CASE SERIES

The free medial femoral condyle periosteal flaps for the treatment of recalcitrant upper limb long bones nonunion

Ali Özdemir, M.D.,[1] Egemen Odabaşı, M.D.,[2] Mehmet Ali Acar, M.D.[3]

[1]Department of Hand Surgery, Gazi Yaşargil Training and Research Hospital, Diyarbakır-*Türkiye*

[2]Department of Orthopaedics and Traumatology, Bolvadin State Hospital, Afyon-*Türkiye*

[3]Department of Orthopaedics and Traumatology, Selçuk University Faculty of Medicine, Konya-*Türkiye*

ABSTRACT

BACKGROUND: Recalcitrant fracture non-union is a condition that is difficult to treat and may require multiple surgeries, sometimes requiring treatment with periosteal flaps. The use of periosteal flaps can be preferred for the treatment of non-unions that do not yet have extensive bone defects. This study aims to share our experience with medial femoral condyle periosteal flap for the treatment of recalcitrant non-union in long bones of the upper limb.

METHODS: Seven patients who underwent treatment for upper limb non-union with a free medial femoral condyle periosteal flap between 2015 and 2019 were retrospectively evaluated. Patients who had previously underwent implant revision and non-vascular grafting procedures and with failed atrophic non-union were included in the study. Non-union was in the humerus in two patients, ulna in three, radius in one, and clavicula in one patient. Demographic data, non-union features, complications, and radiographic findings of the patients were evaluated. Functional results were evaluated according to Quick Disabilities of Arm, Shoulder, and Hand (Q-DASH) scores.

RESULTS: Mean patient age was 41 (23–60) years and the mean follow-up time was 33 months (16–56). Non-union time ranged from 9 to 24 months. Additional surgical procedures were not required. One patient developed a hematoma in the donor site and required surgical drainage. Medial collateral ligament injury of the knee occurred in one patient. Union was observed in all patients in an average of 3 (2–7) months. Mean pre-operative Quick Disabilities of Arm, Shoulder, and Hand (Q-DASH) score was 56 (33–95), while mean post-operative control Q-DASH score was 5 (0–33); the improvement was statistically significant (p=0.017). The functional outcomes of all patients improved, as confirmed by Q-DASH score.

CONCLUSION: The medial femoral condyle periosteal flap offers a viable treatment option for recalcitrant non-unions. This flap has low comorbidity compared to other flaps and is a feasible option for revascularization and bone formation in atrophic non-unions.

Keywords: Free periosteal flaps; medial femoral condyle periosteal flaps; non-unions.

INTRODUCTION

Recalcitrant bone non-union is a severe problem with difficult treatment. Defects where the non-union area is smaller than 5 cm can be treated with non-vascularized grafts, however, fractures together with severe soft-tissue damage, fracture sites that have previously been applied radiotherapy to, and infected fracture sites indicate poor vascularization and are difficult to treat.[1] In these cases, vascularized bone grafts are standard treatment that should be preferred in recalcitrant non-unions.[1,2]

As vascularized bone grafts are rich in osteocytes and osteoblasts, they accelerate biological healing by producing rapid graft consolidation.[3] By increasing the blood supply to the fracture site, it allows healing factors to reach the fracture site, preventing infection. It also decreases the risk of osteopenia by causing an increase in bone mass. As a result, it

Cite this article as: Özdemir A, Odabaşı E, Acar MA. The free medial femoral condyle periosteal flaps for the treatment of recalcitrant upper limb long bones nonunion. Ulus Travma Acil Cerrahi Derg 2022;28:1347-1352.

