GAVIN PUBLISHERS

OPEN ACCESS

Annals of Case Reports

Vieira L, et al. Ann Case Report 14: 512.

DOI: 10.29011/2574-7754.100512

Case Report

Large Vascular Malformation Resection and Reconstruction around the Knee with Combined Free DIEP and SIEA Flaps: Case Report

Luís Vieira[1,2*], Andrea Bára Stefánsdóttir[1], Andres Rodriguez-Lorenzo[1], Pär Gerwins[3], Maria Mani[1]

[1]Department of Plastic and Maxillofacial Surgery, Uppsala University, Sweden

[2]Department of Plastic Surgery, Lisbon Central University Hospital Center, Portugal

[3]Department of Radiology, Uppsala University, Sweden

[*]**Corresponding author:** Luis Vieira, Microvascular Fellow, Plastic Surgery Reception, BV, Ingång 79, Akademiska Sjukhuset, Sjukhusvägen 75185 Uppsala, Sweden

Citation: Vieira L, Stefánsdóttir AB, Rodriguez-Lorenzo A, Gerwins P, Mani M (2020) Large Vascular Malformation Resection and Reconstruction around the Knee with Combined Free DIEP and SIEA Flaps: Case Report. Ann Case Report 14: 512. DOI: 10.29011/2574-7754.100512

Received Date: 21 October, 2020; **Accepted Date:** 26 October, 2020; **Published Date:** 31 October, 2020

Abstract

Introduction: Large vascular malformations close to joints are rare and their treatment multimodal.

Case Report: We present a case of a young male patient with a large vascular malformation (30x10cm) around the knee, with no option for medical or interventional therapy. Radical surgical excision and immediate reconstruction was successfully achieved with a combined Deep Inferior Epigastric Perforator (DIEP) and Superficial Inferior Epigastric Artery (SIEA) free flap anastomosed to tibialis anterior vessels and to the descending branch of the lateral circumflex femoral vessel. Full range of motion and acceptable cosmesis were achieved.

Discussion: Extensive excision and free flap reconstruction can be a reasonable alternative for one stage treatment of vascular malformation. Abdominal based free flaps are versatile options for reconstruction of large defects around the knee.

Conclusion: Microsurgical reconstruction after large vascular malformations excision should be considered more often.

Keywords: DIEP Flap; Free flap; Knee reconstruction; SIEA flap; Vascular malformations

Abbreviation: DIEP Flap: Deep Inferior Epigastric Artery Perforator Flap; SIEA flap: Superficial Inferior Epigastric Artery Flap

Introduction

Large vascular malformations close to joints are rare and the treatment many times multimodal [1,2]. In most scenarios non-surgical treatment is evaluated before any surgery is considered. Non-surgical treatment comprises sclerotherapy, laser therapy, embolization, or a combination of the above, depending on the flow characteristics and vessel type [3]. The indications for surgical intervention are: lack of or non-responsiveness to other treatment modalities, large symptomatic lesions and/or aesthetic concerns [4]. Large soft tissue reconstruction around the knee can be mitigated by sequelae like decreased range of motion, scar contracture, pain and poor cosmesis. Proper reconstruction with soft and pliable vascularized tissue is mandatory for good outcomes [5].

Case Report

We report a case of a 20 year-old male healthy patient with a body mass indexo f 25.4 kg7m^2. He presented with a congenital vascular malformation of the right knee involving the lateral aspect of the distal thigh, the lateral and posterior aspects of the knee and lateral aspects of the proximal leg (30 x 10 cm) (Figures 1 and 2). This lesion was noted soon after birth. Based on the findings on MRI, the lesion was diagnosed as na hypertrophic capillary malformation due to the presence of mostly capillary structures. Laser therapy had been previously tried on the lesion, without success. An increase in the longitudinal, transverse and superficial dimensions was seen over the last two years. The patient did not present any signs of steal syndrome, and his major concern was the appearance of the lesion, its continuous growth and difficulties

with clothes fitting. The lesion was judged not treatable with interventional radiology techniques such as sclerotherapy or embolization, based on the vessel type and flow characteristics. In the present case, pre-operative embolization was not found necessary due to the well circumscribed nature of the lesion on imaging.

Figure 1: Large (30x10cm) vascular malformation involving the lateral aspect of the distal thigh, the lateral and posterior aspects of the knee and lateral aspects of the proximal leg.

