

The Use of Groin Flap for Hand Defects: Which Should Be Prior, Free or Pedicled, Based on Patient-Reported Outcomes?

El Defektleri İçin Kasık Flebinin Kullanımı: Serbest veya Pediküllü, Hasta Bildirim Sonuçlarına Göre Hangisi Öncelikli Olmalı?

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Öz

Amaç: Pediküllü kasık flebi, eldeki geniş defektlerin çoğu için standart bir flep olarak önerilmiştir. Kasık flebini serbest flep olarak kaldırmak da mümkündür. Geniş el defektleri olan hastalarda pediküllü ve serbest kasık flebi rekonstrüksiyonlarını hasta bildirim sonuçlarına göre retrospektif olarak karşılaştırmayı amaçladık.

Hastalar ve Yöntem: 2013-2020 yılları arasında ellerindeki geniş defektler nedeniyle pediküllü veya serbest kasık flebi yapılan 16 hasta bu çalışmaya dahil edildi. Çalışma retrospektif klinik anket çalışması olarak gerçekleştirildi. Hastalar pediküllü kasık flebi grubu (n=8) ve serbest kasık flebi grubu (n=8) olmak üzere iki gruba ayrıldı. Hastalar 2 yıl takip edildi. Hastalara postoperatif dönemde DASH ve SF-36 testleri uygulandı.

Bulgular: Pediküllü flep uygulanan hastaların yarısında ciddi dirsek ve omuz ağrısı vardı ve fizik tedavi gerektirdi. Yara iyileşmesi serbest kasık flebi grubunda anlamlı olarak daha erken tamamlandı (p<0,05). Pediküllü grupta ortalama hastanede kalış süresi serbest flep grubundan (sırasıyla 21 gün ve 13 gün) daha uzundu ve bu istatistiksel olarak anlamlı değildi. DASH skorları pediküllü flep grubunda subakut ve kronik evrede 92 ve 72 iken, serbest flep grubunda sırasıyla 52 ve 24 bulundu (p=0,012 ve 0,002). SF-36 skorlarına göre pediküllü flep grubunda fiziksel fonksiyonlar anlamlı olarak bozulmuştu (p < 0.001).

Sonuç: Kasık flebinin serbest flep olarak transfer edilmesi ile omuz ve dirsek eklemi ile ilgili problemler ortadan kalktı, el rehabilitasyonuna daha erken başlanabildi ve günlük işlere dönüş süresi kısaldı. Eğer kasık flebi tercih edilecekse, serbest stil ilk olarak gözönüne alınmalıdır.

Anahtar Kelimeler: El yaralanmaları, pediküllü flep, serbest flep.

Abstract

Aim: A pedicled groin flap has been offered as a standard flap for most of the large defects in the hand. Raising the groin flap is also possible as a free flap. We aimed to compare the pedicled and free groin flap reconstructions in patients with large hand defects based on patient-reported outcomes, retrospectively.

Patients and Methods: Sixteen patients who had groin flaps pedicled or free for the large defects of their hands were included in this study between 2013-2020. This study was performed retrospectively clinical survey work. Patients were divided into two groups: the pedicled groin flap group (n=8) and the free groin flap group (n=8). Patients were followed for 2 years. The patients were subjected to DASH and SF-36 tests in postoperative period.

Results: Half of the patients with pedicled flaps had serious elbow and shoulder pain and required physical therapy. The wound healing was completed significantly earlier in the free groin flap group (p<0.05). The DASH scores were found to be 92 and 72 in the subacute and chronic stages in the pedicled flap group, whereas 52 and 24 were found in the free flap group, respectively (p = 0.012 and 0.002). According to SF-36 scores, physical functions were impaired significantly in the pedicled flap group (p < 0.001).

Conclusions: By transferring the groin flap as a free flap, the problems related to shoulder and elbow joints have disappeared, hand rehabilitation could be started earlier, and the time to return to daily work was shortened. So, if the groin flap is preferred, free style should be considered first.

