgeries, laparoscopic and robotic surgeries have become a trend in incisional hernia surgeries. Due to the high incidence of incisional hernias, this situation does not reduce the need for open surgical

approaches. In our study, we found that open approach onlay and sublay techniques were successfully applied in incisional hernia repair without any significant superiority over each other.

Basta et al.⁹ analyzed 30,000 abdominal surgeries and found an incidence of IH of 3.8% over a 5-year follow-up. The procedures most commonly associated with the development of IH were colorectal (7.7%), vascular (5.2%), bariatric (4.8%), and organ transplant surgery (4.5%). In IH open surgeries, the name is made according to the area where the mesh is placed. In particular, researchers who prefer open approaches in IH repair in the literature compare onlay and sublay repairs. The parameters that researchers focus on when comparing both techniques are seroma rate, surgery time, hospital stay and recurrence rate in postoperative follow-up. Demographic data, especially in terms of gender and age, showed differences between the studies. In one study with a male-female ratio of 0.6:1, the mean age was 45.4±12.29, while another study with a female ratio of 58% included an older population and reported a mean age of 65.5.^{2,10} In our study, the female rate was 62% and the overall mean age was 55±12. While no statistically significant difference was observed between the groups in terms of age, a significant difference was detected in terms of gender.

Acar et al.⁸ reported that 24.3% of patients who underwent surgery for incisional hernia had comorbidities, particularly diabetes, hypertension, and obesity. In another study, no statistically significant difference was shown between the groups in terms of concomitant diseases.¹¹ Similarly, in our study, while there was no significant difference between the groups in terms of comorbid diseases, the presence of comorbid diseases was determined as 33%. The most important consequence of the presence of comorbid diseases is that the duration of hospitalization can be prolonged due to these diseases or as a result of the disruption of wound healing.

Onlay technique has a time advantage due to standard anatomy and preparation of a single area for mesh placement. In the study of Hassan et al.,¹⁰ the mean intraoperative time for onlay and sublay repair was 88.1±31.39 and 104.9 ±39.41, respectively, and was found to be statistically significant. In a study where the groups were similar in terms of age and gender, the duration of surgery was found to be significantly shorter in the onlay group than in the sublay group. However, the mean length of hospital stay was similar in both groups.¹² In our study, both the operation time and the hospital stay were longer in the sublay group and there was a statistically significant difference between the two groups. We believe that this is due to being a training hospital and the close relationship between retromuscular anatomical orientation and experience. On the other hand, Pereira et al.² in their study associate the longer hospital stay in the onlay group with the seroma rate in the onlay group.

Seroma formation is a common complication after open mesh repair, with an incidence of 30% to 50%. The exact pathophysiology of seroma formation is unknown. However, some studies suggest that seroma occurs more frequently with the onlay technique due to greater dissection of the subcutaneous tissue and contact with the mesh.¹³ Due to its technical simplicity, onlay mesh placement can be considered the preferred method of mesh repair for surgeons who do

not routinely perform retrorectus dissection.¹⁴ Although there are studies^{2,10,15} that detected seroma formation more frequently in the onlay group than in the sublay group, Martins et al.¹¹ detected seroma formation more frequently in the sublay technique. They stated that the reason for this situation was the lower drain placement rate in this group. Recent meta-analyses report that there is no difference in seroma development between sublay and onlay techniques.¹⁶

The wound infection rate after IH repair has been reported as 6-12%, and its etiology is associated with extensive dissection of the subcutaneous tissue and mesh material.¹⁷ Therefore, in studies, the onlay technique has been associated with an increased risk for infectious complications due to the position of the mesh.¹⁴ In a meta-analysis comparing sublay and onlay incisional hernia repair by Timmermanns et al.,¹⁸ fewer surgical site infections were found in favor of the sublay technique. Similarly, Pereira et al.² found a high rate of seroma and surgical wound infection in those who underwent the onlay technique. In our study, the serous wound discharge rate was 13% in the onlay group and 5% in the sublay group. No significant difference was found between the groups in terms of general complications. However, the lack of a clear definition of seroma in the data creates confusion in terms of determining the incidence of seroma. We also believe that the use of surgical drains reduces the detection of symptomatic seroma. The role of drains in open incisional hernia repair and their ability to reduce seroma is not yet clear in the current literature. Therefore, more comprehensive studies are recommended to evaluate the role of drains in open incisional hernia repair.¹⁹

Postoperative follow-up periods for recurrence detection are not standard in the studies. There are studies that present the results of postoperative thirty days, the first six months, or approximately five years of follow-up.^{10-12,20} Venclauskas et al.²¹ reported a recurrence rate of 10.5% in onlay mesh repair and 2% in sublay mesh repair. In their study comparing inlay, onlay and sublay groups, de Vries Reilingh et al.²² reported the recurrence rates at 12-month follow-up as 28.3%, 44% and 12%, respectively. Contrary to these studies, there are also studies showing that there is no difference in recurrence between the two groups.^{10,12} Similarly, in our study, no significant difference was found between the groups in terms of recurrence in the six-month period. In a study reporting a general complication rate of 13%, it is emphasized that hospitalization is not required because all complications are minor.²⁰ This is consistent with the absence of major complications in our results. Therefore, no patient required rehospitalization during the postoperative period.

Limitations

Due to its retrospective design, our study had some limitations. The most important limitation was that all patient follow-up data were not entered into digital information management systems due to personnel shortages. Another major limitation was the low number of patients in the groups. The main reason for this can be explained as the increasing interest in laparoscopic surgery. If a high-volume study is desired, the desired numbers can only be achieved with multicenter studies.

Although most studies in the current literature indicate that the onlay technique is associated with wound complications, seroma rates, and recurrence rates compared to the sublay

technique, we obtained different results from the literature in our study population. Most of the studies on large patient numbers are meta-analyses. However, we believe that studies that include larger patient numbers in a randomized population and longer follow-up periods will contribute more to the literature.

CONCLUSION

Onlay or sublay techniques can be safely applied in open incisional hernia surgery because they have acceptable complication and recurrence rates. Surgical experience and patient factors are the main determinants of which technique to apply.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Başakşehir Çam and Sakura City Hospital Clinical Researches Ethics Committee (Date: 08/2024, Decision No: 197).

Informed Consent

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

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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

Author Contributions

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

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Comparison of demographic and clinicopathological characteristics of refugees and Turkish citizens undergoing appendectomy

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ABSTRACT

Aims: This study aimed to compare the demographic and clinical characteristics of refugee and Turkish patients who underwent appendectomy.

Methods: The study examined 215 patients (86 refugees and 129 Turks). Data included age, sex, Alvarado score, neutrophil percentage, white blood cell count, appendix diameter, CRP level, and time to hospital admission. Clinical findings and pathology results were also evaluated.

Results: The average age was 29.51 years for refugees and 31.31 years for Turks. The Alvarado score was similar in both groups; however, the neutrophil percentage was significantly higher in the refugee group. No significant differences were found in appendix diameter, white blood cell count, or CRP levels. The refugee group showed significantly different time to admission and some symptoms (pain shifting to the lower right quadrant, loss of appetite, rebound tenderness). Pathology results indicated acute appendicitis in 80.2% of the refugee group and 79.8% of the Turkish group.

Conclusion: In conclusion, while imaging methods can be very helpful in diagnosing appendicitis in refugees who do not speak the language of the host country, we believe that the role of a translator in obtaining an accurate medical history and conducting a physical examination cannot be underestimated. The study has some limitations, and we recommend conducting more prospective and detailed research.

Keywords: Acute appendicitis, refugees, diagnostic delays, healthcare access

INTRODUCTION

Migration is the geographic movement of people from one settlement to another due to religious, political, economic, social, and other reasons. According to a report published by the United Nations High Commissioner for Refugees in 2015, there are more than 65.3 million forcibly displaced persons worldwide, including over 21 million refugees.¹ As of September 16, 2020, according to the Directorate General of Migration Management of Türkiye, 59,877 Syrians under temporary protection are hosted in 7 temporary accommodation centers in 5 provinces. Additionally, 3,559,041 Syrians under temporary protection live outside the temporary accommodation centers.² Most of the Syrians in Türkiye come from regions near the Syria-Türkiye border that have experienced intense conflicts. A 2015 report by the Middle East Strategic Research Center noted that the social impact of Syrian refugees in Türkiye has complicated social integration due to differences in language, culture, and lifestyle.³

Acute appendicitis is a condition requiring emergency surgical intervention, demanding rapid diagnosis and treatment to prevent serious complications. It is the most common cause of acute abdominal pain, with a lifetime prevalence of approximately 7%. Diagnosis of acute appendicitis involves laboratory tests, radiological imaging, history, and physical examination. The most critical aspect of treatment is making a definitive diagnosis and performing timely surgical intervention before complications develop.⁴ Due to the wide range of clinical symptoms, delays in diagnosis can lead to increased risks such as perforation, abscess formation, wound infection, and sepsis. The number of Syrian refugees in Türkiye is higher than in other neighboring countries. These refugees face many health problems due to challenging living conditions, socio-economic limitations, and communication barriers.

In Türkiye, all Syrian refugees receive free healthcare services through community clinics and state hospitals. However,

access to these services can be complicated by various factors, leading to delays in hospital visits during emergencies. This study aims to compare the presentation and outcomes of acute appendicitis cases between Syrian refugees and Turkish citizens to understand the impact of socio-economic and communication barriers on health outcomes.

METHODS

The study was conducted with permission from the Hitit University Non-interventional Researches Ethics Committee (Date: 28.06.2021, Decision No: 2021-71). All procedures were conducted in accordance with ethical guidelines and the principles of the Declaration of Helsinki. Data were retrospectively collected from system and written documents for 215 patients over the age of 18 who underwent appendectomy at Çorum Erol Olçok Training and Research Hospital and Abdulkadir Yüksel Hospital between 01.01.2020 and 01.01.2021. Refugee patients were examined at Abdulkadir Yüksel Hospital, which has a high refugee population, with 86 patients, while Turkish citizens were examined at Çorum Erol Olçok Training and Research Hospital with 129 patients. Patients were then divided into two groups based on nationality: Refugee patients (group 1) and Turkish patients (group 2).

In this study, patients' age, gender, preoperative laboratory values, Alvarado score, appendiceal diameter on imaging, time of presentation, histopathological diagnosis, and length of hospital stay were recorded. Additionally, white blood cell count (WBC), neutrophil, lymphocyte, and C-reactive protein (CRP) values were analyzed. The neutrophil/lymphocyte ratio (NLR) and CRP/lymphocyte ratios were calculated based on complete blood count data, and histopathological features were recorded from the hospital database.

Statistical Analysis

The data were analyzed using SPSS software (Statistical Package for the Social Sciences; version 25 Inc., Chicago, IL, USA), and results were expressed as mean±SD, median [interquartile range (IQR)], and percentages where applicable. The Kolmogorov-Smirnov test was used to examine the distribution of the data. Data showing normal distribution were analyzed with the student t-test. Non-parametric data were analyzed using the Mann-Whitney U test, and categorical groups were compared using the Chi-square test. A p-value less than 0.05 was considered statistically significant.