Address for correspondence: Ali Özdemir, M.D.
Gazi Yaşargil Eğitim ve Araştırma Hastanesi, Ortopedi ve Travmatoloji Kliniği, Diyarbakır, Türkiye
Tel: +90 412 - 258 00 60 E-mail: aozdmr@hotmail.com

Ulus Travma Acil Cerrahi Derg 2022;28(9):1347-1352 DOI: 10.14744/tjtes.2021.25032 Submitted: 18.09.2020 Accepted: 04.05.2021

has been shown in many studies that vascularized bone grafts are biologically and biomechanically superior to non-vascularized bone grafts. It also decreases the risk of osteopenia by increasing bone mass. Accordingly, many studies have shown that vascularized bone grafts are biologically and biomechanically superior to non-vascularized bone grafts.[4]

Vascularized fibula flaps, among the most widely used vascularized bone grafts, are the gold standard for the treatment of defects larger than 5 cm.[3,5] It is generally used for large defects that develop after tumor resection. Non-vascularized grafts and refixation are primarily preferred for the treatment of smaller defects. Periosteal flaps may be preferred for defects that are not large and in which recalcitrant non-union is observed despite multiple operations.[1,4]

Regarding periosteal flaps, free medial femoral condyle periosteal flaps (FMFCP) are commonly preferred in patients with defects that do not require extensive soft-tissue dissection and with low donor site morbidity. Because they are more flexible and they can be wrapped around tubular bones, they provide an advantage in small defects.[6,7] In this study, we aimed to present the radiological and clinical results of patients who had undergone FMFCP for the treatment of atrophic recalcitrant non-union in long bones of the upper limb.

MATERIALS AND METHODS

Seven patients who underwent treatment with FMFCP flap in our clinic between January 2015 and January 2019 were retrospectively evaluated. The study was approved by the local ethics committee and was conducted in accordance with the ethical standards of the 1975 Declaration of Helsinki revised in 2008.[8] Patients who had atrophic non-union in upper limb bones and had previously unsuccessful treatment modalities were selected for FMFCP flap surgery procedure. Patients with carpal bones and other small bone non-unions were excluded from the study. All surgical procedures were performed by the senior author. Patient demographics, location of non-unions, mechanism of injuries, additional injuries, complications, follow-up times, and long-term radiographic and clinical outcomes were evaluated. Clinical outcomes were evaluated using the Quick Disabilities of the Arm, Shoulder, and Hand (Q-DASH) score.[9] Post-operative radiography was routinely performed 1 month, 2 months, and 6 months after surgery and when clinically necessary. Surgical history, flap survival, bone union after flap surgery, and time to achieve union were evaluated in all patients. The bridging of three cortices on two viewed radiographs was considered bone union. The non-union period was defined as the time from the injury to the surgery with FMFCP flap.

Surgical Technique

Patients were placed in supine position. FMFCP flaps were harvested from the contralateral extremity. The non-union site was prepared before flap harvesting. In the presence of surgical implanted objects, such as plates, in the non-union site, they were removed. Subsequently, bone borders were debrided, and if there were bone defects, bone grafts obtained from the iliac crest were placed in the non-union site. Then, fracture was fixed with a 3.5 mm or 4.5 mm plate screw system (Truemed Medikal, Istanbul, Turkey).

Flap harvesting began after performing necessary interventions such as debridement and implant exchange. A tourniquet was placed around the thigh without draining blood from the limb. A curved incision was made directly over the medial femoral condyle, extending from the mid-thigh to the level of the patella. If an osteocutaneous flap was planned, the skin perforator was identified with a handheld Doppler probe (Dopplex SD2, Huntleigh Healthcare Ltd., Cardiff, UK) before tourniquet inflation; then, the skin incision could be planned. We retracted the vastus medialis anteriorly to identify the descending genicular vessels (Fig. 1). The periosteal branches were dissected. The required graft size was drawn on the femoral condyle. The joint surface and medial collateral ligament were preserved during all procedures. To prevent damage to the periosteal branches, the flap was carefully harvested (Fig. 2). By following the saphenous branch to the subcutaneous level and with the flap, the skin island was harvested from the medial knee and thigh. At this stage, the tourniquet was deflated, and

Figure 1. A picture of descendent genicular artery dissection.

Figure 2. A picture of the harvested free medial femoral osteoperiosteal flap.

Figure 3. Here, we can see a placed FMFCP flap on the non-union side.