Keywords: Hand injuries, pedicled flap, free flap.

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INTRODUCTION

Most of the large defects in the hand required vascularized coverage because they exposed tendons and bones. In flap selection for soft tissue reconstruction, the size and site of the injury, other accompanying traumas, the age of the patient, and the patient's comorbidities should be considered (1). Physical therapy plays an important role in hand injuries. A healthy soft tissue reconstruction is also essential for the success of the postoperative physical therapy program (2). Therefore, the importance of the flap method chosen for soft tissue and skin cover is increasing. Local flaps are often insufficient to cover large tissue defects. Distant and free flaps are more preferred in these indications (1).

McGregor and Jackson described the groin flap in 1972. Since that time, this flap has been offered as a standard procedure for covering large hand defects (3, 4). But, sometimes, immobilization of the upper extremity because of this procedure caused serious elbow and shoulder pain and disability and hindered appropriate positioning and a physiotherapy program. A groin flap is possible to transfer as a free flap in the same indications. The main disadvantages of free flaps compared to pedicled flaps are that they require microsurgical equipment and skills and are time-consuming surgery. Although the free groin flap was described as the first free flap in the literature, the use of this flap was halted by the assertion of some technical difficulties at the time. Recently, the free groin flap has been popularized again by being named a Superficial Circumflex Iliac Perforator (SCIP) flap because of the thin flap, the most hidden donor site, and technical advancements (5, 6).

We aimed to compare pedicled and free groin flap patients in terms of patient comfort, functional recovery of the hand, and duration of hospital stay.

PATIENTS AND METHODS

Patients

This study included sixteen patients who had large defects in their hands and reconstructed the soft tissues with groin flaps (pedicled or free) between 2013-2020. This study was planned as a retrospective clinical survey work. The Local Clinical Research Ethic Committee approved the conduct of this study (No: 2020-110). Patients were informed about the study and consented voluntarily. They were split into two groups: the pedicled groin flap group (PGF), which had eight patients ($n = 8$), and the free groin flap group (FFG), which also had eight patients ($n = 8$).

Except for one patient, the hand defects were linked to traumatic injuries such as vehicle and industrial accidents. One patient had severe palmar skin burn contracture. In eight patients, hand defects were covered with a pedicled groin flap, while the others received a free groin flap. Groin flap reconstructions were performed immediately in 13 patients and late in 3 patients.

Surgical Technique

Skin and soft tissue coverage of large tissue defects in the hand were performed with pedicled or freely raised flaps raised from the groin area. The operations were performed by the same two teams, especially in the free flap. While the first team was preparing the recipient vessel for free flaps in addition to the necessary procedures on the hand (debridement, fracture fixation, tendon, and nerve repairs, etc.), the second team performed flap raising.

When the groin flap was planned as a pedicle, the pedicle was left as long as possible to allow a more comfortable hand position. The pedicle was tubed. The SCIA origin was found on the femoral artery medially before raising the flap, which was raised as a free flap. In both groups, the sartorius fascia was included so that the deep branch remained on the flap at the ASIS level. When it was raised as a free flap, the superficial inferior epigastric vein was found by first entering the incision parallel to the inguinal ligament, at the level of the femoral artery and its medial one. The vein was followed inferiorly to the place where it opened into the saphenous vein. This vein was used instead of the comitant vein for anastomose. By reaching the femoral artery medially from the lateral side of this vein, the artery that may belong to the flap was seen from the femoral side (Figure 1). Afterward, the flap was raised laterally and joined to the medial exploration area (Figure 2). The recipient's vessels were the radial artery and superficial vein in the snuff box. Two team approaches were usually performed. One team repaired the injured structures in the hand, such as tendon, bone, and nerve, and prepared the recipient vessels, while the other team was working on the flap. SCIA and comitant vein calibers between recipient vessels were well matched. Vessel anastomoses were performed end to end fashion (Figure 3).

