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COMPARISON OF FASCIOCUTANEOUS FLAPS AND GRACILIS MUSCLE FLAPS IN ISCHIAL PRESSURE ULCER RECONSTRUCTION

İSKİAL BASI ÜLSERLERİNİN ONARIMINDA GRASİLİS KAS FLEBİNİN FASYOKUTAN FLEPLERLE KARŞILAŞTIRILMASI

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Abstract

Aim: The reconstruction options for pressure ulcers have been widely reported, but there is still a need for ideal method in ischial pressure ulcer reconstruction. The aim of this study is to compare the development of recurrence and wound site complications and length of stay in two different patient groups who were treated for ischial pressure ulcers with a combination of gracilis muscle flap and fasciocutaneous flap procedures and those who were treated only with local fasciocutaneous flaps.

Methods: Between 2016 and 2022, a total of 34 patients with Grade 3 and 4 ischial pressure ulcers were analyzed retrospectively in the Plastic, Reconstructive, and Aesthetic Surgery Clinic of Çukurova University's Faculty of Medicine. Of this total patient group, 18 were treated with a combination of gracilis muscle flap and fasciocutaneous flap procedures (Group 1) and 16 were treated with local fasciocutaneous flaps (Group 2).

Results: The mean age of the patients was 39 in Group 1 and 44.5 in Group 2. Group 1 patients had a mean length of stay of 9 days, while those in Group 2 had a mean length of stay of 15 days. Early postoperative complications such as dehiscence and hematoma occurred in both patient groups. While complications occurred in 6 patients in Group 1 (33.3%), 7 patients experienced complications in Group 2 (43.8%).

Conclusions: Reconstruction of ischial pressure ulcers is very problematic due to high recurrence rates. Therefore, a wide range of repair options have been defined. Fasciocutaneous flaps may be insufficient to obliterate the dead space alone. In addition to a skin flap, gracilis muscle flap can be an effective option for the ischial cavity with better surgical outcomes.

Keywords: Ischial pressure ulcer, gracilis muscle flap, reconstruction

Öz

Amaç: Bası ülserlerinin onarımı için birçok seçenek rapor edilmekle birlikte iskial bası ülserlerinin onarımında hala ideal bir yöntem bulunmamaktadır. Bu çalışmanın amacı; iskial bası ülseri nedeniyle gracilis kas flebi ve fasyokutan flep kombinasyonuyla onarım yapılan ve sadece lokal fasyokutan fleplerle onarım yapılan iki ayrı hasta grubunun yara yeri komplikasyon gelişimi ve yatış süresi açısından karşılaştırılmasıdır.

Yöntemler: Çukurova Üniversitesi Tıp Fakültesi Plastik, Rekonstrüktif ve Estetik Cerrahi Kliniğinde, 2016-2021 yılları arasında grade 3 ve 4 iskial bası ülseri nedeniyle gracilis kas flebi ve fasyokutan flep kombinasyonu ile onarım yapılan 18 hasta (Grup1), lokal fasyokutan fleplerle onarım yapılan 16 hasta (Grup2) olmak üzere toplam 34 hasta retrospektif olarak incelenmiştir.

Bulgular: Hastaların yaş ortalaması Grup1'de 39, Grup 2'de 44,5'ti. Ortalama yatış süresi Grup1'de 9 gün iken, Grup 2'de 15 gündü. Hastalarda sütur ayrışması ve hematom gibi erken postoperatif komplikasyonlar gelişti. Grup1'de 6 hastada komplikasyon gelişirken (%33,3), Grup2'de 7 hastada komplikasyon gelişti (%43,8).

Sonuç: iskial bası ülserlerinin onarımı yüksek nüks oranları nedeniyle oldukça sorunludur. Bu nedenle onarımda çok sayıda seçenek tanımlanmıştır. Tek başına fasyokutan fleplerle yapılan onarımlar iskial bölgedeki bası ülseri poşunu doldurmada yetersiz kalabilir. Gracillis kasını iskial poşa yerleştirip üzerine fasyokutan fleplerle kombine etmek erken postoperatif komplikasyonları ve nüks gelişimini azaltmak için dikkate alınması gereken bir seçenektir.

Anahtar Kelimeler: İskial bası ülseri, gracilis kas flebi, rekonstruksiyon

Introduction

Pressure sores develop as a result of ischemic damage to the skin and subcutaneous tissues caused by constant exposure to external pressure and friction[1]. Although early-stage pressure sores can be treated with conservative methods, those in advanced stages such as Grades 3 and 4 are treated with surgery. In these patients, the principles of surgical treatment include complete excision of the ulcer and bursa, removal of infected bones or bones that may cause future pressure, and covering of the region with well-blooded tissue[2]. Recurrence rates vary widely in long-term follow-up after surgical treatment[3,4]. The development of recurrence, which can be explained by a variety of factors that vary depending on the wound and the patient, has an impact on the life quality of patients and continues to be a significant issue for the health system due to rising costs.