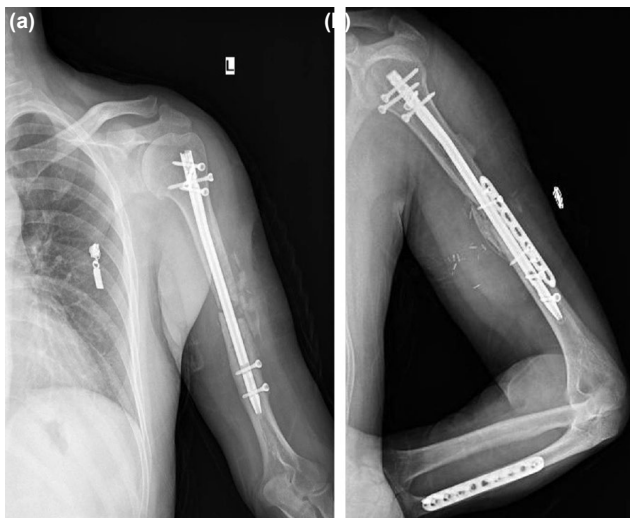

Figure 4. Pre-operative non-union **(a)** and post-operative bone union **(b)** radiographs of a humeral non-union.

we waited until flap circulation was observed. During this period, the recipient veins and artery were prepared. The flap was harvested and placed on the non-union site using non-absorbable sutures (Fig. 3). Then, microvascular anastomosis was performed and flap circulation was checked. The wound was closed after managing hemorrhage and placing the drain.

Post-operative Care and Rehabilitation

Although there is no consensus on post-operative anticoagulant medication,[10] 5000 IU heparin was routinely administered after the anastomosis. On the 2nd day and 3 weeks postoperatively, 4000 IU enoxaparin sodium was prescribed to prevent thrombosis. We restricted movement through the use of an arm sling or long-arm splint for the first 2 weeks postoperatively. Then, passive and active joint motion exercises were gradually begun. Load-bearing exercises were permitted after bone union.

Statistical Analysis

Pre-operative and post-operative Q-DASH scores were com-

Table I. Demographic and clinical data of patients

Case No.	Gender	Age	Location of nonunion	Mechanism of injury	Additional injury	Comorbidities	Smoking	Number of previous surgeries	Non-vascularized bone grafts	Secondary debridements
1	Male	57	Clavicula	Traffic accident	None	COPD	Yes	2	1	No
2	Male	37	Humerus	Traffic accident	None	None	Yes	3	2	1
3	Male	24	Ulna	Traffic accident	Ipsilateral radius fracture	None	No	2	1	No
4	Male	23	Ulna	Industrial accident	Ipsilateral radius and femur fracture	None	Yes	2	1	No
5	Male	47	Radius	Traffic accident	Ipsilateral ulna fracture	None	Yes	3	1	1
6	Male	60	Ulna	Gun shot	Ipsilateral radius fracture, pin and ulnar nerve palsy	Type 2 DM	No	4	2	1
7	Male	39	Humerus	Traffic accident	Ipsilateral radial nerve palsy	None	Yes	2	1	No

COPD: Chronic obstructive pulmonary disease; DM: Diabetes mellitus; ORIF: Open reduction internal fixation.

pared with the related samples Wilcoxon signed-rank test for data without normal distribution[11] and paired samples t-test was used to assess data with normal distribution.[12] P<0.05 was considered statistically significant.

RESULTS

A total of seven cases were evaluated in this study. All patients were male, and the mean age at the time of surgery was 41 years (range: 23–60). Mean follow-up time was 33 months (range: 16–56). All non-unions were atrophic, and the duration of non-union ranged from 9 to 24 months. All patients had previous attempts at debridement with or without antibiotic bead placement, and all underwent rigid fixation with or without non-vascularized bone grafts before vascularized grafting. One osteoperiosteal flap with a skin island was used for humeral non-union reconstruction. The osteoperiosteal flaps were used for three ulnar, one radial, two humeral, and one clavicular recalcitrant non-union. All non-union sites healed primarily without complications in an average period of 3.4 months (range: 2–7) (Figs. 4a and b). The mean pedicle length was 11±1 cm. No additional procedures were required for bone union. Hematoma developed in the donor site of only one patient and required surgical drainage. Knee medial collateral ligament injury occurred in one patient and was repaired during flap surgery. Functional outcomes of all patients improved as verified using the Q-DASH score. The preoperative Q-DASH score was 56 (range: 33–95) and postoperative follow-up Q-DASH score was 5 (range: 0–33); the difference between preoperative and postoperative scores was statistically significant (p=0.017). Data related to patient demographics, comorbidities, additional injuries, injury mechanism, previously attempts for non-union treatment, and smoking history are presented in Table 1. Clinical results of the patients are presented in Table 2.