Evaluation of Patients and Questionnaire Study

Patients' wound healing and wound problems were compared. When the epithelization was finished, wound healing was approved. Wound complications, such as dehiscence and infection, were discussed.

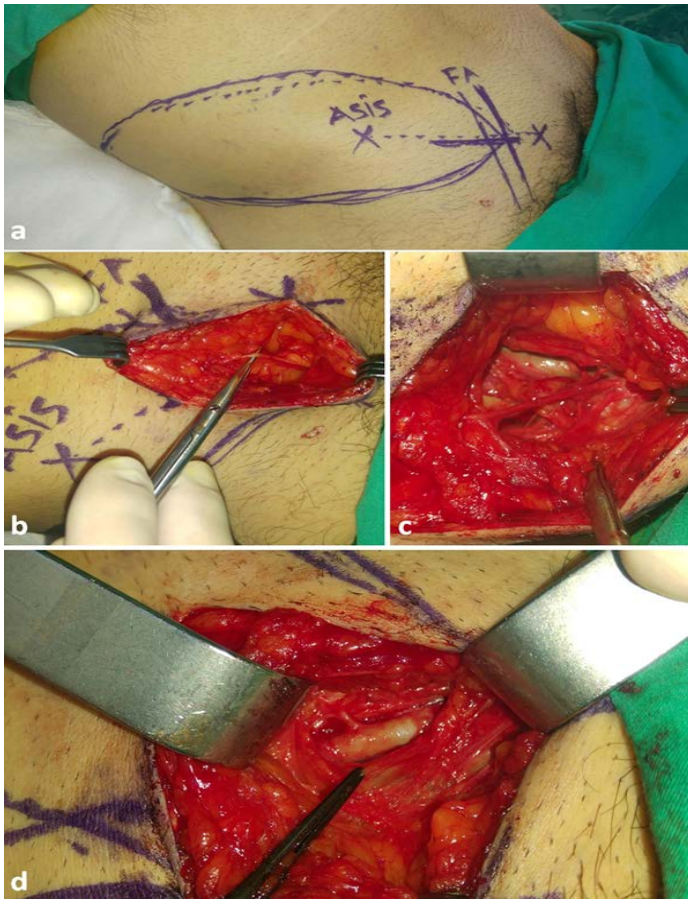


Figure 1. Marking the anatomic landmarks and flap boundaries of the groin flap for freestyle (a) superficial epigastric vein dissection until the saphenous bulb (b, c) and revealing the SCIA arising from the femoral artery (d).

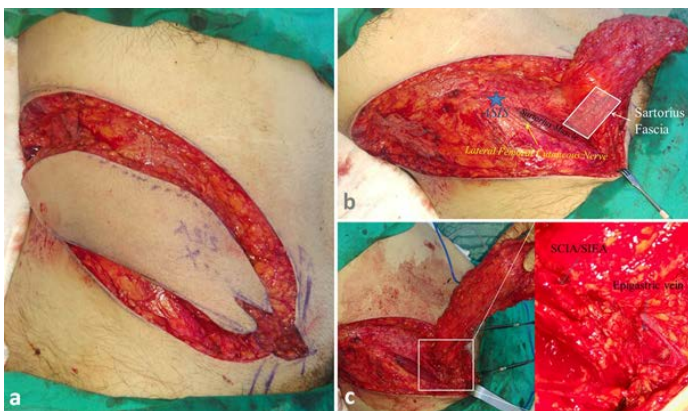


Figure 2. Raising the the free groin flap after pedicle dissection (a). Sartorius fascia should be included in to the flap beginning from ASIS (b). View after completing the dissection (c).



Figure 3. A patient with a crush injury in the hand, including the wrist joint (a, b). A free groin flap was used to cover the skin defect after bone stabilization and tendon and nerve repair. Early postoperative view (c) late postoperative view of the hand and donor site (d, e, f).