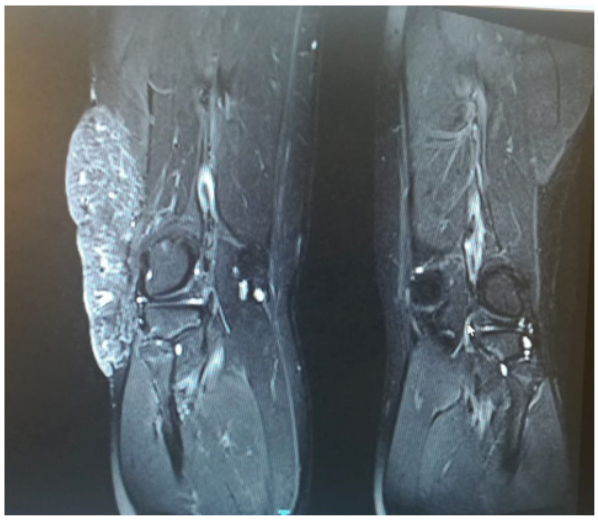

Figure 2: MRI image of the vascular malformation in the subcutaneous tissue around the right knee.

A macroscopic clear margin excision was performed and the defect was reconstructed with a bipedicled conjoined free Deep Inferior Epigastric Perforator (DIEP) and Superficial Inferior Epigastric Artery (SIEA) flap at the time of resection (Figures 3 and 4). Preoperative MR angio was performed both to assess recipient vessels and the potential deeper vessel malformation. The flap was anastomosed to the anterior tibial pedicle via the DIEP pedicle with end to end anastomosis and to the descending branch of the lateral circumflex femoral artery and its vena comitans respectively by the SIEA and SIEV. On the first postoperative day the flap went into ischemia due to kinking of DIEP pedicle and as a consequence there was a thrombosis of the SIE vein. The flap was salvaged by DIEP pedicle release and vein graft to the SIE artery and vein (donor: saphenous vein). The postoperative period was still doomed by venous congestion, solved by leech therapy for 3 days. Gait was started in the second postoperative week with the patient wearing a range limiting orthosis and the patient was discharged at day 12. A smaller necrosis (about 15%) was revised in theatre at 3 weeks and the closure was facilitated by a local flap.

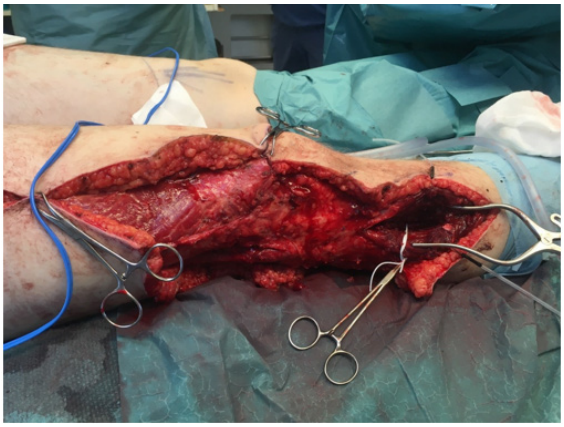

Figure 3: Defect after vascular malformation radical excision and anterior tibial vessels exposure.

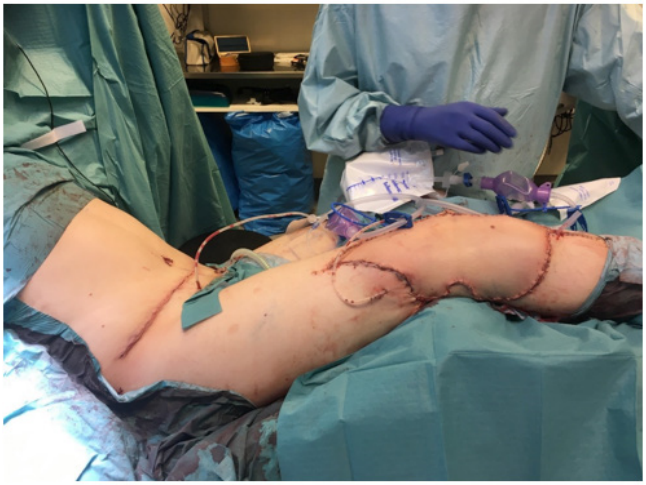

Figure 4: Combined DIEP and SIEA flaps insetting for reconstruction of large defect around the knee. DIEP pedicle anastomosed to anterior tibial vessels and SIE vessels anastomosed to the descending branch of the lateral circumflex femoral artery.

The patient is now on 9 months postoperative period. There are no signs of recurrence. Total range of motion of the knee was achieved, with a good cosmetic outcome (Figures 5 and 6). The donor site has healed with no complications nor sequelae.

Figure 5: 6 months postoperative result. Stable coverage with soft and pliable tissue allowing knee full flexion.

Figure 6: 6 months postoperative result. Stable coverage with soft and pliable tissue allowing knee full extension.