RESULTS

Out of the 215 patients who underwent appendectomy, 86 (40%) were refugees, and 129 (60%) were Turkish citizens. In the refugee group, there were 27 females (31.4%) and 59 males (68.6%), while in the Turkish group, there were 46 females (35.7%) and 83 males (64.3%). The average age in the refugee group was 29.51 years (range: 18-38), and in the Turkish group, it was 31.31 years (range: 18-67).

The Alvarado score was 6.96 (range: 2-10) in the refugee group and 7.6 (range: 2-10) in the Turkish group, with no significant difference. The percentage of neutrophils was 78.25% (range: 49.8-90.6) in the refugee group and 73.37% (range: 48.3-94.5) in the Turkish group, with a p-value of 0.048, indicating statistical significance. The white blood cell

count was $13.69 \times 10^3/\mu\text{l}$ (range: 4.6-29.76) in the refugee group and $12.62 \times 10^3/\mu\text{l}$ (range: 5.99-26.55) in the Turkish group, with no significant difference. The diameter of the appendix on imaging was 9.6 mm (range: 6-18) in the refugee group and 9.72 mm (range: 6-18) in the Turkish group, with no significant difference. CRP levels were 25.019 mg/dl (range: 0.6-156.51) in the refugee group and 31.43 mg/dl (range: 0.1-221.37) in the Turkish group, with no significant difference. Body temperature was 37.06°C (range: 36.3-38) in the refugee group and 37.04°C (range: 36.41-38.1) in the Turkish group, with no significant difference (Table).

The length of hospital stay was 1.84 days (range: 1-4) in the refugee group and 1.9 days (range: 1-8) in the Turkish group, with no significant difference. Pathology results showed that 69 (80.2%) patients in the refugee group and 103 (79.8%) patients in the Turkish group were diagnosed with acute appendicitis. Other findings unrelated to acute appendicitis are detailed in Table. The p-value for this comparison was 0.086.

The time of presentation within the first 24 hours was 18 (20.9%) in the refugee group and 54 (41.9%) in the Turkish group, with a p-value of 0.001, indicating statistical significance. The shift of pain to the right lower quadrant was observed in 59 (68.6%) patients in the refugee group and 62 (48.1%) patients in the Turkish group, with a p-value of 0.003, indicating statistical significance. Loss of appetite was reported in 93 (72.1%) patients in the refugee group and 74 (86%) patients in the Turkish group, with a p-value of 0.016, indicating statistical significance. Rebound tenderness was noted in 63 (73.3%) patients in the refugee group and 76 (58.9%) patients in the Turkish group, with a p-value of 0.031, indicating statistical significance. Sensitivity and nausea/vomiting results are detailed in Table, with no significant differences observed.

All demographic and clinicopathological results for the patients are summarized in Table.

DISCUSSION

Acute appendicitis is the most common cause of acute abdomen. It most frequently occurs between the ages of 10 and 20, with a male-to-female ratio of 1.4:1. In the United States, the lifetime risk is 8.6% for males and 6.7% for females⁵. In our study, the median age of both patient groups was approximately 28 years. Of the total number of patients, 142 (66%) were male and 73 (34%) were female. Advances in laboratory tests and imaging technologies have made accurate diagnosis easier.⁶ The critical aspect of acute appendicitis is making a definitive diagnosis and performing timely surgical intervention before complications develop.

Ultrasound (US) and computed tomography (CT) are the most commonly used imaging methods to rule out appendicitis in patients with abdominal pain. Balthazar et al.⁷ first used CT for diagnosing acute appendicitis in 1986. They identified inflammation signs on CT, such as an appendix greater than 5 mm in thickness and dilated, peri-appendiceal phlegmon, hypertrophied meso-appendix, and free fluid.⁸ In our study, the appendix diameter was significantly larger in the refugee group, with an average of 10.31 ± 2.71 mm compared to the other group. The time of presentation showed that 18 (20.9%) patients in the refugee group presented within the first 24

Table. Comparison between groups					
		Total group (n=215)	Refugee nationals (n=86)	Turkish nationals (n=129)	p value
Gender	Male	142 (66%)	59 (68.6%)	83 (64.3%)	0.518
	Female	73 (34%)	27 (31.4%)	46 (35.7%)	
Age		31.09±10.57 (28)	29.51±8.019 (28)	23.15±11.89 (28)	0.364
Fever		37.04±0.43 (37)	37.05±0.45 (37)	37.04±0.43 (37)	0.912
Loss of appetite		167 (77.7%)	93 (72.1%)	74 (86%)	0.016
Tenderness		191 (88.8%)	72 (83.7%)	119 (92.2%)	0.052
Rebound		139 (64.7%)	63 (73.3%)	76 (58.9%)	0.031
Migration		121 (56.3%)	59 (68.6%)	62 (48.1%)	0.003
Nausea		172 (80%)	74 (86%)	98 (76%)	0.07
Alvarado score		6.84±2.07 (7)	7.19±1.98 (7)	6.61±2.10 (7)	0.045
Appendix diameter		9.72±2.74 (9)	10.31±2.71 (10)	9.33±2.71 (9)	0.001
WBC		12.80±4.42 (12.43)	13.38±4.70 (12.71)	12.41±4.20 (11.95)	0.142
NE#		9.87±4.31 (9.55)	10.39±4.56 (10.10)	9.52±4.12 (9.16)	0.211
LY#		1.91±0.86 (1.78)	1.93±0.72 (1.84)	1.90±0.94 (1.63)	0.120
CRP		26.09±36.10 (12.3)	21.22±27.49 (9.98)	29.34±40.62 (13.50)	0.552
NLR		6.31±4.17 (5.16)	6.69±4.95 (4.86)	6.06±3.55 (5.24)	0.991
CLR		18.10±35.39 (6.94)	13.55±22.60 (5.10)	21.14±41.62 (9.48)	0.443
Admission within 24 hours		72 (33.5%)	18 (20.9%)	54 (41.9%)	0.001
Histopathology	Acute appendicitis	172 (80%)	69 (80.2%)	103 (79.8%)	0.086
	Mucosele	4 (1.9%)	3 (3.5%)	1 (0.8%)	
	Lymphoid hiperplasia	32 (14.9%)	11 (12.8%)	21 (16.3%)	
	Apendix diverticul	2 (0.9%)	0 (0%)	2 (1.6%)	
	Carsinoid tumor	2 (0.9%)	0 (0%)	2 (1.6%)	
Mild dysplasia	3 (1.4%)	3 (3.5%)	0 (0%)		
Hospitalization duration		1.92±1.24 (2)	1.90±0.895 (2)	1.94±1.42 (1)	0.226

WBC: White blood cell, NE: Neutrophil, LY: Lymphocyte, CRP: C-reactive protein, NLR: Neutrophil to lymphocyte ratio, CLR: CRP to lymphocyte ratio, *Mann-Whitney U test, median (interquartile range [IQR]) **Chi-square test, n (%) ***Student t-test, mean±SD, SD: Standard deviation

hours, which we believe is largely due to delays in seeking hospital care. Studies indicate that an increased appendix diameter is a risk factor for perforation and complications.⁹ Many researchers have found that barriers to healthcare lead to delays in presentation and increased perforation rates; issues such as insurance status¹⁰ and race/ethnicity^{11,12} are associated with perforation.

Migration occurs for numerous interrelated cultural, economic, religious, ethnic, and political reasons. Migrants may encounter various issues in the host country, including significant challenges in accessing healthcare services. Refugees may face difficulties in healthcare due to communication barriers and language differences, similar to other social issues. Existing barriers include language obstacles, uncertain access to health insurance, and conflicts between medical treatments and cultural or religious beliefs.¹³ In our study, we believe that the late presentation of refugees was not related to insurance status but rather to communication difficulties and language differences in accessing healthcare.

In diagnosing acute appendicitis, it is crucial to evaluate clinical history, physical examination, and laboratory values, rather than relying solely on imaging methods. Symptoms such as rebound tenderness, right lower quadrant pain, nausea/vomiting, and loss of appetite, along with blood tests, support the diagnosis. In a meta-analysis of 3,382

patients, leukocytosis (leukocyte count >10,000/mm³) had a sensitivity of 83% and specificity of 67% for diagnosing acute appendicitis, while neutrophilia (neutrophil count >6,500/mm³) had a sensitivity of 71-89% and specificity of 48-80%.¹⁴ Other studies have shown that the average NLR (neutrophil leukocyte count) value in acute appendicitis cases is 7.35±5.90, compared to 2.60±1.35 in negative appendectomy cases, demonstrating a significant association between high NLR values and acute appendicitis.¹⁵ In our study, while there were no statistically significant differences in hemogram parameters between the groups, our findings are consistent with existing research.

The Alvarado score and symptoms were significantly different in the refugee group compared to the other group. We attribute this to the delayed hospital presentation and the full development of symptoms in the refugee group.

This study highlights the significant differences in presentation time, appendix diameter, and appendicitis symptoms between the refugee and Turkish groups. We believe these differences are due to the challenges refugees face in integrating into our country, communication issues, and difficulties adapting.

According to the United Nations High Commissioner for Refugees (UNHCR) 2017 data, 65.6 million people are forcibly displaced worldwide, with Syria being one of the

three main countries of origin for refugees, and 64.6% of Syrian refugees live in our country.¹⁶ An international multi-center study involving over 250 healthcare professionals identified eight specific challenges in treating asylum seekers and refugees: language and communication issues, disease due to cultural differences, different understanding of health and treatment, inadequate access to medical history, concerns about healthcare costs, insufficient familiarity with the healthcare system, mistrust, and societal poverty resulting from traumatic events.¹⁷

Limitations

Pathology results indicated that 69 (80.2%) patients in the refugee group and 103 (79.8%) patients in the Turkish group were diagnosed with acute appendicitis, with a p-value of 0.086. One of the main limitations of our study is that we did not specify whether patients had complicated appendicitis based on pathological diagnoses and surgical notes. Including information on complicated appendicitis cases would have added value to our study. Another limitation is the retrospective nature of the study and the potential for incomplete patient information.

CONCLUSION

In conclusion, while imaging methods can be very helpful in diagnosing appendicitis in refugees who do not speak the language of the host country, we believe that the role of a translator in obtaining an accurate medical history and conducting a physical examination cannot be underestimated. The study has some limitations, and we recommend conducting more prospective and detailed research.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was conducted with permission from the Hitit University Non-interventional Researches Ethics Committee (Date: 28.06.2021, Decision No: 2021-71).

Informed Consent

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

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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

Author Contributions

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

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Global research patterns and advances in comb burn treatment: a comprehensive bibliometric analysis

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ABSTRACT

Aims: This study conducts a bibliometric analysis of literature on stasis zones and comb burns, essential for understanding and treating burn injuries. The comb burn model, introduced by Regas and Ehrlich,¹ has facilitated animal studies on burn pathophysiology. The Jackson burn model categorizes burns into three zones: coagulation, stasis, and hyperemia, with the stasis zone posing significant treatment challenges. Utilizing animal models, especially rats, is common in burn research.

Methods: The comb burn model uses a heated brass comb to study the stasis zone effectively. A PubMed search identified 68 relevant articles, analyzed using Biblioshiny within R Studio.