Following the postoperative period, the patients were given DASH and SF-36 tests. The SF-36 test was used to assess general patient comfort in the early postoperative period. At the first and sixth months after surgery, a DASH test was performed to evaluate shoulder, elbow, and hand problems. The Visual Analogue Scale (VAS) was used to assess pre- and postoperative pain, and which days the patients could walk and sit in the toilet without pain and required a second person for daily work were asked.

Statistical Analysis

The arithmetic mean, standard deviation, standard error, median, and mode values of the dataset were calculated to produce descriptive statistical analyses. The Shapiro-Wilk statistical test was used to determine the normal distribution of continuous data, and the Levene test was used to determine homogeneity control between variances ($p > 0.05$). Because the data from the two groups had a sample size of less than 12, and in addition, the most independent group comparisons did not show a normal distribution or homogeneity, the Mann-Whitney U test was used. The Kruskal-Wallis H test and Bonferroni post-

Table. Demographics of patients and perioperative informations .

Flap group	Age	Gender	Operation time	Hospital stay	Pedicle division	Wound healing	Wound infection	Wound dehiscence
		(min.)*		(day)	time (day)	time (day)*	*	*
Pedicled	61	K	125	30	40	40	+	+
Pedicled	67	E	150	40	30	61	+	+
Pedicled	49	E	105	15	25	35	-	-
Pedicled	55	K	120	38	31	52	+	+
Pedicled	56	E	115	28	32	43	+	+
Pedicled	20	E	130	7	25	34	-	-
Pedicled	66	E	90	6	21	15	-	-
Pedicled	23	E	70	4	28	20	-	-
Free	32	E	280	9	0	17	-	-
Free	22	E	230	10	0	26	-	-
Free	20	K	260	11	0	19	-	-
Free	21	E	245	13	0	20	-	-
Free	56	E	345	21	0	23	-	-
Free	13	E	270	14	0	18	-	-
Free	55	E	360	23	0	25	-	-
Free	34	E	250	8	0	15	-	-

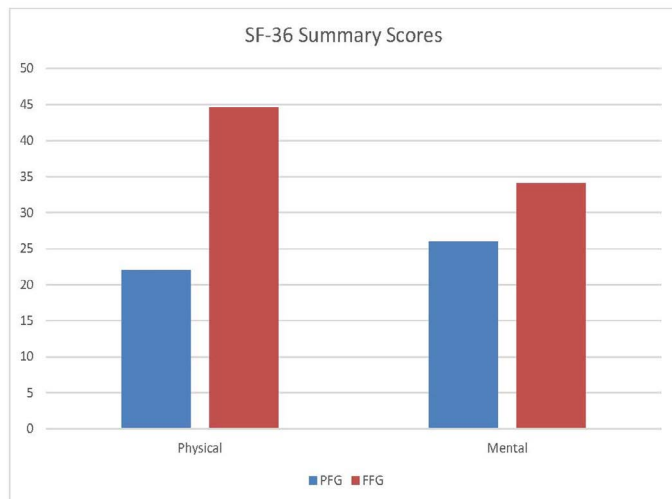
*: p<0,05

hoc corrections were used when comparing more than two independent groups. The collected data were statistically analyzed using the SPSS software package (Statistical Packages for Social Sciences, 29.0, Windows). For all tests, the significance level was set at $\alpha=0.05$.

RESULTS

The demographics and perioperative information

are given in Table. The mean age of patients was 49 in the pedicled flap group and 31 in the free flap group. All flaps survived in both groups. The mean pedicle division time was 29 days in PFG. The wound healed at the 38th day and the 20th day in PGFG and FFG, respectively, and the difference was significant ($p = 0.027$). The complication related to the flap was not seen in FFG, but wound dehiscence and infection were seen in four patients in PFG. The average



PFG: Pedicled Groin Flap Group, FFG: Free Groin Flap Group

Physical: $p<0,05$, Mental: $p>0,05$

Figure 4. SF-36 Summary scores in Pedicled and Free Groin Flap Groups.