DISCUSSION

The combination of modern fixation equipment and bone grafts harvested from the iliac crest can effectively resolve approximately 90% of non-union cases.[13] The lack of adequate vasculature at the fracture site continues to be a major problem in atrophic avascular non-unions, illustrating the much lower success rate with traditional techniques. Conventional techniques (decortication of the fracture tip, pedaling, or drilling) to revascularize the fracture site are unreliable. Electrical stimulation, ultrasound stimulation, and high-energy extracorporeal shock waves have shown good results in hypertrophic non-unions, but there is less chance of success in the presence of atrophic non-unions or a large interstitial space. Percutaneous autogenic bone marrow injection and different osteoinductive molecules (TGF-β, BMP, or PDGF) are promising in the treatment of non-unions but are still used with inconclusive results.[14–17]

The use of free periosteal flaps was first described by Finley et al. in 1978[18] and revealed the canine costa periosteum by dissecting the intercostal artery and vein pedicle. It has been advocated that it has osteogenic capacity. In the following years, it was reported that different periosteal regions may have different osteogenic potential.[19] In another study, the iliac crest periosteum was demonstrated with the iliacus muscle using a deep circumflex iliac artery and vein pedicle, defined as a musculoperiosteal flap, and applied to the pretibial region.[20] The mean time until callus formation was 6 weeks. Iliac crest, distal humerus, costa 10, and distal femur medial condylar periosteal flaps have been used in the treatment of non-union, avascular necrosis, osteoradionecrosis, and osteomyelitis.

The FMFCP flap was described by Sakai et al. in 1991[21] and published in a case series of six patients. The descending genicular artery, a branch of the femoral artery, forms the flap pedicle. Unlike other periosteal flaps, it comprises of harvesting a thin layer of cortical bone with an osteotomy, not just the periosteum. Since it aims to protect the cambium layer between the periosteum and cortex, the Sharpey's fibers can be preserved in this layer, which enter the bone as a bundle from the periosteum. Therefore, the main purpose is to protect the osteogenic activity underneath the periosteum. Many

Table 2. Clinical results

Case no	Nonunion time (months)	Follow up time (months)	Complications	Preoperative Q-DASH score	Postoperative Q-DASH score	Union time (months)
1	24	56	None	66.7	0	7
2	18	24	Hematoma on donor side	50	0	3
3	10	48	None	33.3	0	2
4	9	36	None	33.3	0	2
5	11	32	MCL injury on donor side	66.7	0	3
6	23	18	None	95	33.3	4
7	14	16	None	50	0	3

MCL: Medial collateral ligament; Q-DASH: Quick Disabilities of Arm, Shoulder and Hand.

case series have reported the bone union time as 8 weeks.[21] One study that compared the superiority between periosteal and corticoperiosteal flaps reported that there was no significant difference.[22]

In another study, bone union was observed in three recalcitrant clavicle non-unions treated with FMFCP flap.[23] Muramatsu et al.[24] treated 10 humerus non-unions with FMFCP flap and reported average bone union time of 4 months in nine cases, while one case was a failure. They reported paresthesia in the graft harvest site in three cases. Choudry et al.[7] reported the outcomes of 11 cases, in which eight patients achieved bone union in an average of 3.8 months. Non-union was observed in the three remaining patients, and these patients had an infection in the surgical site, and one patient had a secondary infection due to chemotherapy. In another study of six patients, bone union was reported in an average of 11 weeks. Complications were observed in one patient 3 weeks postoperatively, which was a fracture of the donor femoral condyle.[25] Pelzer et al.[26] treated four patients who had soft-tissue problems with non-union by performing osteoperiosteal-cutaneous flap using a skin perforator of the saphenous branch of the genicular artery; none of the cases were failures. Hypoesthesia, seroma, hematoma, medial collateral ligament instability, and supracondylar femoral fracture have been reported as donor site morbidities.[7,23–25]

Del Piñal et al.[27] used MFC periosteal flap in the treatment of five recalcitrant non-unions of the upper limb. All of the grafts were treated without complications and radiographic healing was observed in all bones in <3 months. Three patients achieved normal range of motion, and two had functional range of motion with only mild restrictions. Rodríguez-Vegas et al.[28] demonstrated similar success rates in a larger case series and supported De Smet's findings[25] in treating 25 non-unions and small bone defects that did not respond to conventional therapy. These studies have demonstrated that the MFC corticoperiosteal flap is a successful option for revascularization with almost complete union rates.