Results: Results indicated that “Burns: Journal of the International Society for Burn Injuries” and “Journal of Burn Care & Research” are key journals. The United States, China, and Turkiye are leading countries in this research area. The study emphasizes the need for standardized methodologies and improved animal models.

Conclusion: The analysis highlights the necessity for ongoing research and international collaboration to advance comb burn understanding and treatment.

Keywords: Comb burns, bibliometrics, research trends, academic analysis, burn injuries

INTRODUCTION

The comb burn model, introduced by Regas and Ehrlich,¹ paved the way for various animal studies to explore the pathophysiology and treatment of the stasis zone in burns.¹ The objective of this study is to conduct a bibliometric analysis of the existing literature on stasis zones and comb burns.

Burn injuries are generally classified by depth, but the Jackson burn model categorizes them into three zones regardless of depth: coagulation, stasis, and hyperemia.² Early research showed that these zones evolve over time, with the stasis zone either progressing to necrosis or healing and becoming part of the hyperemia zone. The coagulation zone remains constant, while the stasis zone can either deteriorate or recover, affecting treatment outcomes (Figure 1).

Jackson's studies used compression with blood pressure cuff to observe these zones: necrosis was evident in the coagulation zone, while the stasis zone had preserved circulation but no metabolic activity, and the hyperemia zone retained both circulation and metabolism.²

The stasis zone presents significant treatment challenges as it can lead to necrosis, complicating healing and increasing complications. Addressing this zone is crucial for improving burn treatment outcomes.

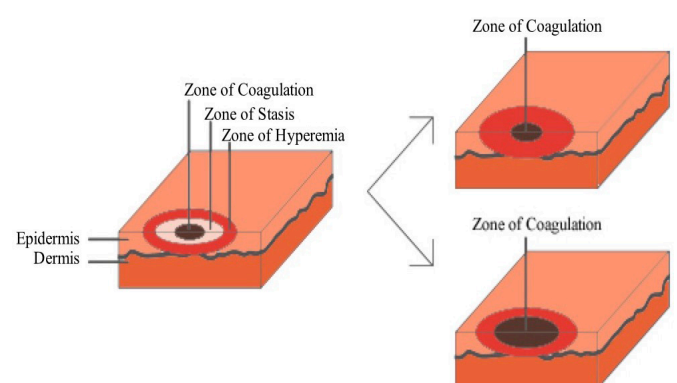


Figure 1. Stasis zone either heals or progresses to coagulation zone (Illustrated by the author)

Burn research involves complex local and systemic effects, making animal models essential for understanding these injuries and testing treatments. In vitro studies alone are inadequate due to their limitations. Rats are commonly used for burn research due to their skin's similarity to humans, though their rapid healing and high contracture rates pose challenges.³ Different animal species are chosen based on the research focus, with sheep, rabbits, rats, and pigs used for various types of burn studies.

One common burn model involves scalding, where animals are exposed to hot water or metal plates. The comb burn model, which involves a heated brass comb applied to the skin, allows for studying the stasis zone more effectively. A 55x19 mm brass comb heated to 70°C creates distinct burn areas, enabling precise monitoring and measurement.¹

However, this model primarily assesses superficial stasis zones, neglecting deeper layers where stasis progression is more significant. Studies have shown that applying the heated comb for 30 seconds at 100°C provides a consistent full-thickness burn, highlighting the need for standardized application times in research.⁴

The comb burn model has evolved to address gaps in stasis zone research, but variability in methodology exists. Standardizing application times and recognizing the limitations of the model will improve consistency and accuracy in future studies.⁵

The objective of this study is to conduct a comprehensive bibliometric analysis of research on the comb burn model and its application to understanding burn injury zones, with a particular focus on the stasis zone. By identifying publication trends, key contributors, and influential research networks, this analysis aims to map the global research landscape in this field. By highlighting trends, gaps, and methodological challenges, the study seeks to inform future research directions and promote standardization in the use of the comb burn model. This will ultimately support advances in burn treatment and improve outcomes for patients with burn injuries.

METHODS

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. There are no conflicts of interest to declare, and no ethical approval was required for this bibliometric analysis. All procedures were carried out in accordance with the ethical rules and the principles.

To analyze the research landscape on comb burns, a comprehensive search was conducted using the term “comb burn” in PubMed (June 2024). The study included only articles written in English, resulting in a total of 77 articles. To ensure the rigor of the analysis, irrelevant articles were excluded, leaving a total of 68 articles for further examination. The retrieved publications were exported and analyzed using the Biblioshiny program within R Studio. Biblioshiny is a web-based application designed for bibliometric analysis, offering tools for visualizing and interpreting academic literature data. Bibliometric analysis was performed to identify key trends and patterns in the comb burn research. This included visualizing publication trends over time, author contributions, journal impact, and citation patterns. The analysis also focused on mapping research networks and collaborations to highlight influential studies and researchers in the field.

RESULTS

Journals and Trends

As illustrated in Figure 2, the annual scientific output on comb burn research exhibits a fluctuating trend from 1992 to 2024. In the initial period between 1992 and 2006, research

activity was intermittent, with a relatively low number of publications, typically ranging from zero to two articles per year. It is noteworthy that there were several years in which no publications were produced. A gradual increase in the number of publications began around 2007, reaching a peak in 2013 with eight articles. Subsequently, the number of publications exhibited fluctuations, demonstrating intermittent increases in research activity. Another noteworthy surge occurred around 2014 and 2018, indicating a resurgence of interest or advancements in the field during these periods. Despite some variability, there has been a general upward trend in publications over the past two decades, reflecting a growing interest and research effort in comb burn studies. The slight decline in recent years suggests the necessity for sustained research focus to maintain and build upon previous advancements.

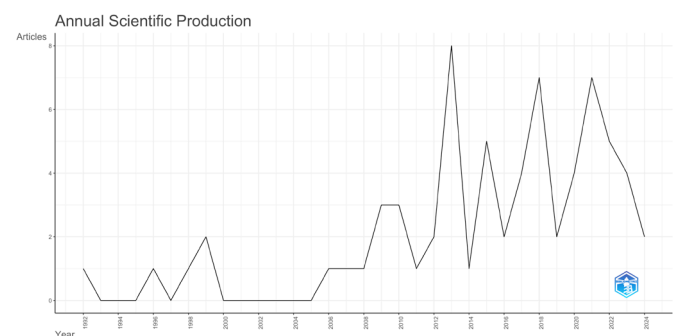


Figure 2. Number of studies published by year. It is worthy of note that the number of articles published on an annual basis has increased markedly in recent years

Figure 3 illustrates the distribution of core sources for comb burn research according to Bradford’s Law. The analysis identifies “Burns: Journal of the International Society for Burn Injuries” and the “Journal of Burn Care & Research” as the primary core sources, each contributing a significant number of articles. The steep decline in the number of articles beyond these core journals highlights their pivotal role in the field, with other sources contributing fewer publications. This distribution underscores the importance of these core journals in disseminating key research findings on comb burns.

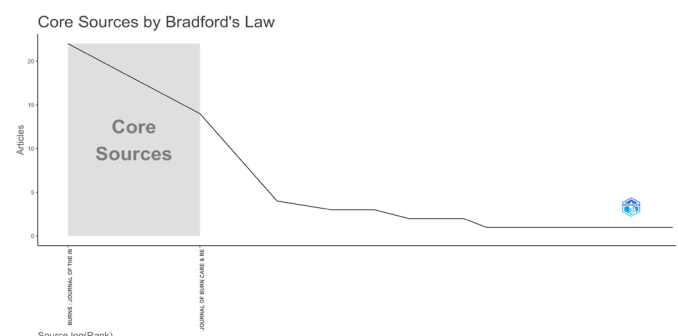


Figure 3. Core sources by Bradford’s Law shows the most efficacious journals

Figure 4 displays the most relevant sources for comb burn research, highlighting the journals with the highest number of published documents. “Burns: Journal of the International Society for Burn Injuries” leads with 22 articles, followed by the “Journal of Burn Care & Research” with 14 articles. Other notable sources include “Academic Emergency Medicine” with 4 articles, “Annals of Plastic Surgery” with 3, and

“Wound Repair and Regeneration” with 3. This distribution underscores the prominence of specialized burn and emergency medicine journals in disseminating significant research findings in the field of comb burn studies.

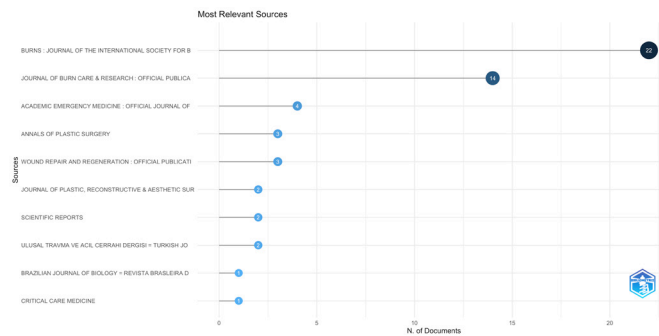


Figure 4. Most relevant sources

Authors and Affiliations

Figure 5 illustrates the publication activity of leading authors in comb burn research over time. The chart shows consistent contributions from authors such as Singer et al.⁷ indicating their long-term involvement and impact in the field. The size of the dots represents the number of articles published, with larger dots indicating higher productivity. Authors like Singer et al.⁷ are notable for their sustained high output. This visualization highlights the significant and ongoing contributions of key researchers, demonstrating their pivotal roles in advancing comb burn research.

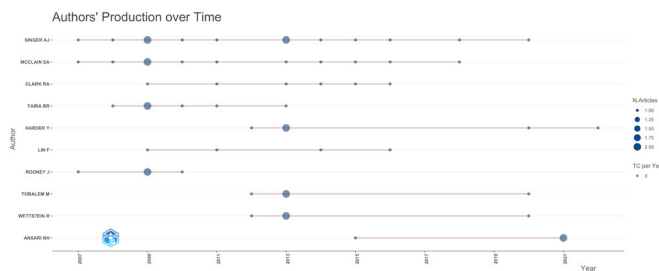


Figure 5. Authors production over time

Figure 6 highlights the most prolific authors in the field of comb burn research. Singer et al.⁷ tops the list with 13 published documents, followed closely by McClain with 11 documents. Other notable contributors include Clark RA and Taira BR, each with 6 publications, and Harder Y with 5. Additional contributors such as Tobalem et al.⁵ have also made significant contributions with multiple publications. This visualization underscores the key researchers who have substantially advanced the field through their extensive work on comb burn studies.

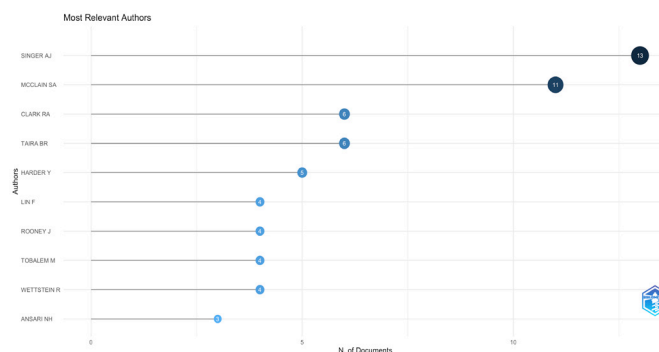


Figure 6. Most relevant authors

Figure 7 illustrates the global research networks and collaborations in comb burn studies. It reveals significant clusters of activity, highlighting key institutions and researchers as central nodes within these networks. It demonstrates that American centers have a considerable number of articles, whereas Turkiye, despite ranking highly in the country ranking, lower in affiliations and authors. The considerable quantity of Turkish research demonstrates a substantial and diverse academic presence, though it may be dispersed across numerous platforms rather than concentrated in a few prominent sources.