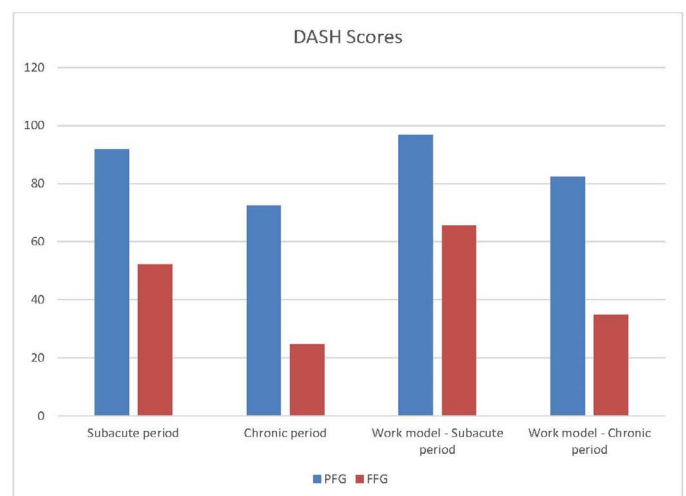


Figure 5. DASH scores in pedicled and free flap groups. DASH scores were decreased in PFG subacute and chronic period including work model with significant ($P<0,05$).

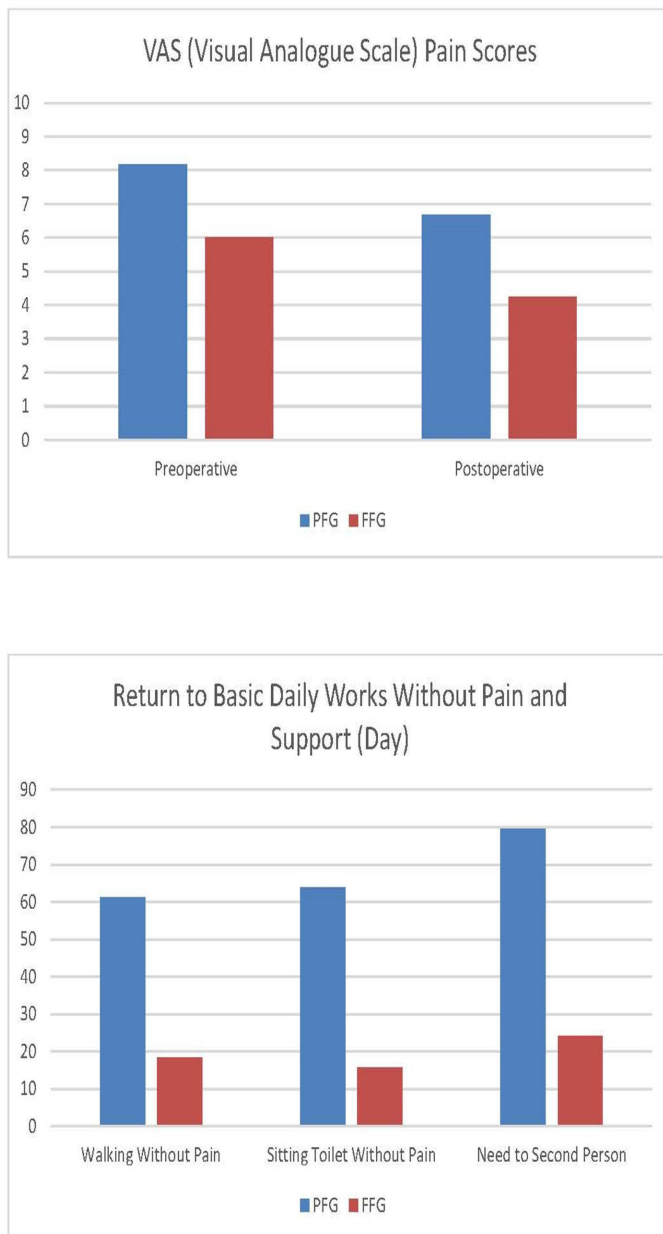


Figure 6. Visual Analogue Scale pain average scores increased in PFG compared to FFG with insignificant ($P > 0,05$). But the return the daily works without pain and support was significantly decreased in FFG compared to PFG ($P < 0,05$).

hospital stay in PFG was higher than in FFG (21 and 13.6 days, respectively), but the difference was not statistically significant ($p > 0.05$). The mean duration of operation was significantly shorter in PFG (113 min.) than in FFG (280 min.) ($p < 0.001$).