In patients with small defects (<3 cm), the use of MFC flaps may prevent the use of larger grafts such as fibular or iliac free flaps. Vascularized MFC corticoperiosteal free flaps are increasingly being used to treat smaller defects with excellent results. Compared to vascularized fibular and iliac free grafts, the use of MFC flaps has many advantages.[29,30] These procedures are relatively simple in technical aspects and yield better cosmetic results. In addition, flap pedicle length provides an advantage in terms of consistent anatomy as well as minimizing donor site morbidities such as joint stiffness, instability, toe contracture, and peroneal nerve injury.[6,31]

This study has some limitations. This is a retrospective case series that included only seven patients without a comparable group, and non-unions were evaluated in different bones. In addition, we could not make a direct comparison between pre-operative and post-operative functional outcome scores. Despite these limitations, we were able to demonstrate the efficacy of vascularized medial femoral condyle corticoperiosteal grafts as a reliable reconstructive tool in the treatment of recalcitrant upper extremity non-union with minimal patient morbidity.

Conclusion

Medial femoral condyle osteoperiosteal flap provides a viable treatment option for non-unions. This flap provides new blood supply, periosteum, and cortical and spongious bone supply for atrophic non-unions, and healing can be achieved in only a few months. We believe that this flap is a reliable option for the treatment of recalcitrant non-union, but further randomized controlled trials are still needed to obtain more evidence.

Informed Consent: Written informed consent was obtained from the patients for the publication of the case report and the accompanying images.

Peer-review: Internally peer-reviewed.

Authorship Contributions: Concept: M.A.A.; Design: M.A.A.; Supervision: M.A.A.; Data: A.Ö., E.O.; Analysis: A.Ö., E.O.; Literature search: A.Ö., E.O.; Writing: A.Ö., E.O., M.A.A.; Critical revision: M.A.A., A.Ö., E.O.

Conflict of Interest: None declared.

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

REFERENCES

1. Weiland AJ. Current concepts review: Vascularized free bone transplants. J Bone Joint Surg Am 1981;63:166–9. [CrossRef]
2. Wood MB. Free vascularized fibular grafting 25 years' experience: Tips, techniques, and pearls. Orthop Clin North Am 2007;38:1–12. [CrossRef]
3. Masquelet A. Muscle reconstruction in reconstructive surgery: Soft tissue repair and long bone reconstruction. Langenbecks Arch Surg 2003;388:344–6. [CrossRef]
4. Shaffer JW, Davy DT, Field GA, Bensusan JS, Kellis GJ. The superiority of vascularized compared to nonvascularized rib grafts in spine surgery shown by biological and physical methods. Spine 1988;13:1150–4. [CrossRef]
5. Goldberg V, Shaffer J, Field G, Davy D. Biology of vascularized bone grafts. Orthop Clin North Am 1987;18:197–205. [CrossRef]
6. Rogers SN, Lakshmiah SR, Narayan B, Lowe D, Brownson P, Brown JS, et al. A comparison of the long-term morbidity following deep circumflex iliac and fibula free flaps for reconstruction following head and neck cancer. Plast Reconstr Surg 2003;112:1517–25. [CrossRef]
7. Choudry UH, Bakri K, Moran SL, Karacor Z, Shin AY. The vascularized medial femoral condyle periosteal bone flap for the treatment of recalcitrant bony nonunions. Ann Plast Surg 2008;60:174–80. [CrossRef]
8. Williams JR. The declaration of helsinki and public health. Available at: https://www.wma.net/what-we-do/medical-ethics/declaration-of-helsinki/. Accessed Aug 29, 2022.
9. Beaton DE, Wright JG, Katz JN, Group UE. Development of the QuickDASH: comparison of three item-reduction approaches. J Bone Joint Surg Am 2005;87:1038–46. [CrossRef]
10. Lecoq JP, Senard M, Hartstein G, Lamy M, Heymans O. Thromboprophylaxis in microsurgery. Acta Chir Belg 2006;106:158–64. [CrossRef]