Discussion

Vascular malformation treatment is usually multimodal [2,4,6,7]. Surgical radical excision is recommended for risk of malignant transformation, symptomatic malformations-pain, steal syndrome, bleeding, function impairment, continuous growth, aesthetic improvement and non-response to other forms of therapy [1,4,8-12]. Scherotherapy is usually indicated for low flow lesions, while embolization is reserved for high flow lesions. Radical excision has proven effective in avoiding recurrence and is a modality able of providing cure [4,7]. However, surgical treatment is not always possible due to the malformation's extent or involvement of deeper structures such as muscles, bones and nerves. A multidisciplinar approach should be favored when dealing with such diagnoses. The resection of the vascular malformation led to exposure of the muscular fascia in the entire extent of the defect. No bone, ligaments or nerves were exposed. Other reconstructive options could have been skin graft or dermal matrix substitutes plus skin graft, local flaps after expander treatment or other free flaps.

The knee is a joint with a large range of motion, and this is dependent, among other factors, on supple soft tissue coverage [13]. Achieving this supple coverage in a single surgical procedure was only possible with a free flap. The massive defect precluded safe local flap reconstruction. Recipient vessels around the knee may be a challenge when a free flap is performed [5,14,15]. Options are branches from the popliteal vessels, descending genicular vessels, posterior tibial vessels, femoral vessels, medial sural vessels, descending branch of the lateral femoral circumflex vessels and the anterior tibial vessels [16-22]. The anterolateral location of the defect precluded the use of popliteal branches, posterior tibial vessels, femoral vessels, medial sural vessels and the descending genicular vessels. In fact, the recipient vessels were a main reason for the laborious postoperative period. The intraoperative dissection of the superolateral genicular artery was not successful.

An end to end anastomosis to the anterior tibial vessels was performed after verification of proper foot vascularization by the remaining main arteries after tibialis anterior clamping. The distal end of the descending branch of the lateral circumflex femoral artery had a small diameter and was also a reason for the vascular insufficiency suffering of the flap. The use of feeding vessels of the vascular malformation as recipient vessels has been described for lower extremity, however we think that lower recurrence rates may be achieved if a normal vessel can be used [6]. Soft tissue free flap reconstruction around the knee can has been described with latissimus dorsi myocutaneous and parascapular flaps, anterolateral thigh flap, omental flap, gracillis flap [5,14,16-18,22,23]. As in any reconstruction, the donor site is chosen according to the defect needs, but also by the patient's body habitus and preference, besides the best operative workflow.

Abdominal based flaps have seldom been used for knee reconstruction, because of subcutaneous fat bulk [24,25]. Conjoined bipedicled abdominal based free flaps, such as DIEP and SIEP are

versatile, allow the harvest of a very large and pliable skin paddle, have long and well located pedicles and reliable blood supply with low donor site morbidity and even contour improvement [26]. Even if the longitudinal dimension of the defect allowed a proper accomodation of the flap in this case, later debulking procedures can be offered to improve recipient site contour. Louer et al. found an 18% rate of reexploration on their series of 34 free flaps for knee reconstruction, and no correlation to recipient vessels choice or use of vein grafts [5]. In this case, we believe the vascular crisis was caused by pedicle kinking on the powerful muscle masses around the joint and advise on proper muscle release, as well as close postoperative surveillance.

Conclusion

Radical excision of vascular malformations can cure these lesions. Abdominal based free flaps are versatile and can provide enough soft tissue for reconstruction of large defects around the knee. Tibial anterior pedicle and descending branch of the lateral circumflex femoral artery are useful recipient vessels for reconstruction around the knee. Multidisciplinary treatment of vascular malformations shuld be favored. Microsurgical reconstruction after large vascular malformation excision is a valuable option.

Declarations of interest

None. This work did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Funding

None.

Conflict of Interest

All authors declare that they do not have conflicts of interest.

Ethical approval

This is an observational study. The Uppsala University Hospital Research Ethics Committee has confirmed that no ethical approval is required.

Informed consent

The participant has consented to the submission of the case report to the journal.

