Online ISSN: 1234-5678

# Journal of Trends in Medical Investigation

Year 2025 Volume 1 Issue 1

Published by
International Society of
Surgery Gastroenterology and Oncology
www.journaltmi.com

Online ISSN: 1234-5678

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**Journal of Trends in Medical Investigation**

**Official abbreviation:** J Trends Med Investig

**ISSN (Online):** 1234-5678

**DOI Prefix:** 10.12345

**Owner**
Owner on behalf of the International Society of Surgery Gastroenterology and Oncology
Prof. Dr. Ender Dulundu (President)

**Publication Type**
International peer-reviewed journal

**Publication Frequency and Language**
Published three times a year (April, August, December), English

**Editor**
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**Publisher**
International Society of Surgery Gastroenterology and Oncology

**Publisher Address**
İnönü Mah. 364. Sokak Dış Kapı No:6 Serin Çayır Apt. İç Kapı No:3 Esenyurt/İstanbul, Türkiye
Email: ucgodtr@gmail.com
Web: www.ucgod.org.tr

**Publishing Services**
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# Editorial

We are delighted and honored to present the inaugural issue of the Journal of Trends in Medical Investigation, a platform established to share scientific advancements, foster interdisciplinary collaboration, and contribute to the growing body of knowledge in the fields of health and medicine.

This journal aspires to serve as a venue for valuable contributions from researchers, academics, and healthcare professionals, covering all areas of basic and clinical medical sciences. As we embark on this publishing journey, we extend our sincere gratitude to all our colleagues who have supported us with their scientific contributions.

Through the regular publication of future issues and inclusion in major indexing services—most notably ULAKBİM—we hope to significantly contribute to medical science both nationally and, in time, internationally.

We aim to become a reputable source indexed in respected databases by publishing original, high-quality scientific work grounded in ethical principles.

We hope that the articles featured in our first issue will benefit the scientific community, and we look forward to continuously enhancing the scientific quality and richness of content in each subsequent issue.

With best regards,
Assoc. Prof. Gülçin Ercan

Journal of Trends in Medical Investigation

J Trends Med Invest 2025;1(1):1-7
https://doi.org/10.12345/jtmi.2025.4

Research Article

# Pedicled groin flap in the treatment of complex hand injuries

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## ABSTRACT

**Aim:** Hand injuries can present complicated challenges and require specific treatments for individual tissue defects. This study aimed to describe the outcomes and dependability of pedicled groin flaps in repairing complex hand injuries.

**Method:** This retrospective study which was conducted between December 2022 and July 2024, included 16 patients with various hand injuries who received pedicled groin flaps for the treatment of hand injuries and who had a suitable recipient vessel for microsurgery, and were older than 18 years of age. Patient demographics, injury aetiologies, flap details, and postoperative outcomes were reported. Mean follow-up period was 6 months.

**Results:** The mean age was 39.5 years, and 81.25% of them were male. Trauma, burns, and tumors were among the underlying causes. All subjects, maintained flap survival and full covering of the soft tissue. A mean flap size of 6.06 cm x 4.81 cm was reported. There was only one patient who experienced partial flap necrosis, which healed secondarily. In 37.5% of patients, donor site closure was accomplished by primary closure; in other patients, partial-thickness skin grafting was necessary.

**Conclusion:** This study suggests that the pedicled groin flap is still a superior therapy for complex hand injuries and remains a practical choice especially for facilities without access to microsurgical technology or experience. Despite certain drawbacks, the groin flap is a useful technique in upper extremity reconstruction due to its simplicity of harvesting, low donor site morbidity, and capacity to give appropriate soft tissue coverage.

**Keywords:** complicated tissue defects, hand injury, groin flap

## Introduction

Hand injuries can be complex due to differences in the dorsal and volar compartments, configuration of the fingers and, tendon, nerve, bone, and soft tissue injuries; making the treatment also specific (1,2). Partial or complete skin grafts, acellular dermal matrices, pedicled, perforator, local and free flaps are among the alternatives for the repair of such tissue defects. However, the safety and superiority of one treatment over the other is controversial; because in hand injuries, the size and site of the injury, the timing of debridement, the patient's negative factors related to wound healing, other accompanying injuries, vascular problems that reduce flap options are crucial in the selection of the treatment (3,4).

For many surgeons, covering the upper extremities' soft tissues still presents an issue. Stable covering, an appealing appear,

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Received: 15.03.2025 ▪ Accepted 20.03.2025

and functional repair are the primary goals of restoration. Large, complicated hand deformities were long treated with pedicled flaps from the groin or abdomen. The groin flap, first described by McGregor and Jackson in the 1970s, gained popularity as a method for covering complicated soft tissues in the hand (5).

The flap chosen in this study was a pedicled groin flap which is a cutaneous flap with an axial structure that relies on the superficial circumflex iliac arteriovenous system (6). It is possible for every region of the hand as well as the distal two thirds of the forearm to receive soft-tissue coverage by groin flap. Despite bearing some challenges for both the surgeon and the patient, the pedicled groin flap is simpler, faster, easier to perform and has a more rapid learning curve for the surgeon compared to the microsurgical option (7). Therefore, we suggested that pedicled groin flap remains as a favorable option for complicated hand defects. The purpose of this study was to assess the outcomes of pedicled groin flap on the treatment of complex hand injuries.

## Materials and Methods

### *Patient selection and study design*

This descriptive retrospective study was conducted between December 2022 and July 2024 and included 16 patients who underwent pedicled groin flap reconstruction for complex hand injuries. Patients were selected based on following criteria: (1) presence of a soft tissue defect in the hand requiring flap coverage, (2) availability of a suitable recipient vessel for microsurgery (to standardize patient selection), (3) age over 18 years, and (4) adequate medical records with documented postoperative follow-up. Exclusion criteria included: (1) patients with vascular conditions affecting flap viability, (2) those with extensive comorbidities impairing wound healing (e.g., diabetes with severe complications), and (3) those lost to follow-up before outcome assessment.

The study protocol was approved by Ethical committee of Başakşehir Çam and Sakura City Hospital Scientific Research No.1 Ethics Committee, Date: 12.03.2025, Number 79.

Age, gender, type of injury, location of the defect, flap separation time, delay requirement, donor site closure, and complications were examined. Postoperative complications were classified as major or minor based on their impact on flap viability, the need for surgical intervention, and their effect on functional recovery. Major complications included flap-related issues such as partial or total flap necrosis requiring secondary surgical procedures or revision, donor site complications like significant infection, dehiscence, or hematoma requiring intervention beyond routine wound care, and severe joint stiffness affecting elbow or shoulder mobility that necessitated prolonged rehabilitation. Minor complications included wound healing issues such as delayed healing, localized infection, or mild seroma/hematoma that resolved with conservative management, donor site concerns like mild color mismatch or contour irregularities that did not require surgical correction, and mild joint stiffness that improved with physical therapy. All complications were recorded during postoperative follow-ups at one week, one month, three months, and six months, and were classified accordingly.

### *Pedicled groin flap reconstruction*

One third of the flap was designed above the inguinal ligament and two thirds below. Flap dissection was started at the lateral border without including the fascia (Figure 1). Ischemic conditioning was performed for 3 minutes with a tourniquet method between postoperative days 10-14, and surgical delay was initiated in patients who completed 15 minutes without pain. All patients were mobilized as early as possible. The axillary region was powdered, arm and forearm fixation were performed with the help of soft elastics in the peroperative period. Patients were washed weekly. Dressings and flap follow-up were performed daily.

**Fig. 1.** Insertion of flap into a wrist tissue defect with wide tendon and nerve exposure.

### *Follow-up duration*

The mean follow-up period was 6 months (range: 4–8 months). Postoperative assessments were conducted at 1 week, 1 month, 3 months, and 6 months to evaluate flap survival, complications, and functional recovery. Patients requiring additional procedures, such as debulking, were followed up accordingly.

### *Statistical analysis*

No statistical analysis was performed in this study as it is a retrospective descriptive study without a control group or comparative cohort. The data presented are summarized using descriptive statistics (e.g., mean, range, and percentage) to report patient demographics, injury characteristics, flap details, and postoperative outcomes. Since this study does not test a specific hypothesis or compare different interventions, no power analysis was conducted.

## Results

The mean age of patients was 39.5 (25-56) years with 13 (81.25%) of the cases being male. The aetiologies of hand injuries included trauma (43.75%), burn and tumor. The indications for this procedure were as follows: complicated injuries of the dorsal hand, crush injuries, tissue defects with bone tendon exposure, large full-thickness tissue defects of the wrist and volar face, multiple finger or hand degloving injuries (Table 1).

**Table 1.** Patient demographics, injury and flap details, postoperative outcomes

| Patient no. | Age | Gender | Aetiology | Defect location | Flap Size (cmxcm) | Flap Separation Time | Donor Closure | Flap Necrosis |
|---|---|---|---|---|---|---|---|---|
| 1 | 25 | Male | Trauma | Wrist dorsal | 7x6 | 22 | Graft | None |
| 2 | 35 | Male | Burn | Hand dorsum | 8x5 | 25 | Graft | None |
| 3 | 39 | Male | Burn | 2-3-4th fingers volar face | 5x3 | 27 | Primer | None |
| 4 | 52 | Male | Burn | Wrist volar | 5x4 | 24 | Primer | None |
| 5 | 43 | Male | Trauma | Hand dorsum | 4x4 | 18 | Primer | Partial |
| 6 | 33 | Male | Trauma | Forearm volar | 8x6 | 20 | Graft | None |
| 7 | 56 | Male | Trauma | 4th finger circular | 4x3 | 23 | Primer | None |
| 8 | 42 | Male | Burn | Wrist volar | 7x7 | 21 | Graft | None |
| 9 | 39 | Male | Tumor | Forearm volar | 9x6 | 21 | Graft | None |
| 10 | 38 | Female | Burn | Hand palmar surface | 5x5 | 19 | Graft | None |
| 11 | 24 | Male | Trauma | 4-5th Fingers volar | 4x3 | 28 | Primer | None |
| 12 | 45 | Male | Burn | Dorsal wrist | 8x7 | 26 | Graft | None |
| 13 | 35 | Female | Burn | Wrist volar | 5x5 | 21 | Graft | None |
| 14 | 35 | Male | Trauma | Hand dorsum | 6x4 | 20 | Graft | None |
| 15 | 46 | Female | Burn | Hand dorsum | 9x6 | 18 | Graft | None |
| 16 | 45 | Male | Trauma | 4th finger circular | 3x3 | 20 | Primer | None |

The mean flap size was calculated as 6.06 x 4.81 $cm^2$. According to the size of the flap, the donor sites were closed with primary closure in only 6 (37.5%) patients, while partial-thickness skin grafting was required in the other subjects. All flaps were fully detached at 1 month. Complete soft tissue coverage and flap survival were achieved in all patients. Patients started physical therapy in the early postoperative period and functional success was achieved.