In the sitting position, the ischial tuberosity is the area that is exposed to the most pressure, and ischial pressure sores are common in patients who spend a lot of time in wheelchairs[5,6]. There are numerous surgical options for closing ischial pressure sores, including V-Y advancement flaps, perforator flaps, gluteus maximus, gracilis, hamstring muscle flaps, and free flaps[7-10]. There is no ideal method, and each method has advantages, disadvantages, and varying rates of recurrence[11]. In the literature, a wide variety of muscle flaps are used in the surgical treatment of pressure sores to fill the dead space. The aim of this study is to investigate whether the gracilis muscle flap, which is used to fill the dead space in addition to the traditional fasciocutaneous flaps in the reconstruction of ischial pressure ulcers, causes changes in the recurrence rates and length of stay.

Materials and Methods

The study was conducted in accordance with the Helsinki Declaration principles. The ethics committee approval was granted on 09.07.2021 by the Çukurova University Faculty of Medicine Clinical Research Ethics Committee (meeting:113, decision:52). 34 patients who underwent surgery for ischial pressure ulcer between January 2016 and January 2022 were retrospectively evaluated from the medical records and surgical logbooks. All patients underwent surgery in the Plastic Reconstructive and Aesthetic Surgery Clinic at Çukurova University's Faculty of Medicine. All patients participating in the study provided written consent. Patients with ischial pressure ulcers who were treated with a combination of gracilis muscle flap and fasciocutaneous flap procedures during this period were classified as Group 1, and patients who only received fasciocutaneous flaps were classified as Group 2. Etiological and demographic characteristics of the patients, repair methods, development of dehiscence in the early postoperative period, and length of stay were recorded. The patients in the two groups were compared in terms of complications developed and the length of stay. Patients with poor health condition and a short life expectancy were excluded from the study.

- *Operation technique*

All the patients had received conservative treatment with antibiotherapy before the operation. The operations were performed in the prone position under general anesthesia. First, the ulcer and bursa were completely excised. Bony spurs were softened if necessary. Gracilis muscle was identified from its origin, then detached from its insertion point through a distal thigh skin incision. Gracilis was dissected to the main pedicle, then transposed to ischial cavity under the subcutaneous tunnel (Figures 1-2). The muscle was passed through the tunnel and sutured to fill the dead space (Figures 3-4).

The muscle was sutured appropriately by covering it using a fasciocutaneous flap procedure such as V-Y advancement,