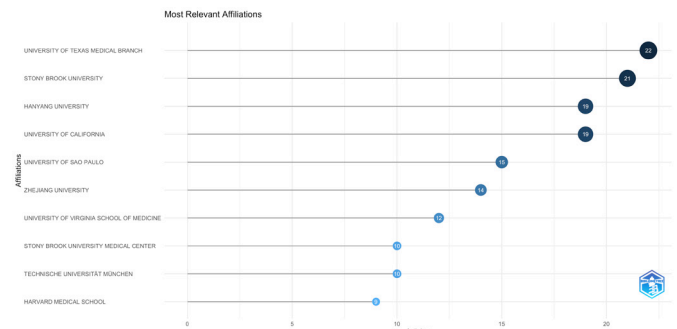


Figure 7. Most relevant affiliations

The citation counts for the papers on comb burns show a diverse range of impact among different authors. Regas and Ehrlich,¹ leads with 106 citations, indicating significant influence in the field. Authors such as Fang et al.⁶ (104 citations) and Singer et al.⁷ (with multiple entries ranging from 18 to 53 citations) also show considerable impact, reflecting their contributions to advancing research on comb burns. Other notable contributors include Nisanci⁸ (34 citations), S. Oksuz⁹ (34 citations), and X. Guo (33 citations), demonstrating their important role in the academic discourse.^{1,6-10} Several authors, including Hayati et al.¹¹ (54 citations) and Ponticorvo et al.¹² (39 citations), also have substantial citations, underscoring their contributions.^{11,12}

Most Relevant Keywords

Figures 8 and 9 provide insights into the most frequently used keywords in comb burn research. Figure 8, a word cloud, highlights the prominence of terms such as “animal,” “models,” “disease,” “male,” “rats,” “Sprague Dawley,” “Wistar albino,” and “progression.” These keywords reflect the focus on animal models, particularly rats, in studying comb burns and disease progression. Figure 8, a table of the most relevant words, corroborates this by listing “animals,” “rats,” “disease models animal,” and “male” as the top terms.

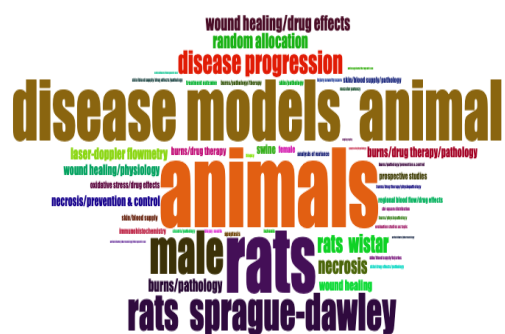


Figure 8. Word cloud of articles

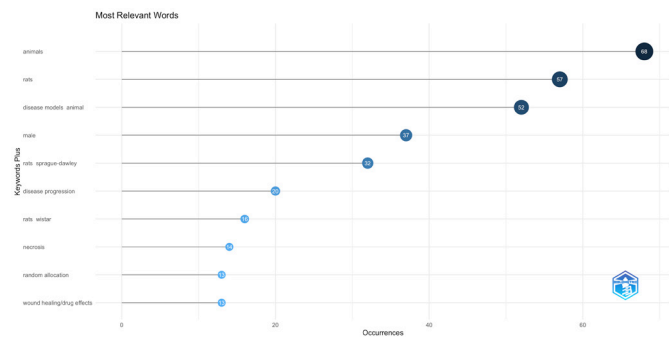


Figure 9. Most relevant words

Countries Contributions

Figure 10 illustrates the scientific production of comb burn research by country. The figure highlights that the United States is the leading contributor, followed by China and Turkiye, indicating strong research activity and focus in these nations. Other countries such as Switzerland, Brazil, Korea and Iran also show significant contributions. Figure 11, which analyzes the contribution of countries by years, demonstrates an increase in the number of publications and the countries that have contributed to them, particularly in recent years. While the USA maintains its leading position, there has been a notable surge in the total number of publications and a rise in global interest in the subject matter, largely due to the contributions of China and Korea.

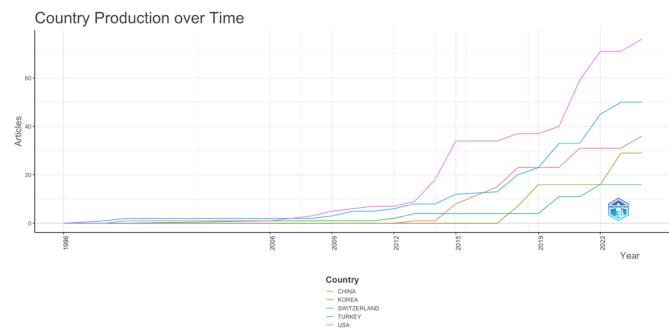


Figure 10. Country production over time

Country Scientific Production

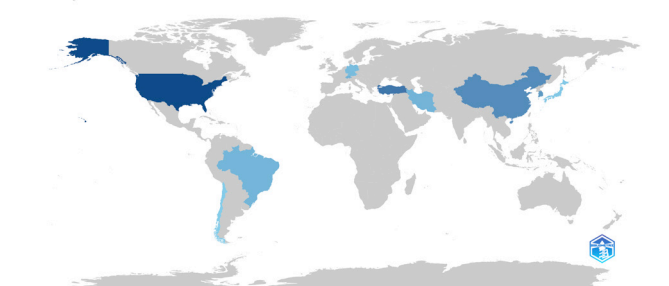


Figure 11. Country scientific production

DISCUSSION

The bibliometric analysis of comb burn research reveals several key trends and insights that reflect the evolution and current state of the field.

Publication Trends

The fluctuating annual output of comb burn research from 1992 to 2024 indicates varying levels of interest and advancements over time. Early intermittent activity suggests initial exploratory phases, while the gradual increase post-

2007 and peaks in 2013 and subsequent years highlight periods of intensified research focus. This trend suggests that while significant progress has been made, ongoing research and innovation are crucial to fully understand and address the complexities of comb burn injuries.

Core Journals and Influential Sources

The identification of “Burns: Journal of the International Society for Burn Injuries” and the “Journal of Burn Care & Research” as core sources underscores their pivotal roles in disseminating key findings. The prominence of these journals suggests that researchers and practitioners in the field rely heavily on these sources for the latest developments. The steep decline in articles beyond these core journals highlights the concentrated nature of impactful research within a few specialized publications, reinforcing the importance of these journals in advancing comb burn knowledge.

Key Authors and Contributions

The consistent contributions of leading authors such as Singer et al.,⁷ as illustrated in Figures 5 and 6, demonstrate the sustained efforts and significant impact of these researchers. Their prolific output and long-term (over a decade) involvement highlight their dedication and the central role they play in advancing comb burn research. This consistency in contributions is vital for the continuous development of the field, providing a solid foundation upon which future research can build.

Focus on Animal Models

The prominence of keywords related to animal models, particularly rats, in Figures 8 and 9, reflects the heavy reliance on these models for studying comb burns and disease progression. While rats provide valuable insights due to their physiological similarities to humans, the challenges posed by their rapid healing and high contracture rates highlight the need for cautious interpretation of results.¹³ This focus also underscores the importance of refining animal models to better mimic human burn injuries, thereby improving the translational potential of research findings.

International Contributions

The analysis of country contributions (Figures 10, 11) reveals that the United States, China, and Turkiye are leading contributors to comb burn research. This international distribution of research efforts signifies a global interest in addressing the complexities of burn injuries.¹⁴ The notable surge in publications from China and Korea in recent years indicates a growing research capacity and focus in these countries, contributing to the global body of knowledge and fostering international collaboration.

Methodological Variability and Standardization

The variability in methodology, particularly in the application times and temperatures of the comb burn model, as noted in the introduction, highlights a critical area for improvement. Standardizing these parameters is essential for ensuring consistency and comparability across studies. Addressing these methodological gaps will enhance the reliability and accuracy of research findings, ultimately leading to more effective treatments and better patient outcomes.

The field of comb burn research has attracted significant interest on a global scale, particularly in countries where

burn injuries are prevalent and present distinctive healthcare challenges. Researchers from regions including Southeast Asia, the Middle East and parts of Europe have demonstrated a notable interest in advancing knowledge on comb burns, recognizing the necessity for specialized approaches to both acute and long-term care.¹⁵ Furthermore, leading journals in the fields of burn care and trauma, such as the *Journal of Burn Care & Research* and the *Burns* journal, regularly publish studies on comb burns, thereby underscoring the significance and visibility of this research area. The focus of these journals on comb burn injuries serves to underscore the global interest in this area and to acknowledge the specific clinical demands that these injuries pose. This, in turn, advocates for the allocation of more dedicated resources and for further research support.¹⁶

Furthermore, the increasing trends in comb burn research indicate a continued gap and growing potential for further exploration in this field. This upward trend suggests that while significant progress has been made, there are still many aspects of comb burns – such as wound healing, infection prevention, and rehabilitation – that remain underexplored or open for innovation.¹⁷ Recent studies addressing topics such as burn care protocols, novel wound dressings and the psychological impacts of comb burns serve to reinforce the active research landscape and demonstrate that there are significant opportunities for advancement, particularly in the areas of improving patient outcomes and reducing the morbidity associated with comb burns.¹⁸ This evolving field encourages both basic and applied research, indicating a promising path for future discoveries and improvements in care.

CONCLUSION

The bibliometric analysis of comb burn research offers valuable insights into the evolution, current state, and future directions of the field. This study underscores several key points that can guide future research and enhance the overall understanding and treatment of burn injuries.

Bibliometric analysis serves as a powerful tool to map the research landscape, identify trends, and highlight influential contributions in a specific field. By systematically analyzing publication trends, author contributions, journal impact, and research networks, this study provides a comprehensive overview of the development and progression of comb burn research. The ability to visualize these trends and collaborations helps to pinpoint areas of strength and identify gaps that need addressing, thus guiding future research efforts.

To further advance the field of comb burn research, it is crucial to address the identified gaps and challenges. Standardizing methodologies, particularly in the application of the comb burn model, will enhance the reliability of research findings. Continued international collaboration and integration of diverse expertise will drive progress and innovation. Additionally, refining animal models to better replicate human burn injuries will improve the translational potential of research, leading to more effective treatments and improved patient care.

In conclusion, this bibliometric analysis provides a comprehensive overview of comb burn research, highlighting

key trends, influential contributions, and areas for improvement. By leveraging these insights, researchers and practitioners can guide future efforts to better understand and treat burn injuries, ultimately enhancing patient outcomes.

ETHICAL DECLARATIONS

Ethics Committee Approval

There are no ethical approval was required for this bibliometric analysis.