The timing of flap separation varied among patients, ranging from 18 to 28 days postoperatively. This variability was influenced by several factors, including the flap size and thickness, extent of recipient site vascularization, postoperative flap monitoring, surgeon preference and institutional protocols. All flaps were completely detached within one month, and no cases required additional delay beyond this timeframe.

Among the major complications, only 1 patient (6.25%) developed partial necrosis distal to the flap. The necrosis area was allowed for secondary healing (Table 1). No cases of total necrosis or complete flap failure were observed. In terms of minor complications, 3 patients (18.75%) required debulking at 6 months postoperatively, with satisfactory cosmetic outcomes. Six patients (37.5%) complained of color difference in the visible part of the hand, and camouflage with micro skin make-up was recommended. No significant donor site morbidity requiring surgical intervention was recorded. Some patients experienced transient elbow or shoulder stiffness, which resolved with early mobilization and physical therapy.

## Discussion

Groin flap is an axial flap elaborated over the Arteria iliaca circumflex superficialis pedicle. It was first described by McGregor and Jackson in 1972 (6). Its elevation as a free flap over the same pedicle was realized in the following few years (8). Groin flap is the flap of choice for complicated hand and upper extremity wounds (9). Upper extremity injuries are usually characterized not only by loss of skin and subcutaneous tissue but also by tendon, nerve and bone injuries which are very likely to occur in this area during trauma since the skin and subcutaneous supportive tissue is thin (10). The aim of this study was to investigate effectiveness of pedicled groin flap on complex hand injuries with defected tissues. Our study showed that all patients who underwent treatment with the pedicled groin flap had full soft tissue coverage and flap survival, displaying favorable outcomes in terms of flap necrosis with the exception of one patient who experienced partial necrosis distal to the flap.

Drawbacks of utilizing groin flap include the fact that it requires 2 sessions, the vascular supply of the pedicle requires delay, the flap is often a thick mass and needs to be thinned, and patients are often left in the same posture during this time, often resulting in shoulder joint stiffness (7). However, the pedicled groin flap is still suggested to remain a favorable option for the repair of complicated hand injuries, as it bears multiple crucial advantages. The major advantage of groin flap is that the donor site morbidity is low and the tissue obtained is sufficient to cover the soft cast. The donor site can be closed primarily depending on the size of the defect, and the use of partial-thickness grafts in patients with incomplete closure is neither cosmetically nor functionally problematic (11).

When considering reconstructive options for soft tissue defects, particularly in the groin area, the choice between groin flaps and free flaps is pivotal in optimizing patient outcomes. Groin flaps, primarily pedicled flaps that utilize local tissue, present several advantages over free flaps, particularly regarding ease of use and reduced complication rates. On the other hand, free flaps offer versatility and can cover larger, and albeit with increased technical demands and longer operative times (12-14).

In contrast, free flaps, such as the anterolateral thigh (ALT) flap, allow for more significant

tissue transfer over longer distances. This capability is critical in reconstructing larger defects or those located far from the donor site. Studies have shown that free flaps have become the gold standard for complex reconstructions, providing not only sufficient coverage but also the opportunity to incorporate multiple tissue types, such as muscle and skin, in a single procedure (11,13). However, they require advanced surgical skills and can lead to complications like reconnective vessel thrombosis or flap failure, necessitating attentive postoperative management (15).

Technically, flap elevation is easy to perform. After marking the pedicle with hand doppler and making proper drawings, it requires a short time to fully elevate the flap (16). In cases where the defect includes bone, the ability to lift it as a composite tissue is among its advantages (12). It can also be easily designed in various shapes such as skin island bilobe (17). In addition to lifting and insetting the flap, fixation and immobilization of the patient's extremity in the appropriate position is just as important (14). Especially during the recovery of the patient from anesthesia, the unconscious desire to move the flap may separate the flap from the inset and disrupt its circulation. For this reason, it is recommended that the drawings should first be performed standing up and the other arm should be taken as a basis to calculate which groin flap will be more comfortable in terms of elbow and shoulder, and the patient should be consulted. When obtaining written consent from the patient in the preop period, the patient should be told not to remove his/her hand when waking up from anesthesia. Another precaution is to fix the entire upper extremity with elastic bandages, partial casts or sutures after the flap is inset. This rigid fixation is necessary for the patient's adaptation phase. Some publications have even reported the use of external fixators (18).

According to our findings, the pedicled groin flap completely covered the soft tissue and survived in each case. These findings are consistent with the results of earlier researches that have demonstrated the pedicled flap's efficacy in treating complicated hand injuries (19). The flap's effectiveness in obtaining both coverage and hand function restoration is highlighted by the fast recovery seen in patients as well as their positive functional outcomes.

The timing of flap separation remains a critical step in pedicled flap procedures, and in our study, this varied between 18 and 28 days. Factors contributing to this variability included flap dimensions, recipient site vascularization, and postoperative circulatory adaptation. Our findings align with previous literature, where separation times typically range between 2.5 to 4 weeks, depending on similar patient and procedural factors (6,10). A more standardized approach to determining separation time in future studies may help optimize outcomes and minimize complications.

Despite the positive outcomes observed, this study has several limitations. First, as a retrospective study, it is inherently subject to selection bias. Patients were not randomized, and the decision to use a pedicled groin flap was based on the surgeon's preference, institutional experience, and the availability of microsurgical expertise. Second, the follow-up period was limited to a mean of 6 months (range: 4–8 months), which may not capture potential long-term complications such as late contracture formation or functional impairment. Longer follow-up studies would be necessary to assess the durability of the reconstruction and long-term patient satisfaction. Third, this study lacks a control group that underwent alternative reconstructive techniques, which would have provided a more direct comparison of outcomes. A prospective study with a comparative cohort, including local and free flaps, could yield more robust conclusions.

## Conclusion

In today's plastic and reconstructive surgery modality, free tissue transplants maintain their priority and essentiality. However, it is

not possible to be applied in every patient. Especially in trauma areas with large defects, regional full-thickness burns and after some tumor surgery, recipient vascular problems may occur. Furthermore, not all medical centers have microsurgery experience or equipment, making it difficult to perform. Groin flap stands out due to the ease of anatomy, simplicity of surgical experience compared to other free tissue transplantation surgeries, low donor site morbidity, and the ability to provide sufficient soft tissue. Especially in areas such as the upper extremities, where functionality must be preserved, the ability to compose with bone and asia also offers its advantages. The design of a tubular pedicle protects the vessels and at the same time facilitates postoperative delay. In this framework, we conclude that the groin flap is still a superior alternative in upper extremity defects. Future comparative prospective studies with larger sample sizes and longer follow-ups are needed to further assess the long-term functional and aesthetic outcomes of different reconstructive options.

### Ethical approval

The study protocol was approved by Ethical committee of Basaksehir Cam and Sakura City Hospital Scientific Research No.1 Ethics Committee, Date: 12.03.2025, Number 79.

### Author contribution

The authors confirm contribution to the paper as follows: Study conception and design: PK; data collection: AS; analysis and interpretation of results: AS; draft manuscript preparation: PK, AS. All authors reviewed the results and approved the final version of the manuscript.

### Source of funding

The authors declare the study received no funding.

### Conflict of interest

The authors declare that there is no conflict of interest.

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Journal of Trends in Medical Investigation

J Trends Med Invest 2025;1(1):8-14
https://doi.org/10.12345/jtmi.2025.5

Research Article

# Impact of migration due to the Syrian civil war on emergency surgical care for foreign patients

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## ABSTRACT

**Aim:** In the modern era, a substantial proportion of individuals live abroad for various reasons. Accessing healthcare systems in foreign countries can pose significant challenges due to obstacles such as language barriers, unfamiliarity with the healthcare framework, and a lack of confidence in obtaining modern and appropriate medical treatment. To shed light on this critical issue, we analyzed the outcomes of 298 foreign patients treated at our institution.

**Methods:** This study included patients with foreign identification numbers who underwent emergency surgery at the Department of General Surgery, Umraniye Training and Research Hospital, between January 2012 and June 2023. Patients were categorized into two groups based on their admission dates (before and after 2019). Data collection and evaluation focused on demographics (age, ethnicity), length of hospital stay (LoHS), surgical procedures, perioperative complications, and mortality rates.

**Results:** The overall mean LoHS was 2 days (range: 1-28), with no statistically significant difference between the two groups ($p>0.05$). Emergent appendectomy was performed in 185 patients (62.1%), while 20 patients (6.7%) underwent cholecystectomy. Laparoscopic surgery rates for appendicitis cases were significantly higher in Group 2 ($p<0.05$); however, no significant differences were observed in cholecystitis cases ($p>0.05$). Additionally, the rates of complicated appendicitis were similar between the two groups ($p>0.05$).

**Conclusion:** Despite the numerous challenges foreign patients may face within a healthcare system abroad, our findings indicate that these patients received appropriate and modern emergency surgical care at our institution. This study underscores the capability of healthcare systems to deliver equitable and high-quality treatment to diverse populations.

