



Case Report

Resurfacing complex knee and upper third leg defect with reverse vastus lateralis muscle flap in a flap exhausted leg - A case report

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ABSTRACT

Coverage of upper third leg and knee defects are complex and the main supply of pedicled flaps come from the uninjured leg.

Hence planning of flaps from leg must be meticulous, because if these fail then reverse flow flaps from thigh or micro vascular surgery will become the only option. Both have their own set of complications and patients who cannot tolerate micro vascular surgery due to their prolonged duration, co morbidities, and severe atherosclerosis of vessels, end up as thigh flaps being the only resort.

Thigh flaps come with a set of complications of their own and even these fail, with above knee amputation being the ultimate option, which patient hardly expects as end result with many stages of reconstruction already being done. It's a nightmare for both surgeon and patient.

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1. Introduction

Resurfacing complex knee defects remains a challenging task,¹ especially when all the work horse flaps of leg have been consumed and yet there remains a significant amount of exposed bone with implant to be covered. Flaps from the leg are first choice as they are proximal based, robust and the chances of failure of these flaps are minimal hence called workhorse flaps.¹

Reconstructive microsurgery option being ruled out due to significant Co morbidities or chances of success of free flaps being remote may be considered as a last option.² Reverse flaps from thigh will come to rescue when there are no options left, knowing the nature and blood supply of these reverse flow muscle flaps will help salvage the knee joint in more than one ways.³ This case report has been written with an intention to describe our surgical intricacies, ordeal faced, course of flaps in the course of

reconstruction to resurface such a defect involving knee, upper third leg almost extending to the junction of middle one third leg, within a flap exhausted leg seen till the end of treatment.

2. Case History

Any eighty-year-old gentleman had presented to us with defect in the upper third of leg (Figure 1) for which he had undergone surgery in the form of flap cover from the same leg and all the flaps from the leg had been utilized. He presented to us with flap necrosis with dry eschar of the flap.

Patient had Schatzker grade V Injury with internal plate screw fixation being done. Arterial Doppler showed triphasic flow with significant atherosclerotic changes in the vessel wall.

Patient had severe pain in the knee joint for which a lavage of the knee joint was performed, and culture taken which showed pseudomonas infection. Patient underwent staged debridement of necrosed flaps with exposed knee,

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upper third of tibia with implants; the exposure was upto junction of upper third to mid third of tibia.



Figure 1: Preoperative image



Figure 2: Intra operative Reverse VL myo cutaneous Flap

A reverse vastus lateralis myo cutaneous flap was planned and about 28 CMS of flap was harvested, with a delay done. (Figure 2) The pivot point was kept at 9 CMS from the upper border of patella. About 11cms of flap necrosed and the rest of flap was viable. Subsequently, the flap was turned to cover the defect but because of the sheer bulk of flap at the base, the flap couldn't reach the defect. Hence only muscle flap was executed, and the muscle was separated from the cutaneous component and muscle reached the defect. (Figure 3) The Fascio cutaneous component after separation was not bleeding hence most of the flap was sacrificed. The muscle flap was skin grafted, and it settled well with grafting being done for the secondary defect. (Figure 4)

3. Discussion

Soft tissue coverage around the knee upto the anterior tibial tuberosity from the thigh as reverse muscle or myo-cutaneous flaps must be undertaken when all other workhorse flaps like gastrocnemius muscle and myo-cutaneous flaps have been exhausted.[1,7]¹

The blood supply of reverse vastus lateralis flaps is the anastomoses of descending branch of lateral circumflex femoral artery with superior lateral genicular artery and these give perforators at 7, and 10 cm above the superior



Figure 3: VL muscle only Flap



Figure 4: Post-operative flap with graft

border of patella.^{1,4-6}

Reverse Vastus lateralis myo cutaneous flaps have been described for knee coverage^{1,7} but they come with venous congestion as a complication.^{1,8} Delay procedure can push the reach of flap to upper third, but reliability is not certain even after delay. Morris et al. have shown improved vascularity even to the most distal parts of the muscle with delay.⁸

For every lesson learnt in our journey to cover an exhausted leg with reverse vastus lateralis flap, few things have been clear with our experience and review of literature. We harvested 28 CMS of length of reverse myo cutaneous flap, 8 CMS from the superior border of patella as the pivot point, in which 11 CMS of flap necrosed, the reason to harvest such a long fascio cutaneous component was to achieve cover to the mid third of leg defect with this flap which unfortunately couldn't be viable. Delay of this length did not help us in increasing the territorial capture of vascularity. Sahasrabudhe et al have shown that the maximum fascio cutaneous capture in reverse flow flaps is 14 to 16 CMS from the distal most perforator i.e., 10 CMS. Super charging the flap was not done as the great saphenous vein had been injured at the medial side of knee. Ihara et al have studied supercharging to prevent venous congestion.⁹

Literature does mention the reach of fasciocutaneous flap to tibial tuberosity and muscle flap to upper third without delay.^{2,7}

But in our case even after delay being done for 1 week, we could not see the myo-cutaneous flap reach tibial tuberosity mainly because of flap necrosis of 11 CMS and

the sheer bulk of flap made rotating the flap difficult as much of the flap had been consumed at the base, hence reach could be possible to cover knee defect.