Informed Consent

There are no ethical approval was required for this bibliometric analysis.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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

Author Contributions









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

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Comparison of resected lymph nodes and additional factors in colorectal cancer patients undergoing emergency versus elective surgery

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ABSTRACT

Aims: Controversy persists regarding the number of lymph nodes (LNs) that should be removed during surgery for accurate colorectal carcinoma (CRC) staging and its impact on prognosis. The effects of other prognostic factors on survival, such as the metastatic LN to resected LN (LNR) ratio and the type of surgical approach, were retrospectively examined.

Methods: A total of 325 patients who underwent emergency or elective surgery for CRC between March 1st, 2019, and December 31st, 2022, were included in the study. Age, sex, tumor location, stage, number of resected LNs, number of metastatic LNs, presence of distant metastases, distance of the tumor from the surgical margins, need for ostomy opening, development of postoperative complications, and level of tumor markers at diagnosis were recorded for patient records.

Results: The data of 142 (43.7%) emergency surgery patients and 183 (56.3%) elective surgery patients were compared. It was revealed that there was a positive relationship between the removal of at least 22 LNs during surgery and survival ($p=0.036$). Factors such as age, a high LNR, emergency surgery, advanced stage of CRC, and not receiving adjuvant chemotherapy were significant predictors of increased mortality (age: hazard ratio (HR): 1.03, 95% CI: 1.01-1.05, $p<0.001$; LNR: HR: 4.74, 95% CI: 1.69-13.3, $p=0.003$; emergency surgery: HR: 2.33, 95% CI: 1.51-3.59, $p<0.001$; advanced stage: HR: 3.24, 95% CI: 1.81-5.79, $p<0.001$; adjuvant chemotherapy: HR: 4.93, 95% CI: 2.94-8.25, $p<0.001$) in the patients with CRC.

Conclusion: Patients with CRC, who had fewer LN dissections, perforation-related peritonitis, advanced disease, were not receiving adjuvant chemotherapy, and emergency surgery, had a worse prognosis.

Keywords: Colorectal cancer, lymph node, ratio, prognosis, survival, surgery

INTRODUCTION

In staging colorectal carcinoma (CRC), the optimal number of lymph nodes (LNs) to be examined is still debatable. Although the guidelines suggest a minimum of 12 LN resections for staging, it is recommended that as many LNs as possible be harvested.¹ In all of the histologic staging methods, LN metastases are crucial for staging colorectal tumors.^{2,3} Due to the unreliability of the data, current staging systems still need to be improved, with disease recurrence occurring in approximately 20%-25% of patients without proven LN metastases.⁴ The most critical factors determining the number of LNs removed in colorectal cancer surgery are the operating surgeon and the pathologist who examines the specimen.⁵ Studies performed on patients with stage II tumors have shown that the more LNs dissected, the easier it is to identify the LN-negative patient group.⁶ The metastatic LN to dissected LN ratio (LNR) is another factor associated with prognosis.⁷ The number of LNs reported in the pathology report is influenced by the type of surgery (such as left or

right hemicolectomy) and pathological examination (such as the pathologist's experience and interest). In addition, the location and number of tumors the patient has and the types of tumors are other factors that affect the number of LNs removed.⁸ The number of LNs removed is related to the tumor stage, tumor size, and tumor location in the colon.⁹ In CRC patients, it is recommended that at least 15 LNs be removed to identify positive LNs and determine an accurate stage of the disease. In metastatic patients, at least 21 LNs should be removed.^{10,11} Some researchers have emphasized that extensive LN dissection may provide better local-regional control, eliminate undetectable lesions, and possibly, prolong survival.^{12,13} However, another study suggested that extensive LN dissection may increase the risk of postoperative comorbidity without improving survival.¹⁴ Nowadays, discussions about the number of dissected LNs, the LNR, and their impact on prognosis continue. In this study, the relationship between the number of resected LNs, metastatic

LN, and the LNR with prognosis was investigated in patients who underwent emergency and elective surgery due to CRC. Our secondary aims were to investigate the effects of patient age, the ratio of metastatic lymph nodes to the total lymph nodes removed, the stage of the disease, and chemotherapy on survival, which we believe are effective on prognosis in the early period after CRC surgery.

METHODS

The study was initiated after approval by the Ankara Bilkent City Hospital No 1 Clinical Researches Ethics Committee (Date: 26.04.2023, Decision No: E1-23-3492). Our study was conducted in accordance with the Declaration of Helsinki. A total of 406 patients aged 18 years and older who underwent emergency or elective surgery for CRC at the Department of General Surgery between March 1st, 2019, and December 31st, 2022, were enrolled in the study. 81 patients who did not meet the study inclusion criteria were excluded from the study. The patients' records were retrospectively reviewed. It was found that 142 patients with CRC had undergone emergency surgery. These patients were included in the study. The control group included 183 CRC patients who had undergone elective surgery by surgeons participating in the study. The length of hospital stay (LOHS), postoperative follow-up duration, and patients' survival during follow-up were recorded. The age, sex, location, stage of CRC, number of LNs removed during surgery, number of metastatic LNs, presence of distant metastases, distance of the tumor from the surgical margins, placement of colostomies, development of postoperative complications, and level of tumor markers at the time of diagnosis were extracted from the patients' records and recorded.

In our hospital, CRC surgeries are performed as complete mesocolic excision (CME) and total mesorectal excision (TME) in every possible case. This also applies to patients undergoing emergency surgery. However, in certain emergency cases, performing CME and TME is impossible. This study retrospectively examined the factors affecting the prognosis of CRC patients who underwent emergency and elective surgery.

Statistical Analysis

IBM SPSS Statistics for Windows 25.0 (IBM Corp., Armonk, NY, USA) was used for the statistical analyses. Descriptive statistics, including frequencies and percentages, were obtained for the categorical variables. Normal distribution of the data between groups was analyzed using the Kolmogorov-Smirnov test. The Chi-squared test was used for analysis of the categorical variables. The significance of differences between groups for noncategorical variables was assessed with the Mann-Whitney U test. To determine the minimum number of LNs that must be removed to make a significant contribution to survival, a receiver operating characteristic (ROC) curve was constructed to determine the cut-off value. The Kaplan-Meier method was used to calculate the mean survival. Cox proportional hazard regression analysis was performed to estimate hazard ratios (HRs) for CRC-specific mortality. Results were considered statistically significant at $p < 0.05$.

RESULTS

The study included 325 patients, of whom 142 (43.7%) underwent emergency surgery and 183 (56.3%) underwent elective surgery for CRC. The mean age of the emergency surgery patients was 67.99 ± 13.22 years, while it was 65.48 ± 12.41 years for the elective surgery patients ($p = 0.103$). Of the CRC surgery patients, 202 (62.2%) were male and 123 (37.8%) were female. The median follow-up time of the emergency surgery patients was 19.5 months (interquartile range (IQR) 25: 4, IQR 75: 30), and that of the elective surgery patients was 27 months (IQR 25: 21, IQR 75: 42). The follow-up period of the emergency surgery patients was significantly shorter due to higher mortality [(34/183) 18.6% vs (57/142) 40.1%] ($p < 0.001$). The tumor localization and surgical operations performed in the patients with CRC who were operated on under emergency and elective conditions are shown in Table 1.

Table 1. Tumor localization and surgical operations performed in the CRC patients operated on under emergency and elective conditions

Tumor localization	Type of surgery	
	Elective [n (%)]	Emergency [n (%)]
Rectum+sigmoid	25 (13.7)	30 (21.1)
Right colon	126 (68.85)	85 (59.9)
Left colon	29 (15.8)	25 (17.6)
Transverse colon	1 (0.55)	1 (0.7)
Other	2 (1.1)	1 (0.7)
The surgery performed		
Sigmoid resection	13 (7.1)	19 (13.4)
Anterior resection	1 (0.55)	8 (5.6)
Low anterior resection	9 (4.9)	2 (1.4)
Abdominoperineal resection	2 (1.1)	1 (0.7)
Left hemicolectomy	27 (14.8)	24 (16.9)
Right hemicolectomy	115 (62.8)	83 (58.4)
Transverse colectomy	1 (0.55)	1 (0.7)
Subtotal colectomy	11 (6)	3 (2.1)
Other	4 (2.2)	1 (0.7)
TNM stage		
Stage I	11 (6)	5 (3.5)
Stage II	75 (41)	46 (32.4)
Stage III	74 (40)	61 (43)
Stage IV	23 (13)	30 (21.1)
Distribution of patients who died according to colectomy		
Right hemicolectomy	22 (64.7)	32 (56)
Left hemicolectomy	5 (14.7)	12 (21)
Rectum and sigmoid colon resection	5 (14.7)	9 (16)
Other	2 (5.9)	4 (7)

n: Number of patients, %: Percentage, CRC: Colorectal carcinoma, TNM: Tumor size (T), lymph node involvement (N) and distant metastasis (M)

The median number of resected LNs was 19 (IQR 25: 13, IQR 75: 28,5) in the emergency patients and 21 (IQR 25: 16, IQR 75: 29) in the elective patients. The median number of metastatic LNs was 1 (IQR 25: 0, IQR 75: 4) in the emergency patients and 0 (IQR 25: 0, IQR 75: 3) in the elective patients. Only 4 of the patients were given neoadjuvant chemotherapy,

3 of whom were in the elective surgery group and 1 of whom underwent emergency surgery because colon perforation developed while receiving chemotherapy. The elective surgery patients had a significantly higher number of LN dissections of 12 or more than the emergency surgery patients (p=0.017) in Table 2.

There were no significant differences between the groups regarding LN metastasis and the development of postoperative complications (p=0.515 and p=0.129, respectively). However, patients with CRC who underwent emergency surgery had a

significantly higher rate of distant organ metastasis (p=0.007). A significantly higher rate of ostomy opening was observed in the emergency surgery patients than the elective surgery patients (p<0.001). Evaluation of the disease stage revealed that the emergency surgery patients were at a more advanced stage (p=0.045). The mortality rate was significantly higher in the emergency surgery patients (Kaplan-Meier test value: 21.648, log rank p<0.001). Emergency surgical intervention, LN metastasis, bowel perforation, need for ostomy, and advanced disease increased mortality, removal of 22 or more LNs, and administration of adjuvant chemotherapy

Table 2. Comparison of selected parameters in patients undergoing emergency and elective surgery

			Type of surgery		p value
			Elective	Emergency	
Ostomy opening	No	n	159	66	<0.001
		%	70.7	29.3	
	Yes	n	24	76	
		%	24	76	
Distant organ metastasis	No	n	158	106	0.007
		%	59.8	40.2	
	Yes	n	25	36	
		%	41	59	
Lymph node metastasis	No	n	91	67	0.515
		%	57.6	42.4	
	Yes	n	88	75	
		%	54	46	
Postoperative complication	No	n	175	130	0.129
		%	57.4	42.6	
	Yes	n	8	12	
		%	40	60	
Number of LNs removed	<12	n	16	25	0.017
		%	39	61	
	≥12	n	167	117	
		%	58.8	41.2	
Colectomy	Right hemicolectomy	n	128	86	0.077
		%	59.8	40.2	
	Other	n	55	56	
		%	49.5	50.5	
Stage of the disease	Early stage	n	86	51	0.045
		%	62.8	37.2	
	Advanced stage	n	97	91	
		%	51.6	48.4	
Adjuvant chemotherapy	No	n	89	72	0.711
		%	55.3	44.7	
	Yes	n	94	70	
		%	57.3	42.7	
Overall survival	Alive	n	149	85	<0.001*
		%	63.7	36.3	
	Died	n	34	57	
		%	37.4	62.6	
Total	n	183	142		
	%	56.3	43.7		