**Keywords:** emergency surgery, perioperative complications, delayed hospital admission, foreign patients, laparoscopic surgery, healthcare access barriers

## Introduction

The 21st century has been marked by numerous internal and external conflicts, economic crises, political instability, and widespread oppression, leading to significant mass migration (1). In 2019, due to the impact of the Syrian Civil War, a significant wave of migration from the Middle East to Turkey took place. Currently,

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Received: 24.11.2024 ▪ Accepted 19.03.2025

more than 5 million individuals from foreign nations, primarily Syria, reside in Türkiye (2). This migration has considerably influenced the country's demographic structure and the demand for healthcare services. While a substantial portion of migrants seek improved working conditions and living standards, a considerable number are refugees fleeing turmoil in their home countries. For the latter group, ensuring access to adequate healthcare becomes crucial, as they often encounter challenges such as language barriers and unfamiliarity with the healthcare system (3). Ethically and professionally, a civilized nation has a responsibility to provide equitable, modern, and comprehensive healthcare to all individuals, including asylum seekers, without discrimination (4). To evaluate this commitment, we present the outcomes of 298 foreign patients who received emergent surgical treatment in our General Surgery Department.

## Materials and Methods

Patients without Turkish citizenship who were admitted to the University of Health Sciences Umraniye Training and Research Hospital and subsequently underwent emergency surgery performed by the General Surgery Department between January 2012 and June 2023 were included in this study. Ethical approval was obtained from the hospital's ethics committee. Patients were categorized into two groups based on their admission date (before and after 2019) and were evaluated according to demographics (age, ethnicity), length of hospital stay (LoHS), surgical procedures, perioperative complications, and mortality rates.

In the study, SPSS (Statistical Package for Social Sciences) Windows 21.0 was used for data transformation and analysis of raw data obtained for both groups. Demographic data (age, gender), length of hospital stay (LoHS), surgical procedures, perioperative complications, and mortality rates. Descriptive statistics (frequency [f], percentage [%], arithmetic mean [x], standard deviation [SD]) were used to evaluate the data. The normal distribution of variables was determined using visual (histograms and probability plots) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk). Non-parametric or parametric tests were chosen based on the suitability. Categorical variables were compared using the $\chi 2$ test or Fisher's exact test when any of the values were less than 5. Continuous variables were presented as mean and standard deviation, and compared using independent t-tests (or Mann-Whitney U tests when appropriate). A p-value less than 0.05 was considered statistically significant.

## Results

A total of 298 patients were evaluated in the study. Of these, 143 patients who underwent surgery before 2019 were categorized as Group 1, and the remaining 155 patients as Group 2.

The mean age of the patients was 30.5 ± 11.8 years (Table 1). Male patients had a mean age of 28.6 ± 10.2 years, while female patients had a mean age of 35.9 ± 14.4 years, a statistically significant difference ($p < 0.05$). Subgroup analysis revealed that this age difference between genders was also significant within Group 1 and Group 2 ($p < 0.05$). The mean age of patients in Group 1 was 29.0 ± 11.6 years, while in Group 2 it was 31.9 ± 11.9 years, a statistically significant difference ($p < 0.05$).

Male patients comprised 75% of the study population, with a higher proportion in Group 1 (81.8%) compared to Group 2 (67.3%). The gender distribution between the two groups was also statistically significant ($p < 0.05$). Afghan and Syrian patients represented the majority (74.5%) across both groups.

The overall mean length of hospital stay (LoHS) was 2 days (range: 1–28), with no statistically significant difference between Group 1 (median: 2 days, range: 1–28) and Group 2 (median: 2 days, range: 1–23) ($p > 0.05$).

**Table 1.** Demographics and Clinical Characteristics of the Patients at Baseline

| Variables | | Total (n=298) | Before 2019 (n=143) | After 2019 (n=155) | p |
|---|---|---|---|---|---|
| **Age (year)** | | 30.5 ± 11.8 | 29.0 ± 11.6 | 31.9 ± 11.9 | ***0.008*** |
| Male | | 28.6 ± 10.2 | 27.7 ± 10.2 | 29.8 ± 10.1 | ***0.042*** |
| Female | | 35.9 ± 14.4 | 34.8 ± 15.1 | 36.4 ± 14.2 | *0.546* |
| | ***p*** | ***<0.001*** | ***0.011*** | ***0.006*** | |
| **Ethnicity** | | | | | ***0.013*** |
| Afghanistan | | 69 (23.2%) | 43 (30.1%) | 26 (16.8%) | |
| Syria | | 153 (51.3%) | 72 (50.3%) | 81 (52.3%) | |
| Turkic States | | 52 (17.4%) | 17 (11.9%) | 35 (22.6%) | |
| Others | | 24 (8.1%) | 11 (7.7%) | 13 (8.4%) | |
| **Duration of Hospital Stay (day)** | | 2 (1-28) | 2 (1-28) | 2 (1-23) | *0.824* |
| Male | | 2 (1-8) | 2 (1-28) | 2 (1-23) | *0.932* |
| Female | | 2 (1-23) | 2 (1-23) | 2 (1-12) | *0.970* |

Data are presented as mean ± SD, median (min-max) or n (%)

**Table 2.** Surgical Procedures

| Variables | Total (n=298) | Before 2019 (n=143) | After 2019 (n=155) | p |
|---|---|---|---|---|
| **Appendectomy** | 185 (62.1%) | 89 (62.2%) | 96 (61.9%) | |
| Laparoscopic | 148 (80%) | 58 (65.2%) | 87 (90.6%) | |
| Open | 27 (14.6%) | 27 (30.3%) | 3 (3.1%) | |
| Conversion | 10 (5.4%) | 4 (4.5%) | 6 (6.3%) | *<0.001* |
| **Cholecystectomy** | 20 (6.7%) | 8 (5.6%) | 12 (7.7%) | |
| Laparoscopic | 17 (85%) | 6 (75%) | 11 (91.7%) | |
| Conversion | 3 (15%) | 2 (25%) | 1 (8.3%) | *0.537* |
| **Peptic Ulcus Perforation** | 25 (8.4%) | 8 (5.6%) | 17 (11%) | |
| **Trauma Related Surgeries** | 26 (8.7%) | 17 (11.9%) | 9 (5.8%) | |
| Penetrating Wounds | 18 (69.2%) | 12 (70.6%) | 6 (66.7%) | |
| In-Vehicle Car Accidents | 2 (7.7%) | 1 (5.9%) | 1 (11.1%) | |
| Pedestrian Accidents | 4 (15.4%) | 3 (17.6%) | 1 (11.1%) | |
| Fall from Heights | 2 (7.7%) | 1 (5.9%) | 1 (11.1%) | *0.898* |
| **Obstetric Anal Sphicter Injury Related Surgeries** | 3 (1%) | 1 (0.7%) | 2 (1.3%) | |
| **Emergent Colorectal Surgeries** | 10 (3.4%) | 8 (5.6%) | 2 (1.3%) | |
| **Others** | 29 (9.7%) | 12 (8.4%) | 17 (11%) | *0.085* |

Data are presented as n (%)

### *Types of Surgery*

In terms of surgical procedures, 185 patients (62.1%) underwent appendectomy, 20 patients (6.7%) underwent cholecystectomy, 25 patients (8.4%) had surgery for peptic ulcer perforation, and 26 patients (8.7%) underwent trauma-related procedures. Other surgeries included colorectal surgery in 10 patients (3.4%) and anal sphincter repair due to obstetric trauma in 3 patients (1%) (Table 2).

Among appendectomy cases, 58 patients (65.2%) in Group 1 underwent laparoscopic appendectomy, compared to 87 patients (90.6%) in Group 2—a statistically significant increase in laparoscopic surgery rates over time ($p < 0.05$). Similarly, laparoscopic cholecystectomy was performed in 6 patients (75%) in Group 1 and 12 patients (91.7%) in Group 2, though this difference was not statistically significant ($p > 0.05$).

### *Perioperative Findings*

Perioperative findings in appendicitis cases included local peritonitis in 10 patients (5.4%), fecal peritonitis in 2 patients (1.1%), and disseminated purulent peritonitis in 9 patients (4.9%) (Table 3). In Group 1, local peritonitis, fecal peritonitis, and disseminated purulent peritonitis were observed in 3 patients (3.4%), 1 patient (1.1%), and 4 patients (4.5%), respectively. In Group 2, these findings were noted in 7 patients (7.3%), 1 patient (1.1%), and 5 patients (5.2%), respectively. The differences in peritonitis findings between groups were statistically insignificant ($p > 0.05$).

### *Trauma Cases and Mortality*

A total of 26 patients were admitted due to trauma. Affected abdominal organs and corresponding surgical procedures are detailed in Table 4 and Table 5. Emergent colorectal procedures are outlined in Table 6.

**Table 3.** Appendectomy Related Findings

| Variables | Total (n=185) | Before 2019 (n=89) | After 2019 (n=96) | P |
|---|---|---|---|---|
| Local Peritonitis | 10 (5.4%) | 3 (3.4%) | 7 (7.3%) | |
| Fecal Peritonitis | 2 (1.1%) | 1 (1.1%) | 1 (1.1%) | |
| Disseminated Purulent Peritonitis | 9 (4.9%) | 4 (4.5%) | 5 (5.2%) | *0.759* |

Data are presented as n (%)

**Table 4.** Affected Organs in Patients with Trauma

| Organ | Before 2019 (n=17) | After 2019 (n=9) |
|---|---|---|
| Diaphragm | 4 (23.5%) | 2 (22.2%) |
| Small Bowel | 3 (17.6%) | 3 (33.3%) |
| Colon | 2 (11.7%) | 2 (22.2%) |
| Liver | 1 (5.8%) | 1 (11.1%) |
| Spleen | 1 (5.8%) | 0 (0%) |
| Anal Sphincter | 1 (5.8%) | 3 (33.3%) |

**Table 5.** Surgical Procedures in Patients with Trauma

| Procedure | Before 2019 (n=17) | After 2019 (n=9) |
|---|---|---|
| Primary Diaphragm Repair | 4 (23.5%) | 2 (22.2%) |
| Partial Small Bowel Resection and Anastomosis | 3 (17.6%) | 2 (22.2%) |
| Partial Small Bowel Resection and End Ileostomy | 0 (0%) | 1 (11.1%) |
| Abdominal/Pelvic Packing | 1 (5.8%) | 1 (11.1%) |
| Primary Colon Repair | 0 (0%) | 1 (11.1%) |
| Ileocecal Resection | 0 (0%) | 1 (11.1%) |
| Splenectomy | 1 (5.8%) | 0 (0%) |
| Anal Sphincter Repair | 2 (11.7%) | 3 (33.3%) |
| Tube Thoracostomy | 3 (17.6%) | 1 (11.1%) |

**Table 6.** Emergent Colorectal Surgeries

| Procedure | Before 2019 (n=8) | After 2019 (n=2) |
|---|---|---|
| Colorectal Resection and Anastomosis | 3 (37.5%) | 1 (50%) |
| Colorectal Resection and End Colostomy | 2 (25%) | 1 (50%) |
| Fournier's Gangrene Debridement | 2 (25%) | 0 (0%) |
| Perianal Abscess Drainage | 1 (12.5%) | 0 (0%) |

Overall, five patients (1.7%) died during the study period. In Group 1, three patients (2.1%) died due to duodenal ulcer perforation, Grade V liver injury, and hemorrhagic liver mass leading to exsanguination, respectively. In Group 2, two patients (1.3%) died due to disseminated splenic abscess and duodenal ulcer perforation, respectively. The mortality difference between the groups was not statistically significant ($p > 0.05$).