Muscle only flap will reach the upper third of leg defect better without undue tension but reach beyond this point even after delay is not possible. We encountered minimal distal margin necrosis of muscle flap, as we harvested the flap from just below the groin and possibly the reverse flow couldn't reach the proximal most portion of the muscle as quoted by Auregan J C et al. Reach of the flap to middle third even after delay is not possible as we attempted in this case and literature does not mention about reach to these levels. Doppler signals intra operative were helpful in our case as there are multiple distal perforator supplying the muscle and a more distal perforators may be chosen; however, this comes with a rider, that the most proximal working area of muscle may necrose.^{3,7} Donor site closure primarily has been quoted in literature,⁷ but we feel that it becomes too tight closure and may lead to compartment.

We noted significant donor site cosmetic deformity in a myo cutaneous flap harvest, but if only muscle is chosen, we can come down on the cosmetic deformity also. We could not assess functional deformity, as our case had preexisting osteoporosis and arthritis, hence muscle chosen was justified. Following are the list of lessons we have learnt while resurfacing such a complex knee with upper and mid third leg defect and we have enumerated it as points

Lessons learnt:-

1. About 20cms of fasciocutaneous component is supplied by musculo-cutaneous perforators from the distal side
2. Delay didn't help in increasing the vascularity of reverse flap
3. Most of the flap will be consumed while rotating the flap at the base
4. Muscle only flap will reach with difficulty to the upper third defect, not beyond this.
5. While harvesting, do not confuse Tensor Fascia Latae muscle for Vastus Lateralis (VL)
6. Handling of the tip of muscle flap requires being gentle, as reverse flow may necrose the tip.
7. All the proximal portion of the muscle and cutaneous component are working area, hence care to be given while dissecting the flap.
8. Reverse VL myo-cutaneous flap is only for defects of knee; do not consider it for upper third.
9. Distal Perforators for vastus lateralis muscle flap are constant
10. Reverse VL muscle only flap is a robust flap for knee and possibly upper third.
11. Failure of myo-cutaneous component is mainly due to venous congestion
12. Venous congestion also happens in proximal most part of muscle flap

13. Donor site cosmetic morbidity is significant after VL myo cutaneous flap

When all other reconstructive options fail, amputation has been considered in literature after failed arthroplasty,[8]but the acceptance of this as the end result is difficult for both patient and surgeon. Decision to salvage knee joints depend upon the age, severity of knee bony and overlying soft tissue envelope injury, osteoporotic bones, knee joint infection or septic arthritis, preexisting osteoarthritis have to be taken into consideration before fixing the bones with hardware, however no classification can capture all injuries.⁹

4. Conclusion

Coverage of complex knee defects including the upper third with vastus lateralis muscle should be considered, when more robust leg muscles have been exhausted. Vastus lateralis muscle only flap is better than myo cutaneous component as bulk hampers the rotation of flap and venous congestion being significant in reverse flow flaps.

5. Source of Funding

None.

6. Conflict of Interest

None.

References

1. Wang Y, Begue T, Masquelet AC. Anatomic study of the distally based vastus lateralis muscle flap. *Plast Reconstr Surg*. 1999;103(1):101–4.

- Morris SF, Yang D. Effect of vascular delay on viability, vasculature, and perfusion of muscle flaps in the rabbit. *Plast Reconstr Surg*. 1999;104(4):1041–7.
- Ihara J, Imanishi N, Kishi K. Venous Anastomosis for Prevention of Venous Congestion in Distally Based Flaps. *Plast Reconstr Surg Glob Open*. 2017;5(12):e1585. doi:10.1097/GOX.0000000000001585.
- Sahasrabudhe P, Panse N, Baheti B, Jadhav A, Joshi N, Chandanwale A. Reconstruction of complex soft-tissue defects around the knee joint with distally based split vastus lateralis musculocutaneous flap: a new technique. *J Plast Reconstr Aesthet Surg*. 2015;68(1):35–9.
- Auregan JC, Bégué T, Tomeno B, Masquelet AC. Distally-based vastus lateralis muscle flap: A salvage alternative to address complex soft tissue defects around the knee. *Orthopaedics Traumatol Surg Res*. 2010;96(2):180–4.
- Nahabedian MY, Orlando JC, Delanois RE, Mont MA, Hungerford DS. Salvage procedures for complex soft tissue defects of the knee. *Clin Orthop Relat Res*. 1998;(356):119–24.
- Rb R, Ramkumar S, Venkatramani H. Soft Tissue Coverage for Defects around the Knee Joint. *Indian J Plast Surg*. 2019;52(1):125–33.
- Sierra RJ, Trousdale RT, Pagnano MW. Above-the-knee amputation after a total knee replacement: prevalence, etiology, and functional outcome. *J Bone Joint Surg Am*. 2003;85:1000–4.
- Zeltser DW, Leopold SS. Classifications in brief: Schatzker classification of tibial plateau fractures. *Clin Orthop Relat Res*. 2013;471(2):371–4.

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