Available online at www.sciencerepository.org

Science Repository

Case Report

Radial artery perforator propeller flap for the posterior interosseous artery flap donor site closure

Janis Zarins MD[1], Vadims Nefjodovs MD[1], Dzintars Ozols MD[1] and Kalvis Pastars MD[1]*

[1]*Department of Hand and Plastic Surgery, Microsurgery Centre of Latvia, Riga Eastern University Hospital, Latvia*

ARTICLE INFO

Article history:
Received 5 August, 2018
Accepted 20 August, 2018
Published 29 August, 2018

Keywords:
hand trauma
soft-tissue defects
propeller flap

ABSTRACT

Introduction: The posterior interosseous artery flap (PIAF) has been used for many years for a successful coverage of the defects of dorsal aspect of the hand. Recently a concern was raised regarding donor site morbidity, as skin grafting has poor functional and aesthetic outcomes. We present a case report with an alternative technique for the donor site closure with radial artery perforator propeller flap. So far, we have used this technique in 4 cases.

Case report: A 50 years old male was hospitalized due to a crush injury to the right hand. Examination revealed fractures of 4th and 5th metacarpal bone, crashed intrinsic muscles, rupture of extensor tendons and 5x7 centimeters soft tissue defect. Bone fixation was done, tendons were sutured primarily. For the hand's soft tissue defect a PIAF was used. To cover the defect on the donor site and to avoid skin grafting a perforator propeller flap was raised. The flap was based on a single perforator from the radial artery. No healing problems occurred.

Conclusions: Perforator based on radial artery at dorsoradial aspect of forearm, could be used as propeller flap for soft tissue covering after PIAF. By covering the donor site with a perforator flap skin grafting is avoided, faster healing, good skin color and texture match is achieved.

Introduction

Crush injuries of the hand is a frequent problem in emergency reconstructive microsurgery. High-energy trauma can result in fractures, tendon and soft tissue defects [1]. Often it is not possible to cover the defect primarily or using skin grafts. The posterior interosseous artery flap (PIAF) as a pedicelled flap has been described in 1980s and used successfully for defect coverage of the dorsal aspect of the hand ever since. Main advantages are possibility to harvest a large flap, it can be designed as fasciocutaneous or osteofasciocutanous flap, the flap can be based both distally and proximally, a long blood-vessel pedicle can be dissected [2-5]. Only recently a concern was raised regarding flaps' donor site morbidity. If it is necessary to cover large defects, donor site can't be closed primarily and usually skin grafts are used, which has poor aesthetic results and longer healing. In this case report we present an alternative technique for the closure of the PIAF donor site with perforator propeller flap.

Case Report

A 50 years old male was admitted to the hospital due to crash injury of his right hand. Examination revealed fractures of 4th and 5th metacarpal bone, crashed intrinsic muscles, rupture of extensor tendons and 5x7 centimeters soft tissue defect. Bone fixation was done, tendons were sutured primarily. Fasciomiocutaneous flap based on the posterior interosseous artery was harvested and sutured on the dorsal aspect of the hand. Muscle was used to obliterate dead space between the bones (Fig. 1). To cover the defect on the donor site and to avoid skin grafting a propeller flap was raised. The flap was based on a single perforator from the radial artery (Fig.2). Whole surgery took 2.5 hours. Passive drainage

**Correspondence to: Janis Zarins, Microsurgery Centre of Latvia, Brivibas Gatve 410, Riga, Latvia, LV-1024; Tel: +37127818161; Fax: +37167969830; E-mail: janis.zarins@mcl.lv*

http://dx.doi.org/10.31487/j.SCR.2018.02.009

was left for one day. No bleeding or healing problems occurred. Patient was discharged from hospital on the 5th postoperative day. Follow up at 4 months postoperatively (Fig.3).

Figure 1: Harvested fasciomiocutaneus PIA flap for covering tissue defect on dorsum of the hand.

Figure 2: Perforator propeller flap used for closure of PIAF donor site.

Figure 3: Follow up at 4 months postoperatively. Excellent color match and skin quality at PIAF donor siste.