## Discussion

Even indigenous populations may encounter challenges when seeking medical treatment. Factors such as unfamiliarity with the healthcare system, language barriers, and a lack of confidence in obtaining equitable and adequate medical care contribute to delayed hospital admissions, even in emergency cases. These obstacles are particularly pronounced among individuals with foreign identities. To address and better understand this issue, we evaluated our institutional experience and outcomes in this study.

Our study population predominantly comprised adult male patients. While the observed male predominance, age distribution, and ethnic backgrounds were noted, an in-depth evaluation of these demographic factors is beyond the scope of this article. The mean length of hospital stay (LoHS) was 2 days in both groups, a figure consistent with current literature, especially given the predominance of appendectomy cases (5,6). This suggests that most patients sought timely medical attention, particularly in cases of acute appendicitis.

Acute appendicitis accounted for more than 60% of surgeries in both groups, aligning with existing literature (7). Notably, the laparoscopic appendectomy rate was significantly higher in Group 2, reflecting the increased adoption of laparoscopic techniques over time. Contemporary studies report a conversion rate from laparoscopic to open appendectomy ranging between 2% and 4.5% (8,9). While our conversion rate was slightly higher, the proportional difference was minimal and unlikely attributable to delayed hospital admissions. In Group 2, the majority of appendicitis cases were successfully managed laparoscopically, indicating that patients generally presented to the emergency department in a timely manner.

We utilized the complicated appendicitis classification system developed by Mariage et al., with findings summarized in Table 3 (10). Both groups demonstrated significantly lower rates of complicated appendicitis compared to the literature, where rates can reach up to 40% (11). Furthermore, the difference in complicated appendicitis rates between groups was statistically insignificant.

Acute cholecystitis cases in our clinic are operated on under strict criteria, including symptom onset within four days, alanine and aspartate aminotransferase levels below 400 U/L, and normal bilirubin levels. Literature suggests conversion rates for acute cholecystitis surgeries can reach up to 25% (12,13). In Group 1, a conversion rate of 25% was observed, although the small sample size (n=8) may have influenced this outcome. Group 2, however, demonstrated a lower conversion rate, and both groups remained within the range reported in

the literature. These findings suggest that most acute cholecystitis cases in our population did not present too late for surgical intervention.

Peptic ulcer cases, including their prevalence and associated mortality, were consistent with the literature (14). As expected, trauma-related surgeries were more frequent than colorectal emergencies in this relatively young population, reflecting typical surgical trends for this age group.

This study has several limitations. First, as a retrospective analysis, it lacks randomization and is subject to selection bias. Second, a significant number of patients in Group 2 were treated during the COVID-19 pandemic, which may have influenced statistical comparisons between groups despite overall outcomes aligning with existing literature.

## Conclusion

Despite these limitations, this study provides reliable data indicating that patients with foreign identities do not hesitate to seek emergency surgical care and are able to receive appropriate and modern treatment. Nonetheless, there is a pressing need to further improve their access to and experience within healthcare systems. Future studies, particularly those including outpatient clinic admissions, are necessary to evaluate additional aspects of their healthcare experiences and identify areas for improvement.

## Ethical approval

The study was approved by İstanbul Health Sciences University Umraniye Training and Research Hospital Clinical Research Ethics Committee (date: 05.10.2023, number: 355).

## Author contribution

The authors confirm contribution to the paper as follows: Study conception and design: MKY; data collection: EFK, MIP; analysis and interpretation of results: HSUG; draft manuscript preparation: MKY; critical review and final approval: FB, HKT. All authors reviewed the results and approved the final version of the manuscript.

## Source of funding

The authors declare the study received no funding.

## Conflict of interest

The authors declare that there is no conflict of interest.

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Journal of Trends in Medical Investigation

J Trends Med Invest 2025;1(1):15-19
https://doi.org/10.12345/jtmi.2025.6

Research Article

# The comparison of cosmetic results of Karydakis and Limberg flap Techniques in pilonidal sinus

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## ABSTRACT

**Background:** Repairing of pilonidal sinus with flap techniques is very effective in prevention of recurrence. Karydakis and Limberg are two popular flap techniques. Their postoperative clinical outcomes are almost the same in the literature. Recently, all surgical techniques try to be less invasive as minimal as possible with the best cosmetic outcome. The aim of this study is to compare these two techniques in terms of cosmetic results.

**Methods:** Total 100 patients operated with Karydakis or Limberg were devided into two groups for comparison of their cosmetic results. Age, gender, BMI and postoperative period are used for demographic comparison and Stony Brook Scar Evaluation Scale (SBSES) was used to compare the cosmetic results of both surgical flap techniques.

**Results:** We found no difference between the groups in terms of demographic features but the SBSES scores was found higher in Karydakis group.

**Conclusion:** Karydakis technique might be preffered more than limberg technique with its better cosmetic result.

**Keywords:** minimal invasive, cosmetic, pilonidal sinus, flap technique

## Introduction

Pilonidal sinus is the most common chronic disease of the sacrococcygeal region. Even most of the studies reported an incidence of 26/100,000 in the worldwide, in some of them the incidence was found around 8% among men, that is more common especially in Mediterranean region countries (1-5). It was first described by Herbert Mayo in 1833. Treatment options range from microsinusectomy to excision with flap repairing (6). Karydakis and limberg flap repairs are most popular surgery techniques in the literature, and also mostly preferred techniques in our clinic. The search for minimally invasive and more cosmetic techniques with similar clinical results must be the target of the preferred treatment technique. No studies have been conducted comparing these two techniques only in terms of objective cosmetic results. We aimed to compare the cosmetic results of these two techniques, those have almost the same clinical results in the literature.

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Received: 23.11.2024 ▪ Accepted 11.03.2025

## Patients and Methods

Patients, who underwent karydakis and limberg flap repair surgery for pilonidal sinus disease in Acıbadem Fulya Hospital and Esenyurt State Hospital general surgery clinics in between 2019 and 2023, were invited by phone for clinical examination. First 50 patients for each surgery group who accepted to be in our study were included in this study. Patients with recurrence or who underwent surgical intervention due to recurrence were not included in the study. Two separate groups were formed as Karydakis group (n=50) and Limberg group (n=50). Both groups were evaluated according to demographic features; age, gender and body mass index (BMI).

For comparison of cosmetic results of these two techniques, Stony Brook Scar Evaluation Scale (SBSES), a validated scale specifically to measure the long-term appearance of scars was used (Table 1) (7). For statistical analysis SPSS Student -t test was used.

The study was designed in accordance with Principles of the Declaration of Helsinki and ethically approved by Committee of Ethics of Acıbadem University (2020/05).

## Results

The mean age was 24 (17-38), and the female-male ratio was 16/84. There was no difference between the groups in terms of postoperative period, gender ratio, and BMI. The cosmetic scores of the karydakis group were found to be significantly higher. Demographic features of the patients are summarized in Table 2, and SBSES scores are summarized in Table 3.

**Table 1.** Stony Brook Scar Evaluation Scale (SBSES)

| | Scar Category | Points |
|---|---|---|
| Width | >2 mm | 0 |
| | < 2 mm | 1 |
| Height | Elevated/Depressed in relation to surrounding skin | 0 |
| | Flat | 1 |
| Color | Darker than surrounding skin | 0 |
| | Same color or lighter than surrounding skin | 1 |
| Suture Marks | Present | 0 |
| | Absent | 1 |
| Overall Appearance | Poor | 0 |
| | Good | 1 |

Total Score = Sum of individual score, from 0 (worst score) to 5 (best score)

**Table 2.** Demographics of Patients

| | Group 1 | Group 2 | P |
|---|---|---|---|
| Age (Mean) | 26.45±5.35 | 27.73±6.18 | 0.08 |
| F/M Ratio | 9/41 (21.9%) | 7/43 (16.3%) | 0.07 |
| BMI | 24.53±5.5 | 25.12±5.8 | 0.1 |
| Mean Postoperative Period (Month) | 15.5±3.3 | 16.2±3.6 | 0.1 |

**Table 3.** SBSES Scores

| | Group 1 | Group 2 | P |
|---|---|---|---|
| Width | 43 | 32 | 0.02 |
| Height | 46 | 29 | 0.01 |
| Color | 47 | 48 | 0.09 |
| Suture Marks | 14 | 9 | 0.01 |
| Overall Appearence | 47 | 36 | 0.04 |
| Mean Total Score | 39.4 | 30.8 | 0.01 |

## Discussion

Even though there are some studies still searching whether pilonidal sinus disease is a congenital or acquired disease, the common view is that it is more of an acquired disease (8-10). The treatment of the disease is surgery, and lower recurrence rates make surgeries performed with flaps advantageous over primary repair, making it the preferred surgical technique (11-15). Comparing these 2 most preferred flap techniques (Karydakis and Limberg flaps) in their systematic review and meta-analysis, Gavriilidis et al. evaluated both techniques in terms of recurrence and complications and concluded that there was no significant difference between them (16).

With the same clinical results, one of these two techniques is preferred according to surgeon's choice. Although these techniques were slightly superior to each other in a limited number of studies comparing operative time, early and late postoperative complications, and recurrence rates, they were not superior to each other in systematic reviews and meta-analyses conducted on this subject (16-18). In the study of Erkent et al., they stated that in the retrospective analysis of 924 cases with flap and primary closure, the primary closure technique was preferred especially in female patients, and cosmetic preferences were at the forefront in this (19).