Half of the patients with pedicled flap had serious elbow and shoulder pain because of immobilization

of the upper extremity. ROM disabilities which are required physical therapy at the shoulder and elbow were also seen. This result was verified with DASH questionnaire. DASH score was found 92 and 72 in subacute and chronic stage in PFG, whereas 52 and 24 in FFG respectively ($p=0.012$ and $p=0.006$). In the work model of DASH, the score was found 96 and 65 in the subacute period in PFG and FFG respectively ($p=0.001$). In the chronic period, score was 80 in PFG and 34 in FFG and the difference was so significant ($p=0.004$) (Figure 4).

The patient's comfort in the early postoperative period related to surgical procedures was evaluated with the SF-36 quality of life test. The average of physical function score was 22 in PFG versus 44,6 in FFG, and the difference was significant ($p = 0.002$). The mental function score was lower in the PFG, but this was not significant ($p > 0.05$) (Figure 5). The mean VAS score was higher postoperatively in the PFG than in the FFG, but the difference was insignificant ($p > 0.05$).

The number of days a second person was needed for daily work was 79 in PFG and 24 in FFG ($p = 0.02$). Sitting in the toilet and walking without pain were started on the 63rd and 61st days in PFG and on the 15th and 18th days in FFG, respectively, with significance ($p = 0.01$ and $p = 0.02$) (Figure 6).

DISCUSSION

Distant flaps are preferred in the reconstruction of large tissue defects in the hand, where local flaps are not sufficient. Although the use of free flaps has increased recently, the widespread use of pedicled groin flaps continues for hand soft tissue defects (3, 4, 7). Although the free groin flap is described as the first flap in the literature, surgeons quit preferring this flap because of some technical difficulties such as a short pedicle, a small caliber of artery, and variations in the vasculature. But it is repopularized because of lower donor site morbidity, with the generous skin donor region allowing primary closure and the most effective hiding of the scar in the body (8). We also use the pedicled groin flap in our clinic for large hand defects. However, the problems that arise with the use of this flap with the pedicle have recently encouraged us to transfer this flap freely. We mostly prefer a groin flap when a free flap is required as a skin cover in the body. The fact that the least donor site problem is effective in this preference In fact, this flap was used to close the donor site of other free flaps (9, 10).

No study has been found in the literature comparing

the effect of pedicled or free transfer of the inguinal flap for hand defects on patient comfort and hand functionality. The most important limitation in the free transfer of this flap is the need for microsurgery and the long operation time because of the tough dissection of the pedicle (short, small, and variable vessel anatomy) (6,11). In our study, FFG operation time was found to be significantly longer than PFG. For this reason, we transferred the flap to the pedicle in patients who we thought could not tolerate the long operation time. This group consisted mostly of elderly patients with additional problems. Therefore, the mean age of both groups was so different (PFG:49 vs FFG:31). The pedicle of the flap was prepared to form a tube in PFG. In the FFG, the problem of pedicle shortness was tried to be overcome by keeping the skin island long. Raising the flap with this method, the handicaps of variational conditions can be eliminated, and operation time can be shortened in comparison with the literature. However, the operation time was found to be significantly higher when compared with the pedicled flap. In their study, Wood and Irons found that the duration of operation was 5.37 hours in various free flap transfers and 2.76 hours in the pedicled group (12). No circulatory disturbance was found in any of the flaps. In a meta-analysis of upper extremity reconstruction with a free flap, arterial and venous problems were found to be 5% and 8%, respectively (13).