11. Rey D, Neuhäuser M. Wilcoxon-signed-rank test. In: International Encyclopedia of Statistical Science. Berlin, Heidelberg: Springer; 2011. p. 1658–9. [CrossRef]
12. Hsu H, Lachenbruch PA. Paired T test. Vol. 6. Encyclopedia of Biostatistics; 2005.
13. Healy WL, White GM, Mick CA, Brooker AF Jr., Weiland AJ. Nonunion of the humeral shaft. Clin Orthop Relat Res 1987;219:206–13. [CrossRef]
14. Yoshida A, Yajima H, Murata K, Maegawa N, Kobata Y, Kawamura K. Pedicled vascularized bone graft from the medial supracondylar region of the femur for treatment of femur nonunion. J Reconstr Microsurg 2009;25:165–70. [CrossRef]
15. Biedermann R, Martin A, Handle G, Auckenthaler T, Bach C, Krismer M. Extracorporeal shock waves in the treatment of nonunions. J Trauma Acute Care Surg 2003;54:936–42. [CrossRef]
16. Garnavos C. Treatment of aseptic non-union after intramedullary nailing without removal of the nail. Injury 2017;48:S76–81. [CrossRef]
17. Schroeder JE, Mosheiff R. Tissue engineering approaches for bone repair: Concepts and evidence. Injury 2011;42:609–13. [CrossRef]
18. Finley JM, Acland RD, Wood MB. Revascularized periosteal grafts--a new method to produce functional new bone without bone grafting. Plast Reconstr Surg 1978;61:1–6. [CrossRef]
19. van den Wildenberg FA, Goris RJ, Nolthenius-Puylaert MC. Free revascularised periosteum transplantation: An experimental study. Br J Plast Surg 1984;37:226–35. [CrossRef]
20. Satoh T, Tsuchiya M, Harii K. A vascularised iliac musculo-periosteal free flap transfer: A case report. Br J Plast Surg 1983;36:109–12. [CrossRef]
21. Sakai K, Doi K, Kawai S. Free vascularized thin corticoperiosteal graft. Plast Reconstr Surg 1991;87:290–8. [CrossRef]
22. Vegas MR, Delgado P, Roger I, Carosini R. Vascularized periosteal transfer from the medial femoral condyle: Is it compulsory to include the cortical bone? J Trauma Acute Care Surg 2012;72:1040–5. [CrossRef]
23. Fuchs B, Steinmann SP, Bishop AT. Free vascularized corticoperiosteal bone graft for the treatment of persistent nonunion of the clavicle. J Shoulder Elbow Surg 2005;14:264–8. [CrossRef]
24. Muramatsu K, Doi K, Ihara K, Shigetomi M, Kawai S. Recalcitrant posttraumatic nonunion of the humerus: 23 patients reconstructed with vascularized bone graft: 23 patients reconstructed with vascularized bone graft. Acta Orthop Scand 2003;74:95–7. [CrossRef]
25. Luc D. Treatment of non-union of forearm bones with a free vascularised cortico-periosteal flap from the medial femoral condyle. Acta Orthop Belg 2009;75:611–5.
26. Pelzer M, Reichenberger M, Germann G. Osteo-periosteal-cutaneous flaps of the medial femoral condyle: A valuable modification for selected clinical situations. J Reconstr Microsurg 2010;26:291–4. [CrossRef]
27. Del Piñal F, García-Bernal F, Regalado J, Ayala H, Cagigal L, Studer A. Vascularised corticoperiosteal grafts from the medial femoral condyle for difficult non-unions of the upper limb. J Hand Surg Eur Vol 2007;32:135–42. [CrossRef]
28. Rodríguez-Vegas J, Delgado-Serrano P. Corticoperiosteal flap in the treatment of nonunions and small bone gaps: Technical details and expanding possibilities. J Plast Reconstr Aesthet Surg 2011;64:515–27. [CrossRef]
29. Hamada Y, Hibino N, Kobayashi A. Expanding the utility of modified vascularized femoral periosteal bone-flaps: An analysis of its form and a comparison with a conventional-bone-graft. J Clin Orthop Trauma 2014;5:6–17. [CrossRef]
30. Bakri K, Shin AY, Moran SL. The vascularized medial femoral corticoperiosteal flap for reconstruction of bony defects within the upper and lower extremities. Semin Plast Surg 2008;22:228–33. [CrossRef]
31. Anthony JP, Rawnsley JD, Benhaim P, Ritter EF, Sadowsky SH, Singer MI. Donor leg morbidity and function after fibula free flap mandible reconstruction. Plast Reconstr Surg 1995;96:146–52. [CrossRef]