In the literature, satisfaction questions regarding the incisions were asked to patients after the surgery, while similar rates were reported in the studies, some studies reported that they found a statistically higher satisfaction rate for Karydakis (20-24). However, in a few of these clinical studies, patients were questioned in terms of scar satisfaction, and it was found higher in Karydakis group (25,26).

Our study is original in terms of more objective comparison of cosmetic results. The scale, which include the evaluations of both the patient and the surgeon, is the first objective scale using in a study to compare these two techniques cosmetically. According to SBSES, our study found the cosmetic score to be significantly higher in the Karydakis group than in the Limberg group.

So we may conclude that Karydakis technique may be preffered instead of Limberg technique with its better cosmetic outcome.

## Conclusion

Pilonidal sinus is a common disease of the intergluteal region. Flap repairs are very effective in its treatment. Karydakis and Limberg flap techniques are the 2 important surgical techniques preferred in this region diseases. Today, where minimally invasive and more cosmetic surgery options are more preferred, we aimed to compare these two surgical techniques in terms of cosmetic outcome. For such an objective study, which has never been done before, we used the Stony Brook Scar Evaluation Scale. As a result of our study, we found the cosmetic score of the Karydakis flap technique to be higher than the limberg flap technique.

As a result, we revealed out that the choice of the karydakis flap in intergluteal pilonidal sinus disease has better cosmetic results.

## Ethical approval

The study was approved by Acıbadem University Ethics Committee (2020/05).

## Author contribution

The authors confirm contribution to the paper as follows: Study conception and design: US; data collection: HK; analysis and interpretation of results: HK; draft manuscript preparation: US, MP. All authors reviewed the results and approved the final version of the article.

### Source of funding

The authors declare the study received no funding.

### Conflict of interest

The authors declare that there is no conflict of interest.

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Journal of Trends in Medical Investigation

J Trends Med Invest 2025;1(1):20-23
https://doi.org/10.12345/jtmi.2025.2

Research Article

# Comparison of laparoscopic and open appendectomy outcomes in acute appendicitis

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## ABSTRACT

**Objective:** This study aimed to compare the intraoperative and postoperative outcomes of laparoscopic appendectomy (LA) and open appendectomy (OA) in patients diagnosed with acute appendicitis, with a focus on surgical outcomes and recovery parameters.

**Methods:** A retrospective analysis was conducted on 376 patients who underwent appendectomy for acute appendicitis at İzmir City Hospital between October 15, 2023, and August 15, 2024. Patients were grouped based on surgical approach (LA or OA). Data on demographic characteristics, body mass index (BMI), operative duration, intraoperative blood loss, time to oral intake, length of hospital stay, return-to-work time, and postoperative complications were collected and analyzed. Statistical significance was defined as $p < 0.05$.

**Results:** Of the 376 patients, 251 underwent LA and 125 underwent OA. The mean operative duration was significantly longer in the LA group (102.56 ± 44.4 minutes vs. 85.4 ± 43.11 minutes, $p = 0.009$). However, intraoperative blood loss was significantly lower in the LA group (29.64 ± 62.97 mL vs. 74.79 ± 168.55 mL, $p = 0.018$). Postoperative pain scores (VAS) were significantly lower in LA patients, and they experienced a shorter hospital stay and faster return to work ($p < 0.001$). The incidence of wound infections was lower in the LA group compared to the OA group (5% vs. 12%, $p = 0.03$). Conversion from LA to OA occurred in 2.9% of cases due to intraoperative complications such as bleeding, perforation, or inadequate visualization.

**Conclusion:** Laparoscopic appendectomy demonstrated favorable postoperative outcomes compared to open appendectomy, including reduced postoperative pain, shorter hospital stays, and quicker recovery. These results support the adoption of LA as a safe and effective alternative to OA, particularly in patients with higher BMI or less severe disease presentations. Nonetheless, larger prospective randomized studies are required to confirm these findings and better define the optimal indications for LA in clinical practice.

**Keywords:** Acute appendicitis, Laparoscopic appendectomy, Open appendectomy, Postoperative outcomes, Minimally invasive surgery

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Received: 06.02.2025 ▪ Accepted 10.03.2025

## Introduction

Acute appendicitis is one of the most common surgical emergencies, and appendectomy is among the most frequently performed abdominal surgeries worldwide (1,2). While open appendectomy (OA) has historically been considered the standard treatment, laparoscopic appendectomy (LA) has become increasingly popular due to its potential benefits, including reduced postoperative pain, faster recovery, and cosmetic advantages (3,4). In recent years, laparoscopic surgery has become the gold standard for many surgical procedures, thanks to its minimally invasive nature. In abdominal surgery in particular, laparoscopic techniques stand out for their smaller scars, lower postoperative pain, and shorter recovery times (4,5).

Numerous studies have compared the clinical outcomes and postoperative complications of LA and OA, but the findings are mixed. While some studies report superior outcomes with LA, others have not demonstrated a clear advantage (6,7). This study aims to compare the intraoperative and postoperative outcomes of laparoscopic and open appendectomy in patients diagnosed with acute appendicitis, focusing on clinical outcomes, postoperative complications, and recovery parameters.

## Methods

A retrospective analysis was conducted on 376 patients who underwent appendectomy for acute appendicitis at Izmir City Hospital between October 15, 2023, and August 15, 2024. The initial cohort of 418 patients was reduced to 376 after applying exclusion criteria, which included patients under 18 years of age, pregnant patients, those with severe sepsis or septic shock contraindicating laparoscopy, and patients with complicated appendicitis. The choice of surgical method was determined by the operating surgeon. The study was approved by the Izmir City Hospital Ethics Committee.

Data collected included demographic characteristics, comorbidities, body mass index (BMI), operative duration, intraoperative blood loss, time to initiation of oral intake, length of hospital stay, return-to-work time, and postoperative complications (wound infection, intraperitoneal infection, paralytic ileus, and mortality). Patients were monitored for 30 days postoperatively, with findings related to suture removal, dressing changes, and postoperative complications documented (Table 1).

### *Statistical analyses*

The collected data were analyzed using IBM SPSS Statistics (v.25.0) software. Continuous variables were expressed as mean ± standard deviation (SD) or median (minimum-maximum), while categorical variables were expressed as frequency and percentage. For comparisons between groups, independent samples t-test or Mann-Whitney U test was used for continuous variables, and chi-square test or Fisher's exact test was used for categorical variables. A p-value of$<0.05$ was considered statistically significant.

## Results

A total of 376 patients were included in the study. Of these, 251 underwent laparoscopic

**Table 1.** Distribution of Alvarado Score and BMI between OA and LA Groups

| Variables | Total (n=376) | OA (n=251) | LA (n=125) |
|---|---|---|---|
| Mean Age (years) | 38.5 (18-87) | 40.6 (18-87) | 34.7 (18-75) |
| Gender (Male/Female) | 206/170 (55.6%) | 151/100 (60%/40%) | 75/50 (60%/40%) |
| Alvarado Score 9 or higher (n, %) | 161 (43.6%) | 125 (50%) | 36 (31.2%) |
| Alvarado Score 8 or lower (n, %) | 212 (56.4%) | 126 (50%) | 86 (68.8%) |
| Patients with BMI > 30 (n, %) | 110 (29.3%) | 52 (20.7%) | 58 (46.4%) |

**Table 2.** Operative and Postoperative Outcomes, Complication Rates, and Significance Values

| Variables | Total (n=376) | OA (n=251) | LA (n=125) | p-value |
|---|---|---|---|---|
| Operative Time (minutes) | 95.5 (35-180) | 85.4 ± 43.11 | 102.56 ± 44.4 | 0.009 |
| Intraoperative Blood Loss (mL) | 52.2 (10-500) | 74.79 ± 168.55 | 29.64 ± 62.97 | 0.018 |
| Time to Oral Intake (days) | 2.25 (1-5) | 2.48 ± 2.17 | 2.03 ± 1.66 | 0.123 |
| Postoperative Pain (VAS score) | 4.5 (2-10) | 5.0 ± 2.5 | 3.5 ± 2.2 | 0.044 |
| Postoperative Vomiting (n, %) | 98 (26.1%) | 70 (28%) | 20 (16%) | 0.045 |
| Wound Infection (n, %) | 30 (8%) | 30 (12%) | 7 (5%) | 0.03 |
| Paralytic Ileus (n, %) | 12 (3%) | 12 (5%) | 0 (0%) | 0.012 |
| Length of Hospital Stay (days) | 3 (1-7) | 3.5 ± 1.2 | 2.1 ± 0.9 | 0.016 |
| Return-to-Work Time (days) | 10.5 (6-18) | 13.4 ± 3.8 | 8.8 ± 2.6 | 0.001 |

appendectomy (LA), and 125 underwent open appendectomy (OA). The overall mean age of the patients was 38.5 years, with the OA group having a higher mean age (40.6 years) compared to the LA group (34.7 years). The gender distribution was similar in both groups, with 60% male and 40% female representation.

Surgical selection varied based on Alvarado scores. Among patients with a score of 9 or higher, 50% were treated with OA and 31.2% with LA. Conversely, among those with a score of 8 or lower, 50% underwent OA, while 68.8% were treated with LA. LA was more frequently preferred in patients with a BMI ≥30 (46.4% vs. 20.7%).

The operative duration was significantly longer in the LA group (102.56 ± 44.4 minutes vs. 85.4 ± 43.11 minutes, p=0.009). However, LA provided the advantage of reduced intraoperative blood loss (29.64 ± 62.97 mL vs. 74.79 ± 168.55 mL, p=0.018). Postoperative pain (measured by VAS score) was lower in the LA group, and these patients had shorter hospital stays (2.1 ± 0.9 days vs. 3.5 ± 1.2 days, p=0.016). Additionally, LA patients returned to work earlier (p<0.001) and had a lower wound infection rate compared to the OA group (5% vs. 12%, p=0.03) (Table 2).

A total of 11 patients (2.9%) were converted from LA to OA. The reasons for conversion included bleeding, perforation, and insufficient exploration (Table 3).