Another problem with the groin flap is the bulkiness because of the adipose tissue, especially in overweight people (14). Therefore, in our study, the thinning procedures were required in both groups. As in the study by Ince et al. (15), procedures to reduce the fat tissue of the flap during the free style, may eliminate the need for seconder flap thinning.

Wound healing was significantly shorter in FFG compared to PFG. Thus, this contributed positively to both the short hospital stay and the initiation of the physical therapy program. When evaluated in terms of postoperative complications, wound dehiscence, and infections were all seen in PFG. These complications resulted in delayed wound healing and a prolonged hospital stay. In a meta-analysis examining the studies on upper extremity reconstruction with a free flap, infection was found to be 7%, hematoma 6%, seroma 6%, and wound dehiscence 7% (16).

The short duration of hospital stays is desirable both in terms of cost and patient psychology. The significant decrease in the length of hospital stays in FFG motivated us to choose this method more. In

the study comparing it with a pedicle groin flap using various free flaps, the length of hospital stay was found to be 13 days in the free flap group and 19 days in the pedicle flap group (12).

Restriction of the movement of the upper extremity in PFG is an important problem, especially in elderly individuals (3). In half of the patients, serious problems were encountered in the elbow and shoulder regions due to restrictions other than the injury area in the hand. Physical therapy programs had to be applied to the shoulder and elbow regions in order to eliminate the limitations. With the inclusion of hand injuries, a significant increase in DASH scores was encountered in subacute and chronic periods. In a study, the median DASH score was found to be 11.5 in patients who underwent reconstruction of hand defects with a pedicled groin flap (16). In the same study, 39% of the patients developed hand stiffness due to restriction, and the patients could be given physical therapy one week later than after the separation of the pedicle. There was only one study investigating the change in the quality of life-related to a free groin flap. In the study evaluating the cases where oral defects were reconstructed, the quality of life was mostly evaluated in terms of oral functions.

In addition, it was observed that the quality-of-life studies related to the reconstructions performed in the upper extremity and especially in the hand were very limited. In our study, hand and upper extremity problems were evaluated with the DASH score, and the effect on life comfort was evaluated with the SF-36. SF-36 summary scores were evaluated in two main categories: physical and mental. While the mean physical score was found to be significantly lower in PFG compared to FFG, the mean mental score was low in PFG but not statistically significant. This shows that the negative psychological effects of surgical trauma on patients are similar in both groups. From this, it can be concluded that physical status and mental status are not always correlated in patients. Although the postoperative early pain status was higher in the PFG group, there was no significant difference between the groups. In this respect, there is a similarity between mental scores and pain status. It can be said that pain may be effective in improving the psychological state of the patient. In the study where free flap reconstruction was performed in the upper extremity, it was concluded that pain was negatively correlated with DASH and SF-36 tests (17).

The questioning of the walking and sitting toilet, which are among the basic daily functions, was made

by comparing two different techniques recommended for the pilonidal sinus (18). We wanted to question the effect of the choice of flap method on the quality of life from a different perspective by adding the time that the patient was independent in her/his daily work and did not need the help of a second person to these questions. PFG showed a significant delay in painless walking and sitting on the toilet ($p < 0.05$). The need for the support of a second person in daily work was found to be significantly reduced in FFG. It is inevitable that the increase in difficulty in performing daily basic functions will result in a decrease in the quality of life.

Among the limiting factors of the study are the fact that it is retrospective, the homogeneity between the groups is low, and the number of patients is less.

In conclusion, by transferring the groin flap as a free flap, the problems related to shoulder and elbow joints have disappeared, and early hand rehabilitation could be started. DASH and SF-36 scores verified this. Return to daily work was also started earlier, and postoperative patient comfort was found to be better in free groin flap patients. These findings should be considered if the groin flap choices for reconstruction and the circumstances force the transfer of the groin flap as free in terms of patient comfort.

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