Pearson Chi-square test was used, *Kaplan-Meier test used, n= Number of patients, LNs: Lymph nodes

were significantly associated with a decrease in mortality ($p < 0.001$, $p = 0.003$, $p = 0.005$, $p < 0.001$, $p < 0.001$, $p = 0.036$, and $p < 0.001$, respectively) in Table 3. Tumor markers (CEA, CA19-9) in the preoperative blood samples were significantly higher in the emergency surgery patients compared to the elective surgery patients ($p < 0.001$ and $p < 0.001$, respectively). There was no significant difference between the emergency and elective surgery patients in terms of the distance of the tumor to the proximal and distal resection margins ($p = 0.339$ and $p = 0.239$, respectively). When considering survival, the number of LNs removed was significantly higher, and the LNR value was considerably lower in the surviving patients ($p = 0.047$ and $p < 0.001$, respectively) in Table 4. The ROC curve analysis showed that the removal of at least 22 LNs was significantly positively associated with survival [area under the ROC curve (AUC): 59.4%]. The sensitivity of removing at least 22 LNs to predict better survival was 78.8% and the specificity was 65.9%. The LOHS was extended for the

elective surgery patients ($p = 0.002$). The median LOHS for the elective surgery patients was 11 days (IQR 25: 8, IQR 75: 15), while for the emergency surgery patients, it was 9 days (IQR 25: 6, IQR 75: 15). This difference was attributed to the higher early postoperative mortality in the emergency surgery patients and the hospital admission of the elective surgery patients during the preoperative preparation phase. When multivariate Cox regression analysis was performed to determine the factors affecting mortality in the CRC patients, it was determined that increasing age, having surgery under emergency conditions, advanced stage of the disease in Figure, and a high LNR increased mortality, while receiving adjuvant chemotherapy decreased mortality (age: HR: 1.03, 95% CI: 1.01-1.05, $p < 0.001$; LNR: HR: 4.74, 95% CI: 1.69-13.3, $p = 0.003$; emergency surgery: HR: 2.33, 95% CI: 1.51-3.59, $p < 0.001$ advanced stage: HR: 3.24, 95% CI: 1.81-5.79, $p < 0.001$; adjuvant chemotherapy: HR: 4.93, 95% CI: 2.94-8.25, $p < 0.001$) in Table 5.

Table 3. Distribution of the data based on whether the patients survived or not

		n	Survival		p value
			Alive	Died	
Surgery	Emergency operation	n	85	57	<0.001
		%	59.9	40.1	
	Elective operation	n	149	34	
		%	81.4	18.6	
Perforation	No	n	221	77	0.005
		%	74.2	25.8	
	Yes	n	13	14	
		%	48.1	51.9	
Ostomy	No	n	184	41	<0.001
		%	81.8	18.2	
	Yes	n	50	50	
		%	50	50	
LN metastasis	No	n	129	32	0.003
		%	80.1	19.9	
	Yes	n	105	59	
		%	61	39	
Number of LNs removed	<12	n	25	16	0.271
		%	68.3	31.7	
	≥12	n	209	75	
		%	73.6	26.4	
Number of LNs removed	<22	n	119	60	0.036
		%	66.5	33.5	
	≥22	n	115	31	
		%	78.8	21.2	
Adjuvant chemotherapy	No	n	91	70	<0.001
		%	56.5	43.5	
	Yes	n	143	21	
		%	87.2	12.8	
Stage of the disease	Early	n	117	20	<0.001
		%	85.4	14.6	
	Advanced	n	117	71	
		%	62.2	37.8	
Total	n	234	91		
	%	72	28		

Kaplan-Meier test used, n= Number of patients, LN= Lymph node, LNs: Lymph nodes

Table 4. Impact of the LN count and LNR on overall survival in the CRC patients

Survival	n (%)	Mean rank	p value
Number of LNs removed	Alive 234 (72)	171.53	0.047
	Died 91 (28)	141.07	
LNR	Alive 234 (72)	147.37	<0.001
	Died 91 (28)	203.19	
CEA	Alive 234 (72)	136.71	<0.001
	Died 91 (28)	230.60	
CA 19.9	Alive 234 (72)	146.37	<0.001
	Died 91 (28)	205.77	

Kaplan-Meier test was used, n= Number of patients, LN= Lymph node, LNR= The ratio of metastatic lymph nodes to the number of dissected lymph nodes, CRC: Colorectal carcinoma, LNs: Lymph nodes, CEA, CA19-9: Tumor markers

Table 5. Analysis of the factors influencing the HR in the CRC patients

	HR	95.0% CI for exp (B)		p value
		Lower	Upper	
Age	1.03	1.01	1.05	<0.001
LNR	4.74	1.69	13.3	0.003
Emergency/elective	2.33	1.51	3.59	<0.001
Early/advanced	3.24	1.81	5.79	<0.001
Adjuvant chemotherapy	4.93	2.94	8.25	<0.001

The Cox regression test was used. X =144.890, $p < 0.001$, HR= Hazard ratio, CRC: Colorectal carcinoma, LNR= The ratio of metastatic lymph nodes to the number of dissected lymph nodes

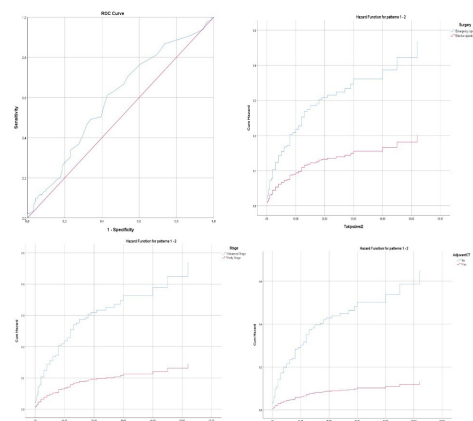


Figure. Flow chart of exclusion criteria

DISCUSSION

The primary results of this study were that although our clinic pays attention to performing CME and TME in every possible CRC patient, the number of LNs removed in patients undergoing emergency surgery remains low. Mortality was higher in the emergency surgery patients, especially in those with tumor perforation and extensive peritonitis. The secondary results of this study were that factors such as advanced age, urgent surgical intervention, a high LNR rate, not receiving adjuvant chemotherapy, and advanced disease were the main determinants of increased mortality in patients with CRC.

Nelson et al.¹⁵ reported that LN positivity could be accurately determined in 80%-90% of patients by examining 12 LNs. Feng et al.¹⁶ suggested that the optimal number of LNs to examine for prognostic classification in LN-negative colon cancer should be 15. Wu et al.¹⁷ reported that resecting at least 20 LNs in patients with right-sided colon tumors was superior to the recommended minimum of 12 LN resections for accurate staging, and that performing less than 20 LN resections was a poor prognostic indicator. On the other hand, Lee et al.¹⁸ reported that having a minimum of 22 resected LNs in right-sided colon tumors improved overall survival. In their recent study, Hayes et al.¹⁹ reported that resecting more LNs in LN-negative patients improved overall survival but did not have a significant association with increased overall survival in the presence of LN metastasis. Lacy et al.²⁰ reported that optimal oncological surgery for middle and lower rectal cancers, performing TME to ensure removal of the tumor and locoregional LNs, was directly linked to local recurrence and survival outcomes. Benz et al.²¹ reported that complete mesocolon excision had no general benefit in stage I and II right-sided colon cancers and that overall survival was better in stage III disease. In contrast to researchers advocating for increased LN resection, Li Destri et al.²² suggested that the immune status of patients could be adversely affected by an increase in the number of excised LNs and that increasing the number of excised LNs may be ineffective in improving survival in patients with metastasis. The current study showed that the overall survival rate was positively affected in patients who had 22 or more LNs removed. This may indicate that more LN dissection has a positive effect on prognosis, and it also shows that it is possible to perform more LN dissections due to the early stage of the disease. In addition, an urgent need for surgery arises in advanced-stage tumors due to obstruction and perforation. Distension and inflammation in the intestines of these patients complicate LN dissection. Particularly in stage III CRC patients, it has been reported that using the LNR instead of the number of resected LNs provides a better prognosis.²² The present study found that patients with a low LNR had a higher survival rate, and a significant relationship was found between the LNR and prognosis.

The incidence of colon perforation in patients undergoing emergency surgery ranges from 18.6% to 28.4%.^{23,24} These patients have a lower survival rate, a higher need for ostomy, and higher rates of recurrence and distant organ metastasis.^{24,25} In patients who undergo surgery for colon perforation, the presence of local recurrence and distant metastasis are higher than in those who undergo surgery for obstruction, while disease-free survival is lower.²⁵

Perforated CRC cases are often associated with fewer resected LNs than in patients with obstructive disease.^{25,26} Patients undergoing surgery due to colon perforation experience more postoperative complications and extended LOHS in the intensive care unit than those operated on for obstruction.²⁷ In this study, patients with unresectable tumors in the colon or rectum who only had an ostomy were excluded from the study. The ostomy of the patients included in the study was in the form of a diverting ostomy or a Hartmann procedure. Most of these patients had colon perforation and widespread peritonitis. Patients who underwent surgery due to colorectal cancer perforation had fewer lymph node resections and had poorer survival rates.

While planning this study, we planned to investigate the factors affecting early survival of CRC patients who underwent emergency and elective surgery. Colon cancer and rectal cancer are conditions that require different approaches. For this reason, we tried to equalize the tumor locations of the patients we included in the study in both groups as much as possible. However, the fact that patients with colon and rectal cancer were evaluated together was a limiting factor of the study.

Advanced age, female gender, emergency surgery, less than 12 resected lymph nodes, and advanced stage of CRC are negative prognostic factors. However, postoperative adjuvant chemotherapy has been shown to improve overall survival.^{28,29}

In patients with colon cancer with clinical findings, advanced age, emergency surgery, advanced LN stage (N1, N2), the presence of vascular invasion, and neglect of adjuvant chemotherapy are poor prognostic factors.^{30,31} In the current study, it was observed that adjuvant chemotherapy reduced local recurrence and increased overall survival because the number of patients who received neoadjuvant chemotherapy was small and the number of patients who received adjuvant chemotherapy was almost equal in patients who underwent emergency and elective surgery.

CEA and CA 19-9 are important factors that indicate the prognosis of CRC patients.³² Additionally, elevated CA 19-9 levels before surgery are associated with a higher likelihood of postoperative recurrence.³³ In our study, tumor marker levels of CEA and CA 19-9 were found to be significantly higher in patients undergoing emergency surgery than in patients undergoing elective surgery. In addition, it was shown that among all patients, those with high CEA and CA19-9 levels had poorer survival.