**Table 3.** Conversion from LA to OA Cases

| Variables | Total (n=376) |
|---|---|
| Total number of conversion cases (LA to OA) | 11 (2.9%) |
| Due to bleeding (n, %) | 3 |
| Due to perforation (n, %) | 3 |
| Due to insufficient exploration (n, %) | 5 |

## Discussion

The findings of this study indicate that laparoscopic appendectomy (LA) can be a safe and effective alternative to open appendectomy (OA) in the treatment of acute appendicitis.

Compared to other studies in the literature, these results confirm the contributions of LA to the postoperative recovery process (6,7). In particular, the ability of LA to reduce infection risk and provide technical ease in patients with a high BMI aligns with previously reported findings (8). However, disadvantages such as the longer operative duration and higher cost associated with LA remain limitations that are also discussed in the literature (6).

Several limitations of this study should be noted. The limited sample size, particularly the relatively low number of patients in the LA group, may restrict the generalizability of the findings. Additionally, the retrospective nature of the study may introduce selection bias and issues related to incomplete data. Furthermore,

due to the short follow-up period, long-term complications could not be assessed.

## Conclusion

The findings of this study demonstrate that laparoscopic appendectomy (LA) provides superior intraoperative and postoperative outcomes compared to open appendectomy (OA) in the treatment of acute appendicitis. The laparoscopic approach has proven to be a safe and effective surgical method, offering clinical advantages such as shorter hospital stays, faster return to work, and lower wound infection rates. Additionally, the laparoscopic technique has the potential to provide more accurate diagnosis and appropriate treatment in cases where definitive diagnosis is challenging.

Furthermore, LA has emerged as a preferred option for the treatment of appendicitis in overweight and obese patients due to its technical ease, reduced infection risk, and faster recovery. In light of these findings, the increasing preference for laparoscopic appendectomy highlights its potential to improve patients' quality of life and reduce postoperative complications. Moreover, patient feedback has indicated that the cosmetic advantages of laparoscopic incisions enhance patient satisfaction and the acceptability of this surgical method.

## Ethical approval

The study was approved by the İzmir City Hospital Ethics Committee (date: 05.02.2025, number: 2024/166).

## Author contribution

The authors confirm contribution to the paper as follows: Study conception and design: BE, ME, KEK; data collection: BE, CD, SS, ME, MG; analysis and interpretation of results: BE, ME, MG, KEK; draft manuscript preparation: BE, CD, SS. All authors reviewed the results and approved the final version of the manuscript.

## Source of funding

The authors declare the study received no funding.

## Conflict of interest

The authors declare that there is no conflict of interest.

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Journal of Trends in Medical Investigation

J Trends Med Invest 2025;1(1):24-29
https://doi.org/10.12345/jtmi.2025.3

Case Report

# Stercoral perforation of the colon: a report of two cases with different anatomic locations and prognostic outcomes*

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**ABSTRACT**

Stercoral perforation, which is a colonic perforation secondary to impacted stool, is a rare but highly mortal clinical entity. The main pathophysiology is chronic inflammation, ischemia caused by chronic pressure, necrosis, and subsequent perforation. The major risk factors are being older, chronic constipation, immobilization, being bedridden, and comorbidities that cause constipation and prolonged colonic transition. The most common clinical findings are abdominal pain, acute abdominal tenderness, and sepsis symptoms. We present two cases of stercoral perforation whose postoperative clinical courses varied significantly due to differences in perforation sites and the degree of intra-abdominal contamination. Accurate diagnosis of stercoral perforation is vital for physicians to implement timely and effective interventions, ultimately reducing morbidity and mortality through early detection.

**Keywords:** Stercoral perforation, stercoral colitis, cecum perforation, sigmoid colon perforation, fecal impaction

## Introduction

Stercoral perforation is a rare clinical entity of bowel perforation that occurs when accumulated fecal material causes pressure on the bowel wall, the vascular structure becomes compressed, and increased pressure causes a decrease of the bowel wall perfusion, leading to necrosis, ulceration, and subsequent perforation. Perforation causes fecal peritonitis, which has high mortality rates. Chronic constipation, immobilization, chronic opioid drug use, and comorbidities such as renal failure, diabetes mellitus, and hypothyroidism are the main causes of prolonged constipation and prolonged colonic transition. The most common anatomic perforation localization is the sigmoid colon, followed by the rectosigmoid colon. Cecal stercoral perforation is a rare presentation that was first reported in the literature in 1988 (1-4).

We report two cases of spontaneous perforation of the cecum and the sigmoid colon caused by impacted fecal material.

## Case 1: Perforation of the Cecum

A 56-year-old female patient brought by her caregivers presented to the emergency department of our hospital. She had been experiencing abdominal pain for a week, which worsened on the day of admission, and an abdominal right upper quadrant bulging was

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Received: 10.12.2024 ▪ Accepted 08.03.2025

* Part of the data included in this manuscript has been presented as a poster presentation at the 23rd National Surgical Congress, 24-28 April 2024, Antalya, Turkey, and published in Congress Abstract Book.

added. She also had been confused, and she was less responsive to vocal stimuli.

The patient had a medical history, including thrice-weekly hemodialysis-dependent chronic kidney disease, and had not undergone any abdominal surgery. Her medications were a tricyclic antidepressant drug, an opioid analgesic, and a recombinant human erythropoietin drug for anemia caused by renal failure.

The patient's vital signs were unstable; hypotensive, arterial blood pressure was about 80/50 mm Hg; pulse rate was 115 beats per minute (BPM), and her physical examination presented with abdominal distension accompanied by a right upper quadrant bulging and a crepitus sign with the palpation. Her white blood cell (WBC) count was 36.2 × $10^3$/μL (reference: 4.5–11.0 × $10^3$/μL), and her C reactive protein (CRP) level was 254 mg/L (0-5 mg/L).

An intravenous contrast-enhanced abdominal computed tomography (IV-CT) showed cecal perforation from the anti-mesenteric wall, fecal material filling the right paracolic space, extending to the hepatic flexure. The perforation caused pneumoperitoneum, tearing the abdominal fascia, which could be seen in the subcutaneous distance on CT at the right upper quadrant, which was the reason for the subcutaneous emphysema and crepitus (Figure 1 and Figure 2).

Stercoral perforation and septic shock associated with fecal peritonitis were first considered in the diagnosis. We performed an emergency explorative laparotomy. The cecum and right colon had ruptured through the anti-mesenteric wall, and the lateral abdominal wall formed a sac filled with fecal material (Figure 3).

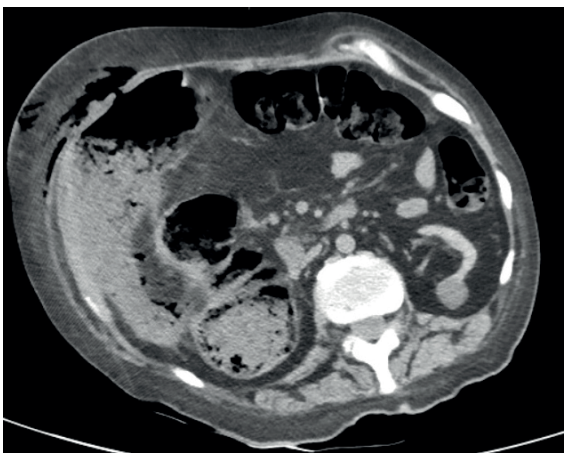

**Figure 1.** Axial image of the abdomen CT scan showing perforation

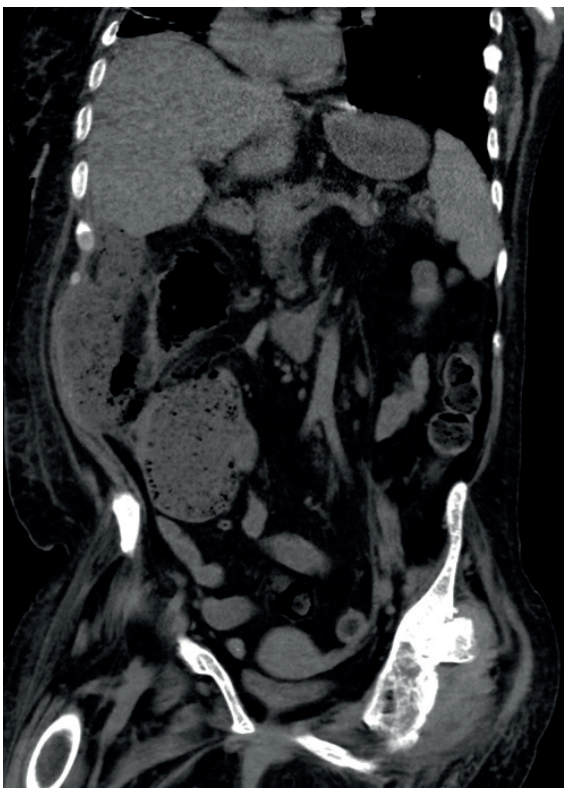

**Figure 2.** Coronal image of the abdomen CT scan showing perforation

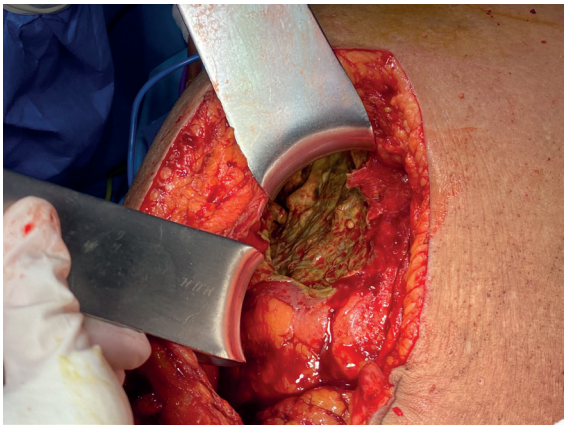

**Figure 3.** Intraoperative view of the lateral abdominal wall filled with fecal material

**Figure 4.** Image of the excised specimen along with fecal material

Fecal material was observed to have spread into the subhepatic space, crossed the peritoneum and fascia, and reached the right upper abdominal wall. We made an incision in the bulging of the patient's right upper quadrant of the abdomen, fecal material and pus were drained, and a penrose drain was placed through this incision directly into the abdominal cavity. After peritoneal lavage, we performed a right hemicolectomy (Figure 4) and end ileostomy surgery. Surgical drains were placed in the colectomy area and the pelvis.