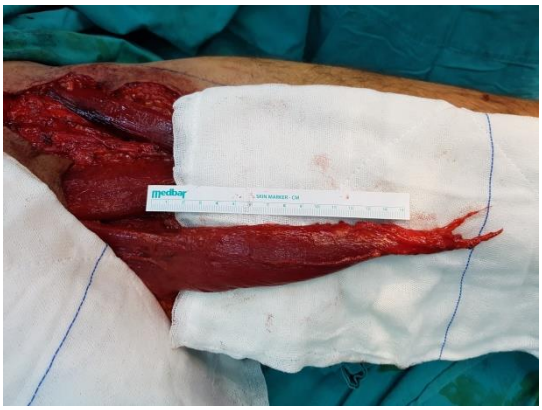

Figure 1. Preparation of the gracilis muscle flap

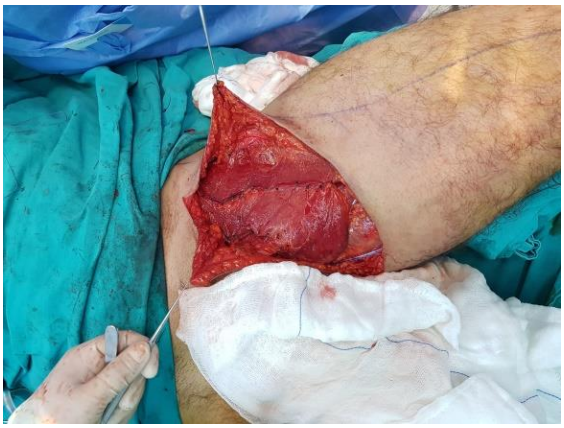

Figure 4. Suturation of the muscle

Figure 2. Donor site of the gracilis muscle flap

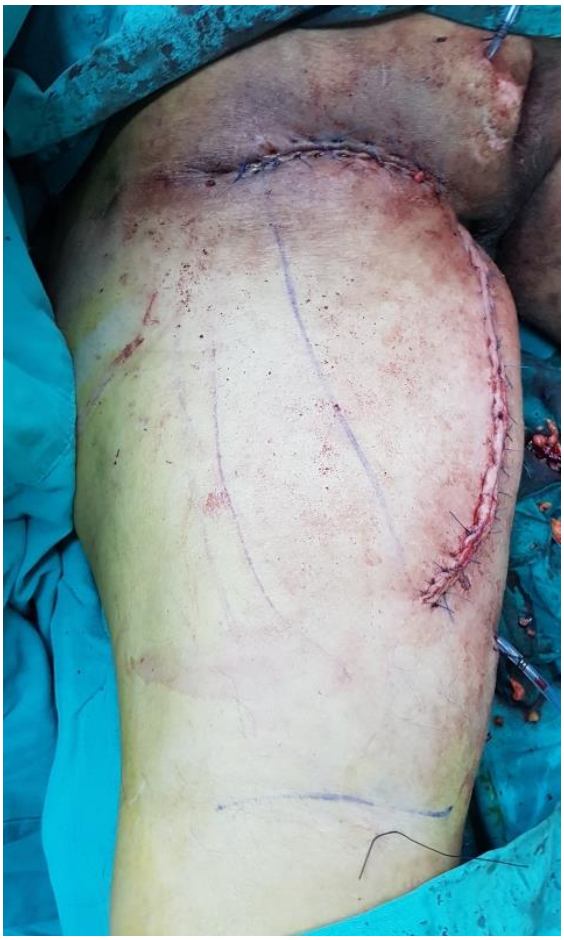

Figure 5. Covering the muscle flap with fasciocutaneous rotation flap

Figure 3. Filling the dead space with the muscle flap

hatched, SGAP (superior gluteal artery perforator), and IGAP (inferior gluteal artery perforator) (Figure 5).
A hemovac drain was placed under the flap and in the donor area. In Group 2 patients, the reconstruction was performed using only fasciocutaneous flaps without the gracilis muscle.
A standard diet program was applied after surgery. The patients were positioned appropriately to prevent pressure on the flap in the postoperative period. While hospitalized, the patients were checked for early complications with twice-daily visits. They were evaluated at 1 week, 1 month, 3 months, and 6 months outpatient clinic controls after discharge.

- *Statistical analysis*

Data were analyzed using the IBM SPSS 25.0 program. The assumption of normality was accepted when the skewness and kurtosis values of the variables were between -1.5 and +1.5 (B.G. Tabachnick, L.S. Fidell Using Multivariate Statistics (sixth ed.) Pearson, Boston, 2013).
The Mann Whitney U test was used to determine whether the non-normally distributed variables differed by group in terms of their medians. Medians and quartiles are used as representations (shown as Median (1st Quartile-3rd Quartile) (Field, A. 2013. Discovering statistics using IBM SPSS statistics. Sage).
Fisher Exact statistics were used if the expected number of observations was less than 5, and Yate's statistics were used if it was between 5 and 25.

Results

Eighteen of the 34 patients in the study (52.9%) were in Group 1, and 16 (47.1%) were in Group 2. The overall F/M ratio was 13/21. The etiological data of the patients are listed in Table 1. The median age values were 39 and 44.5 for Group 1 and 2, respectively, and no statistically significant difference in median age was found between the groups (p=0.31). The median length of stay durations were 9 and 15 days for Group 1 and 2, respectively, and no statistically significant difference in median length of stay duration was found between the groups (p=0.01). The duration of hospitalization of the patients in Group 2 was longer than Group 1. Suture dehiscence and recurrence were seen in 6 patients (33.3%) in Group 1, and 7 patients (43.8%) in Group 2. In this respect, no statistical difference was found between the two groups (Table 2).

Table 1. General Patient Characteristics

	Group 1	Group 2	Total
Number of Patients	18 (52.9)	16 (47.1)	34 (100)
Sex (F/M)	6/12	7/9	13/21
Etiology			
• Traffic accident	6	7	13 (38.2)
• Fall from height	6	1	7 (20.6)
• Meningomyelocele	3	3	6 (17.6)
• Cerebrovascular incident	2	2	4 (11.8)
• Occupational accident	0	2	2 (5.9)
• Vertebral mass	1	1	2 (5.9)

Table 2. Analysis of Quantitative Variables

	Group 1	Group 2	
Age	39 (28.5-53.25)*	44.5 (38.25-56.75)*	p=0.31 U=64.5
Length of Stay	9 (6.75-12)*	15 (10.25-21.5)*	Z=-2.75 p=0.01
Sex	n (%)	n (%)	
• Male	12 (66.7)	9 (56.3)	x2=0.07
• Female	6 (33.3)	7 (43.8)	p=0.79a
Complications	n (%)	n (%)	
• No	12 (66.7)	9 (56.3)	x2=0.07
• Yes	6 (33.3)	7 (43.8)	p=0.79a

a; Yate's Statistics, * Median (1st quartile-3rd quartile), the $p<0.05$ value was accepted as significant.