References

1. Scorletti F, Hammill A, Patel M, Ricci K, Dasgupta R (2018) Malignant tumors misdiagnosed as benign vascular anomalies. Pediatr Blood Cancer 65: 1-5.
2. Taghinia AH and Upton J (2018) Vascular Anomalies. J Hand Surg Am. 43: 1113-1121.
3. Johnson AB and Richter GT (2019) Surgical Considerations in Vascular Malformations. Tech Vasc Interv Radiol 22: 100635.
4. Morgan P, Keller R, Patel K (2016) Evidence-Based Management of Vascular Malformations. Facial Plast Surg 32: 162-176.
5. Louer CR, Garcia RM, Earle SA, Hollenbeck ST, Erdmann D, et al. (2015) Free flap reconstruction of the knee: An outcome study of 34 cases. Ann Plast Surg 74: 57-63.
6. Fujiki M, Ozaki M, Iwashina Y, Takushima A (2019) Clinical outcomes and recipient vessel selection for free flap transfer following arteriovenous malformation resection. J Plast Surg Hand Surg. 53: 56-59.
7. Goldenberg DC, Hiraki PY, Caldas JG, Puglia P, Marques TM, et al. (2015) Surgical treatment of extracranial arteriovenous malformations after multiple embolizations: Outcomes in a series of 31 patients. Plast Reconstr Surg 135: 543-552.
8. Agir H, Sen C, Onyedi M (2007) Extended Lateral Supramalleolar Flap for Very Distal Foot Coverage: A Case With Arteriovenous Malformation. J Foot Ankle Surg 46: 310-313.
9. Sánchez-Morales GE, Anaya-Ayala JE, Serrano-Cueva MA, Salas-Torrez E, Hinojosa CA (2019) Hand Ischemia due to Steal Syndrome Associated with Multiple Arteriovenous Malformations in a Patient with Parkes-Weber Syndrome. J hand Surg Asian-Pacific 24: 89-92.
10. Choi JW, Joo YH, Jeong WS, Jang YJ (2017) Free-flap reconstruction for the management of life-threatening hereditary hemorrhagic telangiectasia. Auris Nasus Larynx. 44: 607-611.
11. Lin CS, Lin YS, Lin BS, Lien CF, Liu CF (2016) Radial forearm and forehead flap reconstruction following resection of a nasal arteriovenous malformation: A case report. Oncol Lett 12: 2868-2871.
12. Oh SJ (2011) Combined neurovascular gracilis muscle and jejunal free-flap reconstruction for extensive venous malformation of the face. J Craniofac Surg 22: 899-900.
13. Rao AJ, Kempton SJ, Erickson BJ, Levine BR, Rao VK (2016) Soft Tissue Reconstruction and Flap Coverage for Revision Total Knee Arthroplasty. J Arthroplasty. 31: 1529-1538.
14. Fang T, Zhang EW, Lineaweaver WC, Zhang F (2013) Recipient vessels in the free flap reconstruction around the knee. Ann Plast Surg 71: 429-433.
15. Hong JP and Koshima I (2010) Using perforators as recipient vessels (supermicrosurgery) for free flap reconstruction of the knee region. Ann Plast Surg 64: 291-293.
16. Settembre N, D'oria M, Dekerle L, Saba C, Bouziane Z, et al. (2018) Free Omental Flap for Tissue Defect Coverage after Resection of Complicated Venous Malformation in the Area of the Knee. Ann Vasc Surg 51: 327.e9-327.e13.
17. Venkatramani H, Sabapathy SR, Nayak S (2014) Free-flap cover of complex defects around the knee using the descending genicular artery as the recipient pedicle. J Plast Reconstr Aesthetic Surg. 67: 93-98.
18. Bigdeli AK, Thomas B, Schmidt VJ, Kotsougiani D, Hernekamp FJ, et al. (2018) The conjoined parascapular and latissimus dorsi free flap for reconstruction of extensive knee defects. Microsurgery 38: 867-875.

19. Beumer JD, Karoo R, Caplash Y, Semmler JG, Taylor J (2011) The medial sural artery as recipient vessel and the impact on the medial gastrocnemius. Ann Plast Surg 67: 382-386.

20. Bhogesha S, Rimal D, Song C (2019) The descending branch of lateral circumflex femoral artery (LCFA) as recipient pedicle for free flap cover of complex defects around the knee. Microsurgery 39: 573-574.

21. Kim JS, Lee HS, Jang PY, Choi TH, Lee KS, et al. (2009) Use of the descending branch of lateral circumflex femoral artery as a recipient pedicle for coverage of a knee defect with free flap: anatomical and clinical study. Microsurgery 30: 504-506.

22. Tremp M, Kappos EA, Oranges CM, di Summa PG, Schaefer DJ, et al. (2018) Extending the limits of the anterior tibial artery as the recipient vessel for around the knee and proximal lower extremity defect reconstruction using the free anterolateral thigh and gracilis flap. Microsurgery 38: 60-65.

23. Ng SW, Fong HC, Tan BK (2018) Two sequential free flaps for coverage of a total knee implant. Arch Plast Surg 45: 280-283.

24. Hallock G (2014) Abdominoplasty as the patient impetus for selection of the deep inferior epigastric artery perforator for knee coverage. Microsurgery 34: 102-105.

25. Van Landuyt K, Blondeel P, Hamdi M, Tonnard P, Verpaele A, et al. (2005) The versatile DIEP flap: Its use in lower extremity reconstruction. Br J Plast Surg 58: 2-13.

26. Cho MJ, Haddock NT, Teotia SS (2020) Clinical Decision Making Using CTA in Conjoined, Bipedicled DIEP and SIEA for Unilateral Breast Reconstruction. J Reconstr Microsurg 36: 241-246.