The risk of death increases with advancing age in CRC patients. Patients aged 60 and above have the highest mortality risk.³⁴ Increased mortality risk in elderly CRC patients is influenced by comorbidities, malnutrition, low quality of life, and decreased tolerance to treatment.^{35,36}

Since our hospital is a training and research hospital located in the capital, it receives a lot of referrals. For this reason, the number of patients with CRC who are operated on is very high.

Limitations

The weak aspect of the study is its retrospective design, which relies on existing data and may be subject to limitations inherent in such studies. Another weakness is that it is a single-center study. Despite the short patient follow-up

period, CRC patient data showed that the patient's age, emergency surgery, high LNR, advanced stage of the tumor, and failure to give adjuvant chemotherapy were negative prognostic factors. In addition, the vital element of this study was that it was conducted in a center with well-maintained patient records, allowing for easy access to data. This strengthened the reliability and accuracy of the information gathered for analysis.

CONCLUSION

Patients with CRC are taken in to emergency surgery because of obstruction and perforation. Patients who are born to emergency operations usually have more advanced diseases. Inflammation, peritonitis, and adhesions due to intestinal perforation make LN dissection difficult. Increasing the number of resected LNs in patients with CRC may positively affect survival. Other studies are needed to see the effects of more than 22 LN dissections on long-term mortality. Although attention is paid to performing surgery by oncological principles in our clinic, the number of LNs removed in emergency surgical operations remains low compared to that in elective surgeries due to the conditions of the surgery and advanced disease. In conclusion, factors such as advanced age, emergency surgery, high LNR rate, not receiving adjuvant chemotherapy, and advanced disease are essential determinants of increased mortality in patients with CRC.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Ankara Bilkent City Hospital No 1 Clinical Researches Ethics Committee (Date: 26.04.2023, Decision No: E1-23-3492).

Informed Consent

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

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

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

Data access

The metadata for this research are available on the Zenodo site, which has a Creative Commons license-transportation link: 10.5281/zenodo.8002151.

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Incidental gynecologic cancers who underwent surgery for pelvic organ prolapse

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ABSTRACT

Aims: Despite symptom inquiry and preoperative sampling are performed for endometrial, cervix and ovarian pathologies in the preoperative evaluation, it is not clear whether cancer will be detected in the surgical specimen of an asymptomatic patient for pelvic organ prolapse surgery. In our study, we aimed to investigate the incidental cancer rates in patients who underwent vaginal or abdominal surgery due to pelvic organ prolapse.

Methods: In this retrospective study, all patients who underwent surgery for pelvic organ prolapse at SBÜ İstanbul Training and Research Hospital between 2019 and 2023 were included in the study. Patients who had diagnosis of cancer were preoperatively excluded from the study. Preoperative transvaginal ultrasound was made for all patients using sonography by 5 MHz probe, (Voluson E8, GE Healthcare, Milwaukee, WI) or MRI. Accompanying endometrial, myometrial and adnexial pathologies were recorded. Routine endometrial thickness at preoperative evaluation was saved. Type of the surgery for pelvic organ prolapse, complications and final pathology reports were recorded.

Results: 107 patients had surgery due to pelvic organ prolapse between 2019 and 2023. Mean endometrial thickness before surgery was 4.72 ± 4.27 mm. After surgery, all of the hysterectomy±salpingooferectomy specimen sent to pathology. In our study there was a statistical difference between preoperative and postoperative diagnosis of endometrial polyps as $p: 0.0001$. Due to the fact that Pipelle is more effective in postmenopausal patients, the false-negative rate of office endometrial sampling, and that the main evaluation should be endometrial sampling accompanied by hysteroscopy. We did not evaluate endometrium by hysteroscopy preoperatively, so endometrial polyps can be found incidentally. In our study there was no incidental diagnosis of cancer.

Conclusion: Despite the risk of incidental cancer detection is different and controversial in the literature, it was ultimately decided to send the hysterectomy material for routine pathological examination.

Keywords: Cervical neoplasia, endometrial cancer, hysterectomy, pelvic organ prolapse, preinvasive lesion

INTRODUCTION

Pelvic organ prolapse (POP), the herniation of the pelvic organs to or beyond the vaginal walls, is a common condition. Women with prolapse experience symptoms of mass, gas discharge, urinary incontinence symptoms that impact daily activities, sexual function, and exercise. The presence of POP can have a detrimental impact on body image and sexuality.¹

Treatment of POP requires significant health care resources; the annual cost of ambulatory care of pelvic floor disorders in the United States from 2005 to 2006 was almost \$300 million² and surgical repair of prolapse is increasing day by day due to the aging.^{3,4}

However, in addition to pelvic organ prolapse, which increases with age, there are also gynecological cancers that increase with age.⁵

Although symptom inquiry and preoperative sampling are performed for endometrial, cervix and ovarian pathologies in the preoperative evaluation, it is not clear whether cancer will be detected in the surgical specimen of an asymptomatic patient.

The median age at uterine cancer diagnosis is 63 years, with approximately 79% of all uterine cancers being diagnosed in women aged 55 years and older.⁶ Further, a study⁷ showed that the risk of uterine cancer increases >8-fold between the ages of 45 and 75 years.

20% of cervical cancer seems after 65 years of age and also ovarian cancer incidence increases between 35-64 age.⁸

In a meta-analysis, 1 out of 77 and 250 women had incidentally diagnosis of cervical and endometrium cancer



after POP surgery respectively.⁹ It was concluded that this is due to the fact that Pipelle is more effective in postmenopausal patients, the false-negative rate of office endometrial sampling, and that the main evaluation should be endometrial sampling accompanied by hysteroscopy. Although the risk of incidental cancer detection is different and controversial in the literature, it was ultimately decided to send the hysterectomy material for routine pathological examination.⁹

In our study, we aimed to investigate the incidental cancer rates in patients who underwent vaginal or abdominal surgery due to pelvic organ prolapse.

METHODS

Approval for this study was obtained from SBÜ İstanbul Training and Research Hospital Clinical Researches Ethics Committee (Date 13.10.2023, Decision No. 277). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

In this retrospective study, all patients who underwent surgery for pelvic organ prolapse at SBÜ İstanbul Training and Research Hospital between 2019 and 2023 were included in the study. Patients who had diagnosis of cancer were preoperatively excluded from the study. Patients's age, parity, number of vaginal births, having symptoms of pelvic organ prolapse as palpating mass from vulvar region, urinary incontinence, fecal incontinence were recorded. Medical illness, smoking and menopausal status, family history of gynecological cancers were also recorded. Preoperative transvaginal ultrasound were made for all patients using sonography by 5 MHz probe, (Voluson E8, GE Healthcare, Milwaukee, WI) or MRI. Accompanying endometrial, myometrial and adnexial pathologies were recorded. Routine endometrial thickness at preoperative evaluation was saved. Type of the surgery for pelvic organ prolapse, complications and final pathology reports were recorded.

The Statistical Package for Social Sciences (IBM SPSS Statistics for Windows, Version 22.0, IBM Corp., Armonk, NY, USA) was used for statistical analyses. The normality of distribution was assessed using the Kolmogorov-Smirnov test. Mean or median values were used to describe normally distributed data, while categorical data were presented as percentages. The Chi-square and Fisher exact tests were used for categorical data, and a t-test was used to determine two independent means. The significance level for all tests was set at $p < 0.05$.

RESULTS

107 patients had surgery due to pelvic organ prolapse between 2019 and 2023. 98.1% of patients were symptomatic; 64.5% had palpating mass, vaginal bleeding in 8.4%, urinary incontinence in 25.2% of patients. None of the patients had neither fecal incontinence nor difficulty in coitus. Demographic characteristics were mentioned in Table 1.

None of the patients had history of endometrium, ovarian, cervical cancers. One patient (0.9%) and one patient (0.9%) had history of vaginal and breast cancer respectively. 2.8% of patients had family history of cancers as; 0.9% of endometrial and 2.9% breast.

Table 1. Demographic data of patients in this study

	Number (n)	Percentage (%)	Total number (n)
Hypertension	35	32.7	107
Diabetes	19	17.8	107
COPD*	4	3.7	107
Chronic renal insufficiency	0	0	107
Smoking	9	8.4	107
Menopausal patient	86	80.4	107
Mean±SD (range)			
Age (years)	59.23±9.49		
Parity	3.65±1.79		
Number of vaginal births	3.56±1.79		
Menopausal age	48.36±5.26		
*COPD: Chronic obstructive pulmonary disease, SD: Standard deviation			

In addition, during preoperative evaluation, 71% of patients had endometrial sampling; 68.2% of total patients' pathology report was normal. 105 out of 107 patients had hysterectomy via vaginal, total abdominal and total laparoscopic routes. Operation types were showed in Figure.

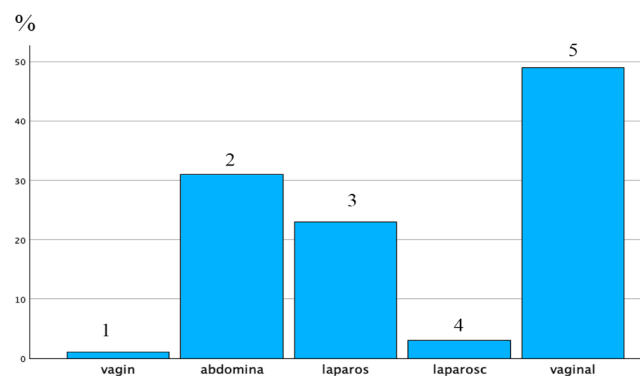


Figure. Operation types in pelvic organ prolapse. 1. Vaginal hysterectomy, 2. Total abdominal hysterectomy + bilateral salpingooferectiony + uterosacral ligament plication, colporaphy posterior, 3. Total laparoscopic hysterectomy + bilateral salpingooferectiony, uterosacral ligament plication, colporaphy posterior, 4. Laparoscopic sacrocolpopexy, 5. Vaginal hysterectomy + bilateral salpingooferectiony, McCall culdoplasty, colporaphy posterior

Mean endometrial thickness before surgery was 4.72 ± 4.27 mm. After surgery, all of the hysterectomy ± salpingooferectiony specimen sent to pathology. Comparing all preoperative and postoperative all pathology reports were mentioned in Table 2. In our study there was no incidental diagnosis of cancer. In our study preinvasive cervical lesions were found to be 4.7%. In addition, in our country owing to our cervical cancer screening program made by Ministry of Health, our occult cervical cancer rate is zero, and there was no statistical difference between preoperative and postoperative cervical pathology reports ($p: 0.26$). In our study there was a statistical difference between preoperative and postoperative diagnosis of endometrial polyps as $p: 0.0001$.

DISCUSSION

As aging, the number of patients with pelvic organ prolapse will increase, as will the number of those undergoing surgery. In addition, we know that the risk of cancer increases with age. So, if the patient has cancer without realizing it, can we

Table 2. Preoperative and postoperative pathology reports of organs

	Preoperative (%)	Postoperative (%)	p
Cervix			
Normal pathology	97.2	95.3	0.26
Preinvasive lesion	2.8	4.7	
Cancer	0	0	
Endometrium			
Normal pathology	97.2	74.8	0.001*
Endometrial polyp	2.8	22.4	
Endometrial hyperplasia	0	2.8	
Cancer	0	0	

Due to not having an screening test for ovarian mass, it was not included. * p is significant if <0.05

miss it during surgery? We evaluated this in our study and investigated the frequency of incidental cancer diagnosis in patients with pelvic organ prolapse.