Discussion

There are a variety of reasons why treatment of pressure sores in the ischial region is more difficult than in the sacral and trochanteric regions. Pressure sores in the sacral and trochanteric regions occur in the supine position, whereas pressure sores in the ischial region occur as a result of sitting for a long time. In the sitting position, the pressure on the ischial region is greater than the pressure on the sacral region in the supine position[11,12]. In other words, the ischial region is exposed to a greater burden. Because the dead space in the ischial region is larger than in other areas, infection is more prevalent in this region[3]. Furthermore, contamination and maceration with urine and feces are more common due to anatomical susceptibility[13]. Due to these disadvantages, surgeons often look for different flap options in the reconstruction of ischial pressure sores. The most commonly used flaps are fasciocutaneous, musculocutaneous, and, more recently, perforator flaps. Fasciocutaneous flaps are considered by some to be insufficient to fill the dead space in the ischial region and some argue that moving muscle to the region will provide sufficient volume to fill the dead space and that richer vascularity can control infection[9,14]. Indeed, muscle flaps can be a good option for closing the dead space and controlling infection in pressure ulcers with deep pouches[15]. In general, hamstring and gluteus maximus muscle flaps are preferred in this region[9,14,16,17].

The rich vascularity of muscle flaps provides an advantage; however, these flaps have been questioned due to studies showing that the muscle atrophies significantly over time[18,19]. Loss of muscle function is disadvantageous in non-paraplegic patients[20]. Experimentally, compression of musculoskeletal flaps causes tissue hypoxia, resulting in muscle necrosis without skin necrosis[21]. For these reasons, there is still no consensus about whether muscle flaps should be used in the reconstruction of pressure sores[22].

In the present research, gracilis muscle flaps together with other fasciocutaneous flaps were preferred in the reconstruction of ischial pressure sores. As a long muscle, the gracilis provides sufficient volume to fill the dead space. The preparation of the muscle flap is simple. It is possible to cut the distal insertion region with a small incision in the distal thigh after locating the

proximal part, pass the muscle through the tunnel, and fill the defect easily. Since this procedure does not cause extensive scar development, it will not limit future flap options. Also, blood loss is minimal.
Muscle reconstruction was carried out using a fasciocutaneous hatched flap, V-Y thigh flap, or IGAP flap. There was no difference between the groups in terms of suture dehiscence and recurrence in the early postoperative period. However, the length of stay was shorter in patients on whom muscle flaps were used. Restoration was easier when there was suture dehiscence in the muscle flap group due to the fact that the muscle filled the dead space, allowing the fasciocutaneous flap to adapt to the defect more easily. When suture dehiscence and recurrence developed in the group treated using only fasciocutaneous flaps, the dead space could not be filled completely, and secondary procedures become difficult. The belief is that the long length of stay in Group 2 is related to this situation.
The limitations of this study are that it is retrospective, and the accuracy of the study depends on the accuracy of the medical records. Furthermore, the presence of more than one surgeon, the fact that flap choice was determined by the surgeon, and the inability to standardize factors such as nutrition and antibiotic prophylaxis of the patients before the surgery are other disadvantages of the study. Moreover, a further disadvantage of the technique used in this research is that in some patients, the tone and volume of the gracilis muscle may have been insufficient.

Conclusion

Reconstruction of ischial pressure ulcers is very difficult due to high recurrence rates. The gracilis muscle flap can be considered an alternative option in this type of reconstruction because it is a simple technique that causes minimal donor site morbidity and does not limit future flap options.

Author contributions

All authors contributed to the study conception and design. All authors read and approved the final manuscript.

Conflict of interest

The authors declare that they have no conflict of interest.

Funding

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Ethical approval

This study, in which patients participated on a voluntary basis, was conducted in accordance with all ethical procedures /standards and the Declaration of Helsinki.
The study was approved by the Çukurova University Faculty of Medicine Clinical Research Ethics Committee (09.07.2021, meeting:113, decision:52)

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