OLGU SERİSİ - *ÖZ*

Üst ekstremite inatçı kırık kaynamaması tedavisinde serbest periostal medial femoral kondil flebinin kullanılması

Dr. Ali Özdemir, Dr. Egemen Odabaşı, Dr. Mehmet Ali Acar

[1]Gazi Yaşargil Eğitim ve Araştırmra Hastanesi, El Cerrahisi Kliniği, Diyarbakır
[2]Bolvadin Devlet Hastanesi, Ortopedi ve Travmatoloji Kliniği, Afyon
[3]Selçuk Üniversitesi Tıp Fakültesi, Ortopedi ve Travmatoloji Anabilim Dalı, Konya

AMAÇ: İnatçı kırık kaynamaması tedavisi zor, birden çok cerrahi gerektirebilen, bazen periost flepleriyle tedavi gerektirebilen bir durumdur. Periost flepleri kullanımı henüz yaygın olmayan kemik defekti bulunmayan kaynamalar için tercih edilebilen bir yöntemdir. Bu çalışmanın amacı, üst ekstremite uzun kemiklerin inatçı kaynamamalarının tedavisi için medial femoral kondil periost flebi ile ilgili deneyimimizi sunmaktır.

GEREÇ VE YÖNTEM: 2015–2019 yılları arasında üst ekstremitede kemik kaynamaması olan serbest medial femoral kondil periosteal flep ile tedavi edilen yedi hasta geriye dönük değerlendirildi. Daha önce implant revizyonu ve nonvasküler greftleme işlemleri yapılmış ve başarısız olunmuş atrofik kaynamama görülen hastalardan oluşmaktadır. Bunların ikisi humerus, üçü ulna, biri radius ve biri klavikula daydı. Hastaların demografik verileri, kaynamama özellikleri, komplikasyonları ve radyografik bulguları değerlendirildi. Fonksiyonel sonuçlar kol, omuz ve el skorlarına göre değerlendirildi.

BULGULAR: Ortalama yaş 41 (23–60), ortalama takip süresi 33 aydı (16–56). Kaynamama süresi 9–24 ay arasında değişiyordu. Ek cerrahi prosedüre gerek duyulmadı. Bir hastanın donör bölgesinde hematom gelişti ve cerrahi drenaj gerektirdi. Bir hastada diz medial kollateral bağ yaralanması meydana geldi. Hastaların hepsinde ortalama üç aylık bir sürede (2–7) kaynama görülmüştür. Ameliyat öncesi Q-DASH skoru 56 (33–95) ve ameliyat sonrası kontrol Q-DASH skoru 5 (0–33) idi ve istatistiksel olarak anlamlıydı (p=0.017). Tüm hastaların fonksiyonel sonuçları, kol, omuz ve eldeki engellerle doğrulandığı üzere iyileşmiştir.

TARTIŞMA: Medial femoral kondil periosteal flep inatçı kaynamama durumlarında tercih edilen bir tedavi seçeneği sunar. Bu flep, diğer fleplere göre komorbiditesi düşük, atrofik kaynamamalarda yeniden kanlanma ve kemik oluşumu için uygun bir seçenektir.

Anahtar sözcükler: Kaynamama; medial femoral kondil periostal flebi; serbest periost flepleri.

Ulus Travma Acil Cerrahi Derg 2022;28(9):1347-1352 doi: 10.14744/tjtes.2021.25032