In our study there was no incidental diagnosis of cancer. In a meta-analysis, the occurrence of occult (incidental) cancer diagnosis was mentioned as 1/77 for cervical, 1/250 for endometrial cancer.⁹ In this meta-analysis and literature, the studies had heterogeneity. Studies with low populations had negative results for cancer as our study. Our study had included 107 patients. In this meta-analysis it was thought and decided that as screening programs for cervical cancer and human papillomavirus vaccine the incidence will be lower.

In Elbia et al. study,¹⁰ the prevalence of preinvasive lesions as CIN for cervical cancers found to be highest in the literature as 33.75%. Despite this data in this country (Kuwait) did not have national cervical cancer screening program, so this data cannot be generalized. In our study preinvasive cervical lesions were found to be 4.7%. In addition, in our country owing to our cervical cancer screening program made by Ministry of Health, our occult cervical cancer rate is zero, and there was no statistical difference between preoperative and postoperative cervical pathology reports (p: 0.26).

Knowing that uterine cancer peaks after the age of 55, the reason we did not catch it since it was the average age of 59.23±9.49 in our study can be explained by this. Since the average number of births in our patients was high as 3.56±1.79, hysterectomy was performed due to pelvic organ prolapse before the age of cancer increased.

In a meta-analysis, correlation between endometrial thickness and endometrial cancer and optimizing the threshold for endometrial thickness was not found due to the heterogeneity of studies.¹¹ In our study, there was no statistical relationship between menopausal or pre-menopausal endometrial thickness and endometrial cancer.

In our study there was a statistical difference between preoperative and postoperative diagnosis of endometrial polyps as p: 0.0001. Since Pipelle is more effective in postmenopausal patients, the false-negative rate of office endometrial sampling, and that the main evaluation should be endometrial sampling accompanied by hysteroscopy. We did not evaluate endometrium by hysteroscopy preoperatively, so endometrial polyps can be found incidentally.

In the literature, endometrial polyps with obesity are risk factors for endometrial cancer.^{12,13} Similarly, hypertension was examined as an independent risk factor of malignancy

within endometrial polyps.¹⁴ The correlation between diabetes mellitus and malignancy within endometrial polyps has been explored by several authors.¹⁵ Although incidental cancer was not found, risky lesions like endometrial polyps were caught and prevented.

Limitations

A single center, small number of patients and especially younger for the mean age of gynecologic malignancies, it is not enough to use the data to the general.

CONCLUSION

Although the risk of incidental cancer detection is different and controversial in the literature, it was ultimately decided to send the hysterectomy material for routine pathological examination.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of SBÜ İstanbul Training and Research Hospital Clinical Researches Ethics Committee (Date 13.10.2023, Decision No. 277).

Informed Consent

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

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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

Author Contributions

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

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Atypically located lipomas in the head and neck region: two case reports and a review of the literature

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Dear Editor,

Since lipomas seen in the head and neck region are quite rare, treatment approaches are also important. Lipomas are the most frequently encountered benign tumors and can develop anywhere in the body that contains fatty tissue. They consist of mature fat cells and are generally enclosed within a capsule. Histologically, they are categorized as diffuse lipoma, fibrolipoma, osteolipoma, angioliipoma, spindle cell lipoma, myelolipoma, and chondroid lipoma.¹ In some case reports, it has been stated that lipomas can undergo malignant transformation, although very rarely, and studies are ongoing to suggest that this may be a sequential process.²

Approximately 13% of all lipomas are seen in the head and neck region.³ These are most commonly located in the posterior cervical region of the head and neck. The majority of lipomas are smooth surface, painless, asymptomatic masses immediately beneath the skin. Lipomas located in the upper aerodigestive tract can cause symptoms such as dysphagia, odynophagia, voice restriction, dyspnea, and a foreign body sensation in the throat.⁴ Retropharyngeal space lipomas may not be identified until they achieve a large size and become symptomatic. Buccal space lipomas may be overlooked until they cause swelling and asymmetry in the face. Imaging methods can be used in diagnosis, thus also excluding other potential pathologies. The treatment of symptom-producing lipomas is surgery. Cases of retropharyngeal and buccal space lipomas in the literature are limited. We present two distinct cases of lipoma, one retropharyngeal and one buccal, treated with intraoral surgery.

Our first patient, a 78-year-old male, applied to our clinic with complaints of increasing feeling of obstruction and dysphagia while eating for the last two years. He experienced no pronounced symptom with liquid foods, but reported difficulty in swallowing solids. In addition, he reported a constant sensation of an object in his throat and a need to swallow. He described no voice limitation or dyspnea. Oropharyngeal examination revealed a well-circumscribed mass protruding into the lumen and covered in intact mucosa. Magnetic resonance imaging (MRI) of the neck was

performed with a preliminary diagnosis of a retropharyngeal mass (Figure 1). The MRI report described an image compatible with probable lipoma with smooth borders, approximately 49*18 mm in size, with left-side predominance, beginning from the level of the hard palate and extending to the upper end of the epiglottis, located between C2 and C6 in the pharyngeal region. The mass was also reported to exhibit close contiguity to the vertebral artery close to the left neural foramen at the C2 level. The lipoma in the retropharyngeal region was totally excised intraorally with the patient under general anesthesia (Figure 2). No postoperative complications were observed. The pathology report identified the mass as a lipoma, and no recurrence was observed at annual postoperative follow-ups.

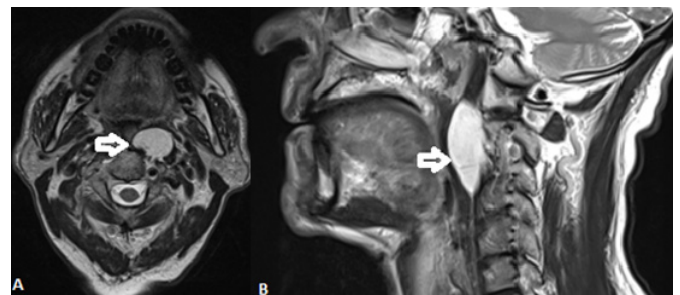


Figure 1. MRI images of the retropharyngeal space lipoma in the axial (A) and sagittal (B) planes, and its relationship with neighboring structures

MRI: Magnetic resonance imaging



Figure 2. Intraoperative excision of the retropharyngeal space lipoma (A) and its postoperative appearance (B)

Our second patient, a 51-year-old male, applied with the complaint of a growing mass in the left buccal region that had been present for three years. His history was unremarkable. Examination revealed a palpable, painless mass with a smooth surface and a soft consistency causing facial asymmetry, beginning from the left buccal region and extending to the preauricular area. With-contrast facial MRI was performed. The report described a well-circumscribed, 42x34 mm space-occupying structure (lipoma?) exhibiting a fat signal in the anterior of the left masseter muscle (Figure 3). The patient was operated on under general anesthesia. Intraoral excision of the mass was planned. A vertical intraoral incision was made, preserving Stenon's duct. The mass was accessed and the lipoma was totally excised (Figure 4). Postoperative cold therapy was applied. The pathology report identified the mass as a fibrolipoma, and no recurrence was observed in the postoperative first year.

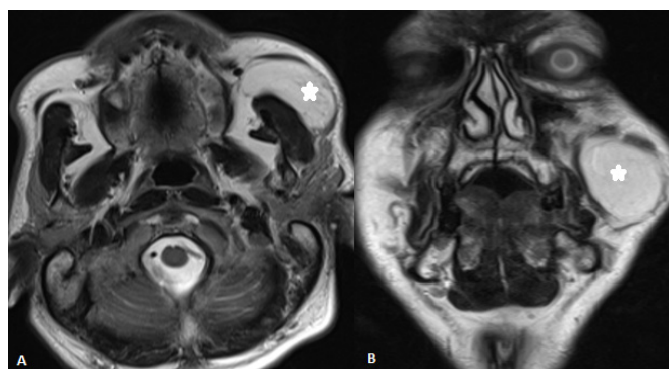


Figure 3. Axial (A) and coronal (B) MRI images of the buccal lipoma
MRI: Magnetic resonance imaging

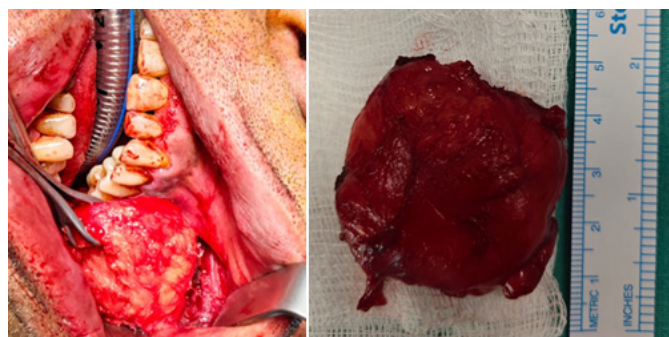


Figure 4. Intraoperative excision of the buccal space lipoma (A) and its postoperative appearance (B)

Lipomas are benign tumors of mesenchymal origin.⁵ Retropharyngeal space lipomas represent less than 1% of benign tumors in the airway. While small tumors are asymptomatic, growing tumors can cause local pressure. Chrysovitsiotis et al.⁶ examined 79 patients with retropharyngeal space lipoma in their systematic analysis and reported that the most common symptom was dysphagia at 65.2%. This was followed by snoring in 37.9% of cases, dyspnea in 34.8%, and dysphonia in 30.3%. Our patient was a 72-year-old man with dysphagia. Lipomas in the oral cavity are rare, representing 1–4% of all benign tumors.⁷ Lipomas in that cavity are most commonly seen in the buccal mucosa, tongue, the floor of the mouth, the vestibular area, the lower lip, and the hard and soft palates, and rarely in the buccal fat pad. There are few reports of buccal space lipoma in the literature. Our patient was a 51-year-old man with a painless swelling in the buccal region.

It may not always be easy to diagnose lipomas located deep in the head and neck region since these produce symptoms in the late period. Computed tomography (CT) and MRI are the most frequently employed methods in diagnosis and differential diagnosis. These are important in terms of differentiating the mass from neighboring tissues and from other potential masses. MRI is 100% specific for diffuse lipoma and 100% sensitive and 83% specific in differentiating liposarcoma.⁸ Biopsy material collection before surgery from masses suggestive of lipoma at radiological imaging is not a recommended procedure.⁹ Symptomatic lipomas are treated surgically, although patients who refuse surgery, with severe bleeding diathesis, or severe comorbidities representing a risk for surgery can be observed.¹⁰ The intraoral excision of retropharyngeal lipomas and those in the oral cavity is advantageous as it does not result in scarring.¹¹ It is important to protect Stenon's duct during surgery to the buccal area. In addition, every tissue removed must be sent for pathological examination. Unexpected conditions may be encountered, albeit rarely.

In conclusion, Lipomas are relatively rare pathologies in the head and neck region. Retropharyngeal and buccal space lipomas are rarely reported masses. Excising these using an intraoral approach is generally sufficient.

ETHICAL DECLARATIONS

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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

Author Contributions

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

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