The patient was transferred to the intensive care unit. She received high-dose vasopressors and broad-spectrum antibiotics and was monitored intubated, but unfortunately, she died in the 46th postoperative hour due to multiorgan failure.

Pathological examination of the colectomy specimen showed that there was a large (approximately 13 centimeters) perforation and necrosis on the anti-mesenteric site of the right colon macroscopically and chronic inflammation signs characterized by widespread demarcating ulcers and ischemic mucosal changes microscopically without the evidence of malignancy or infection.

### Case 2: Perforation of the Sigmoid Colon

A 91-year-old female patient was admitted to our emergency department with a complaint of abdominal pain that had been going on for about four days. She was conscious, cooperative, and responsive to stimuli.

The patient, who had only a known diagnosis of hypertension in her medical history, was using an antihypertensive drug consisting of a combination of angiotensin receptor blocker and thiazide diuretic once a day. According to her relatives, she had no history of abdominal surgery.

The patient's vitals were stable when he arrived at the emergency room; blood pressure was 125/76 mm Hg, and heart rate was 83 beats per minute (BPM). The WBC count was $6.6 \times 10^3/\mu L$, and her CRP level was 90 mg/L. On physical examination, there was widespread abdominal distention and tenderness.

An IV-CT showed that the rectum was dilated with feces and measured 8.5 cm in diameter at its widest point. Proximally, the colonic loops

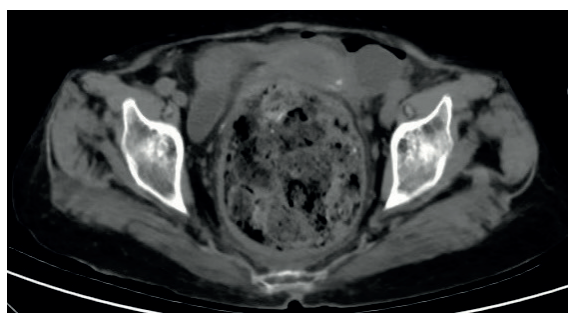

**Figure 5.** Axial image of the abdomen CT scan showing perforation

**Figure 6.** Coronal image of the abdomen CT scan showing perforation

were apparently distended with air. Due to the presence of free air in the abdomen, it was decided to perform an emergency laparotomy with the initial diagnosis of perforation (Figure 5 and Figure 6).

During the exploratory laparotomy, dilated colonic loops and widespread fecal impaction in the colonic segments were observed. A self-limited perforation area covered with a thick fibrous membrane was observed in the sigmoid colon, and it was associated with hard fecal impaction. No intra-abdominal fecal contamination was found. No masses or diverticula were observed in the colon segments. After irrigation of the abdomen with saline, it was decided to perform a loop colostomy. The accumulated fecal impaction was drained, and the distal segment was irrigated with saline. The perforation site was repaired and followed by proximal colostomy. A surgical drain was placed in the pelvis, and the operation was completed without complications. The patient was extubated and transferred to the general surgery ward.

Liquid food intake was allowed on postoperative day one when gas discharge occurred. Surgical drainage was serous and was removed on postoperative day two when the output decreased. After fecal discharge from the colostomy, the patient was discharged from the ward on postoperative day four.

## DISCUSSION

Stercoral perforation is rare, but it's a life-threatening condition. A study identified 1295 cases of patients who had laparotomy for a colorectal disease between 1993 and 1998, and the stercoral perforation was present in 0.5% and 3.2% of all colonic perforations identified during laparotomy. Another retrospective study published in 2022 examined 224 patients who underwent emergency laparotomy; the stercoral perforation rate was 17.4% (n=39) (5,6).

A systematic review published in 2013 identified 137 stercoral perforation cases, and the mean age was 62. It occurs primarily in elderly patients, but it can be seen in younger patients with risk factors associated with fecal impaction, comorbidities such as hypothyroidism, diabetes, renal failure, chronic opioid use, and being bedridden. The estimated overall mortality rate of stercoral perforation can be as high as 34% (1,3).

The incidence and prevalence of stercoral perforation are not well-established because there aren't any well-defined criteria for its diagnosis. In a study, reported criteria for stercoral perforation diagnosis are 1) Perforation at the anti-mesenteric wall of the colon, extending >1 cm in diameter, 2) Free stool in the abdomen and/or fecalomas within the colonic lumen, extending to the intra-abdominal space 3) Ulcer formation at the colonic wall and pressure related necrosis and an inflammatory reaction at the perforation site of the specimen (5).

The three most common anatomic locations of stercoral perforation are the apex of the sigmoid colon, the anti-mesenteric border of the rectosigmoid junction, and the anterior rectum. Perforation of the cecum was first reported in 1988; it is a very uncommon clinical entity. The most frequent symptoms are abdominal pain, acute abdominal tenderness, and signs of sepsis, such as hemodynamic instability, fever, and leukocytosis (1,4).

Our two cases highlight two major differences: the localization of the perforation and the prognosis. The first case was very rare because only a few right colon perforations are reported in the literature; on the other hand, in our second case, perforation occurred in the location where this event is most commonly reported in the literature.

Looking at the prognosis, our first patient lived only forty-six hours after the operation; she was being followed in an intensive-care unit, intubated, and in need of vasopressor drugs. Our second patient, however, was being followed up in the surgical ward and was discharged on the fourth day after fecal discharge from the loop colostomy. This major prognostic difference that affected the patient's mortality arises from the clinical condition of the patient at the time of admission, the severity of the perforation, and whether it causes fecal peritonitis or not.

In our first case, there was severe intra-abdominal fecal contamination caused by a wide 13 centimeters tear on the cecum wall, while the second patient had a self-limited perforation area on the sigmoid colon, covered by a fibrous membrane and omentum and there wasn't any sign of fecal contamination in the abdomen. These two major differences show us that if we better understand this entity's causes, mechanism, clinical findings, and consequences, we can predict the patient's prognosis much more accurately.

In conclusion, stercoral perforation of the colon is an uncommon condition that requires immediate surgery. Early diagnosis and appropriate surgical intervention are important to reduce mortality in these patients, who often have multiple comorbidities.

## Ethical approval

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Written consent to publish potentially identifying information, such as details of the case and photographs, was obtained from the patient.

## Author contribution

The authors confirm contribution to the paper as follows: Conceptualization: ME; Methodology: MZCS, CB, AY, ME; Formal analysis and investigation: MZCS, CB, AY, ME; Writing - original draft preparation: MZCS, CB, AY, ME; Writing - review and editing: MZCS, CB, AY, ME; Funding acquisition: MZCS, CB, AY, ME; Resources: MZCS, CB, AY, ME; Supervision: ME. All authors reviewed the results and approved the final version of the article.

## Source of funding

The authors declare the study received no funding.

## Conflict of interest

The authors declare that there is no conflict of interest.

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Journal of Trends in Medical Investigation

J Trends Med Invest 2025;1(1):30-35
https://doi.org/10.12345/jtmi.2025.7

Review

# A general overview of ethical issues encountered in rare diseases

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**ABSTRACT**

Rare diseases are diseases that are seen quite rarely in society with a prevalence of 1/2000. However, this prevalence varies from country to country. These diseases are serious, chronic, and reduce the quality of life and expectation. The lack of sufficient medical and scientific information about them prolongs the diagnosis process. The prolongation of the diagnosis period makes it difficult for the physician to make a diagnosis in the clinic, while the time works to the detriment of the patient. Since their drugs are not profitable drugs, their development has been neglected and they have been defined as orphan drugs. In addition to the difficulty of accessing drugs and the high costs, the difficulty of caring for these diseases brings psychological, social and economic burdens to the person or persons providing care to the patient. Such difficulties bring many ethical problems. In this study, some ethical issues encountered in rare diseases will be discussed.

**Keywords:** Rare diseases, health ethics accessibility of treatment, social justice

## Introduction

Diseases with a prevalence of less than 1 in 2000 are defined as rare diseases (orphan diseases). This rate, which usually affects children and is 80% genetic, can vary from country to country, so the rate of occurrence in society varies. For example, the rate of these diseases in France is 3 million, while it is around 25-30 million in Europe overall. These diseases, which affect multiple systems, manifest themselves with mental and physical disorders that reduce the quality of life. While the rate of occurrence in our country affects 5-8% of the society, 6-8% of the world is affected (1). This means that approximately 5-6.4 million people in our country and 473 million of the world's population suffer from this disease. Since these diseases are rare in societies, the difficulty of diagnosing them is experienced all over the world, and in this context, diagnosis and treatment centers are being opened to increase this awareness, especially in Europe and the United States. In addition, the lack of treatment options and limited access to these treatments increase mortality and morbidity (2). Although rare diseases are rare, they bring with them a lot of problems. The rarity of the disease causes physicians to be inexperienced about these diseases and causes time to be lost in diagnosis, limited or no treatments cause patients to have difficulty accessing treatment, studies on these diseases are still insufficient, especially when they are seen in children, parents who care for the child experience both psychological and economic difficulties, and ethical problems such as stigmatization in society arise (3). In 2018, the United Nations

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Received: 06.11.2024 ▪ Accepted 11.03.2025

published the "Rights of Individuals Living with Rare Diseases Document" regarding the rights of individuals with rare diseases. The document draws attention to the problems of individuals with rare diseases. These are the difficulties in diagnosis due to the lack of a well-organized infrastructure for these diseases, the lack of treatment for some diseases, the difficulty in finding medicine, the difficulty in providing care, and the difficulties these individuals experience in accessing health services. Therefore, many ethical problems arise in the context of human rights (4). These diseases, which reduce the patient's quality of life and life expectancy, also bring some ethical problems in the context of human rights with the difficulties they bring. This study will discuss some ethical issues caused by rare diseases (5).