Discussion

As reported by other studies, defects up to 6 cm in width can be closed primarily, but for larger defects skin grafting is used [6, 7]. As reported by Neuwirth et al, patients report significantly better functional and especially aesthetical results if the PIAF donor site is closed primarily compared with skin grafting [8]. The radial artery perforator flap based on the distal perforators has been described as a viable alternative to the radial artery forearm flap [9, 10]. Anatomical studies have shown that the radial artery also gives appropriate perforators in the proximal part of the forearm. Authors describe their usage for covering defects on the elbow, but no other authors report raising these flaps for covering other flaps' donor sites [11, 12]. In our case primarily closure was not possible, therefore, exploration toward radial artery was done to directly visualize skin perforators and appropriate size of perforator propeller flap was harvested, placed into PIAF donor site, closing all wounds primarily. No complications or healing problems occurred postoperatively, proving this as a successful and easy technique to avoid skin grafting. Further anatomical studies should be carried out to investigate perforator precise landmarks.

Conclusion

The PIAF is an excellent choice for reconstructing soft tissue defects on the dorsum of the hand. Donor site morbidity is avoided if skin grafting is not used. The radial artery perforator propeller flap proved to be successful technique for the PIAF donor site coverage, providing primarily healing and better aesthetic outcomes.

Acknowledgements

Dr. Dzintars Ozols was the first one, who developed this technique.

Conflict of interest statement

All authors of this article declare no conflicts in any regard. All authors of this article did not receive any financial support or award for this completed study.

Consent for Publication

Informed consent was obtained from the patient for the publication of this case report and any accompanying figures.

References

1. Lukas B, Hartl P, Bäcker K (2008) [Soft-tissue reconstruction of the dorsum of the hand and finger to cover the extender tendons]. *Handchir Mikrochir Plast Chir* 40: 110-114. [Crossref]
2. Penteado CV, Masquelet AC, Chevrel JP (1986) The anatomic basis of the fascio-cutaneous flap of the posterior interosseous artery. *Surg Radiol Anat* 8: 209-215. [Crossref]
3. Costa, H. and D.S. Soutar (1988) The distally based island posterior interosseous flap. *Br J Plast Surg* 41: 221-227. [Crossref]
4. Moshammer, H., et al. (1998) [The posterior interosseous flap--review and personal experience]. *Handchir Mikrochir Plast Chir* 30: 82-86. [Crossref]
5. Costa H1, Pinto A, Zenha H (2007) The posterior interosseous flap - a prime technique in hand reconstruction. The experience of 100 anatomical dissections and 102 clinical cases. *J Plast Reconstr Aesthet Surg* 60: 740-747. [Crossref]

6. Koch H, Kursumovic A, Hubmer M, Seibert FJ, Haas F, et al. (2003) Defects on the dorsum of the hand--the posterior interosseous flap and its alternatives. *Hand Surg* 8: 205-212. [Crossref]
7. Costa H, Gracia ML, Vranchx J, Cunha C, Conde A, et al. (2001) The posterior interosseous flap: a review of 81 clinical cases and 100 anatomical dissections--assessment of its indications in reconstruction of hand defects. *Br J Plast Surg* 54: 28-33. [Crossref]
8. Neuwirth M, Hubmer M, Koch H (2013) The posterior interosseous artery flap: clinical results with special emphasis on donor site morbidity. *J Plast Reconstr Aesthet Surg* 66: 623-628. [Crossref]
9. Page R1, Chang J (2006) Reconstruction of hand soft-tissue defects: alternatives to the radial forearm fasciocutaneous flap. *J Hand Surg Am* 31: 847-856. [Crossref]
10. Ho AM, Chang J (2010) Radial artery perforator flap. *J Hand Surg Am* 35: 308-311. [Crossref]
11. Tiengo C, Macchi V, Porzionato A, Stecco C, Parenti A, et al. (2007) The proximal radial artery perforator flap (PRAP-flap): an anatomical study for its use in elbow reconstruction. *Surg Radiol Anat* 29: 245-251. [Crossref]
12. Sham E, JA Masia, TJ Reddy (2018) Vascular Analysis of Radial Artery Perforator Flaps. *Ann Maxillofac Surg* 8: 66-72. [Crossref]