## Difficulty in Diagnosis

Approximately 8000 rare diseases are seen in 1 in 2000 people. The number of people who meet this qualification is approximately 5 million in Turkey (6). Almost all pediatric and some adult cancers meet the definition of rare disease. The fact that clinicians do not have much information about these diseases causes these patients to apply to many health centers for a long time (7). The fact that their prevalence is quite low compared to other diseases, and that there is little participation in research to have more information about them and to develop drugs can leave physicians uninformed on this subject. Even if a physician suspects a rare disease, many tests will need to be performed on the patient, otherwise a wrong diagnosis will lead to wrong treatment and harm to the patient will be on the agenda. In addition, the lack of adequate testing environments in developing countries to make a full diagnosis and the lack of attention paid to these diseases by some governments will make it difficult for individuals with rare diseases (5). For example, diagnosing telomere disorders can be almost impossible for a clinician. It has been reported that rare diseases such as these are not taught in medical schools or are not emphasized much. This may be true for almost all rare diseases. The small number of patients and the fact that they are not taught as a subject in schools or not at all make it difficult for clinicians to diagnose these diseases. However, early diagnosis increases the patient's chance of survival and quality of life. An incorrect and/or delayed diagnosis worsens the prognosis and reduces the patient's chance of survival (1).

## Orphan Drugs

Rare diseases are a significant public health problem. The reason why drugs used in rare diseases are called Orphan Drugs is that pharmaceutical companies spend more money on the development and production of these drugs than on their marketing, meaning they do not bring profit. Pharmaceutical companies do not want to develop drugs unless they can make a profit from these drugs because the number of individuals with this type of disease is quite low. Therefore, this situation causes the price of orphan drugs to be high (8). The European Union has used this term for drugs developed for life-threatening and/or chronic diseases that are rare in society and do not bring profit. The reason why these drugs are called orphan is that their production has been neglected (9). Drug development is a very long and costly endeavor. This situation has become more difficult in orphan diseases. The very small number of patients, the wide geographical distribution of patients, the inability to make a complete and timely diagnosis in the clinic and the length of the diagnostic process, and the inability of pharmaceutical companies to make a profit because they will produce a limited number of drugs prevent the production of these drugs. Since it is not known exactly how orphan drugs are priced, they are called "black boxes". Due to their low prevalence and limited demand for drugs, it was impossible to produce these drugs in the United States (US). There were only 10 drugs in the 1970s. To encourage the production of these drugs, the Orphan Drug Act was passed in the US in 1983. This law included the following: 1)

7-year market exclusivity would be given to off-patent drugs used for rare diseases. 2) Credit opportunities would be provided for research and development expenses. 3) Elimination or reduction of procedural fees. 4) Applications for orphan drugs would be submitted to the FDA (Food and Drug Administration) for approval and designation as orphan drugs. 5) Research grants from the National Institutes of Health for drug development. The number of rare drugs increased with this law. However, the high prices of medicines and the problem of access to drugs continue. This is also considered problematic in terms of the principle of justice. In this context, policy makers recommend that more egalitarian laws be made in terms of justice (10). The lack of a globally accepted norm regarding the prevalence of rare diseases also prevents a global consensus. The principle of justice, one of the principles of medical ethics, generally deals with the distribution of health services. In the context of Human Rights, the principle of justice is concerned with all people accessing this service. However, orphan drugs pose an ethical dilemma in this regard. When we look at the texts where the principle of justice is divided into procedural, distributional and social subcategories, procedural justice deals with transparency in decisions taken; distributive justice deals with the fair distribution of limited resources; and social justice deals with treating people with the dignity and respect they deserve. The issue of orphan drugs falls outside these scopes. Therefore, all procedures from the development of orphan drugs to the determination of their prices should include transparency, and access to these drugs is important in terms of both social and distributive justice. In addition, the development of orphan drugs is also approached with a rights-based and egalitarian moral understanding. Since the utilitarian perspective aims at maximum benefit, there are concerns about the exclusion of rare diseases. The rights-based approach aims to meet the legitimate demands of the individual or group based on human rights. In this case, there should be a minimum right to health care for rare diseases (11). Article 35 of the Charter of Fundamental Rights of the European Commission on health care states: "Everyone has the right to access preventive health care and the right to benefit from medical treatment under the conditions determined by national laws and practices. A high level of human health protection shall be ensured in the definition and implementation of all Union policies and activities." (12). Alongside all these ethical discussions, the principle of "non-abandonment" is discussed. This approach is based on social moral obligations and the benevolence that is the basis of professional moral obligation.

**Improvement of Databases**

It is a necessity to have biobanks where information about patients with rare diseases will be collected. To develop orphan drugs and obtain more advanced information about the disease, patient data needs to be collected in a common database worldwide. However, the small number of patients also causes the patient data to be collected in the database to be small. In addition, patients may be concerned about the confidentiality of their data (13). However, the fact that each country has different laws prevents the collection of patient data in a common database. This practice brings with it many ethical issues regarding informed consent and confidentiality of patient data (14). In 1997, orpha.net, which currently provides services in 8 languages, provides information on clinical symptoms of rare diseases, orphan drugs, laboratory tests, research, and data. A database providing information about patient data, patient organizations, and institutes has been established (15).

**Functioning of Ethical Committees**

Some authors suggest the establishment of an ethics committee for rare diseases, while others may oppose it. While it is suggested that interdisciplinary ethics committees should be formed by the best experts in medicine, law and ethics, some authors argue that ordinary

individuals should also be included in the committee. However, in addition to all this, the approval of this ethics committee is required for a research and development to be conducted for rare diseases, and some authors have stated that the decision to be made by the committee takes years. Therefore, both the long duration of the research and the long duration of the decision will not be beneficial for the individual with a rare disease (16). Therefore, a systematic study should be conducted on the functioning of ethics committees, and bureaucratic problems should not prolong the process. The existence of an ethics committee ensures that the benefits of the volunteers are provided and prevents them from suffering any possible harm. The research process for rare diseases is both long and the number of patients is low. The fact that ethics approval takes years means a waste of economic resources allocated to research for these chronic, progressive, serious and life-threatening diseases. At the same time, a long wait can cause the death of the patient. In this context, the ethics committee should protect the volunteer's interests, but this situation may harm the volunteer (17). Ethics committees must include a person who is an expert in rare diseases. In addition to granting consent for the research to be conducted, they should control any activity that will put the participant at risk. Since the number of individuals with rare diseases is very small, these studies are successful with participants from other countries. However, the biggest problem in this situation is that these studies are conducted in developed countries and patients from developing countries are also needed. Developing countries may not have an ethics committee or ethical standards may not be followed strongly. In such a case, since international cooperation is needed in the field of ethics, there is a need for training of experts in the field of ethics and rare diseases in developing countries. Ethics committees should not only approve orphan drug research, but also determine new ethical rules and follow them (14).

**Patient-Physician Relationship**

Physicians will probably have a different relationship with individuals with rare diseases than the classical patient-physician relationship. Since the physician is knowledgeable about the disease and treatment, they may have a paternalistic attitude that is not considered ethically appropriate. However, the situation seems a bit different in rare diseases. While the physician is facing a patient who is an expert on the disease, he may not have any knowledge about the disease. Therefore, the physician should listen seriously to the patient who describes the symptoms of the disease in the clinic and evaluate every detail well. Rather than increasing the patient's participation in the treatment process, he can keep control of the treatment process (18).

**Genetic Screening**

While genetic screening performed on embryos, fetuses, newborns and adults has many benefits, it may also pose a risk of causing some eugenic approaches. In countries where health insurance is not guaranteed by the state, many problems can be encountered, ranging from insurance companies to the economic interests of the companies that work. Genetic screening on newborns can help with possible treatments for a rare disease that will be discovered, increasing the quality of life with early diagnosis and positively affecting prognosis, the risk of recurrence of these diseases in the future and helping individuals combat this risk, and taking precautions. There are discussions about prenatal tests, as the tests are 98% accurate, with a 1-2% risk of giving incorrect results and causing abortion of a healthy fetus. Preimplantation tests are performed by testing the embryo formed by in vitro fertilization (IVF) before pregnancy. If the embryo carries a genetic disease, pregnancy is prevented in advance. However, there are ideas that destroying the embryo, this structure that has the potential for life, could be the same as killing a person. It is not ethically appropriate

to expand preimplantation diagnosis to change the child's characteristics such as intelligence, gender, eye, hair, and skin color (5).

**Effects on Families**

Rare diseases are difficult to diagnose due to the lack of scientific data and prevalence, and they usually affect children. The long-lasting diagnosis process, the need to visit many laboratories and doctors negatively affect families psychologically. The serious symptoms of the disease, the painful treatments applied after the diagnosis, and in addition to all these, parents isolating themselves from social life due to their children's illness have devastating effects on parents psychologically. In addition to all these, the lack of scientific information and definitive treatments, difficulty in accessing orphan drugs, the unknown, the parent's inability to obtain clear information from the doctor about the disease, and the unknown emotionally weaken the parent who provides care for the child. The expenses incurred during the diagnosis process, the need for technological devices to provide home care, the mother quitting her job to provide care, the need for a professional for home care, being dependent on abroad to access orphan drugs, and the parent's absenteeism from work are all directly and directly negative economic effects. The process of providing care for a rare disease that has serious physical effects on the caregiver or parent also has negative physical effects on the caregiver. In summary, rare diseases impose psycho-social, physical and economic burdens on the caregiver (19).

**Conclusion**

Rare diseases are difficult to diagnose, have no definitive treatment and are a public health problem that brings with it a wide range of ethical issues. They are a public health problem and are also abnormal diseases that clinicians encounter. Lack of medical and scientific knowledge makes it difficult for physicians to diagnose these diseases in the clinic. Including more information about rare diseases in the curriculum of medical schools and providing physicians with training about these diseases at certain periods will increase the clinician's awareness of these diseases, prevent the diagnosis process from being prolonged and prevent harm to the patient. In this context, early diagnosis will increase the patient's quality of life and life expectancy. The emotional fatigue that the parent is experiencing should be evaluated by the physician in the clinic with empathy and it is ethically appropriate to keep the communication dynamic. International cooperation and incentives are definitely needed for the development of orphan drugs. For this, the necessary legal regulations of countries to increase the data in the database are again dependent on this international cooperation. It is essential to establish interdisciplinary ethics committees in countries, including professionals who are experts in their fields, with the primary aim of protecting the welfare of volunteers in research.

**Author contribution**

The author confirm contribution to the paper as follows: Review conception and design: ME; literature review: ME; draft manuscript preparation: ME. The author reviewed the results and approved the final version of the manuscript.

**Source of funding**

The author declare the study received no funding.

**Conflict of interest**

The author declare that there is no conflict of interest.

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