

Propeller Flaps in Reconstruction of Tissue Defects Around Knee

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ABSTRACT

Background: Soft tissue defects around knee joint are challenging for every surgeon. Due to varied causes of injury and peripheral crashed tissues, proper options to overcome catastrophe of exposed bone or implants, seems to be limited. Though, free tissue transfer is ideal, but availability of suitable recipient vessel is crucial. In such cases, perforator flaps are glooming.

Case Presentation: 2 severely injured lower limb patients were admitted. They underwent several orthopedic surgeries and wound care treatments without improvements. Plans were propeller perforator anterolateral and anteromedial flaps. Nourishing vessels detected by hand hold doppler and flaps raised successfully and covered the defects.

Conclusion: Nowadays, propeller flaps are well-known and lower limb is the right place to use such flaps to salvage more crashed limbs and exposed bones.

Keywords

Soft tissue defect, Anterolateral thigh flap, Anteromedial thigh flap, Propeller flap.

Introduction

Complex surgeries around knee area always have risk of complications, as probable skin and soft tissue defects can be catastrophe for every surgeon to cover skin defects of this area, especially when it is associated with an implanted prosthesis. Though, availability of proper tissues above and below knee, can be hopeful, sometimes surgeons encounter with injured local tissues to be used [1].

Soft tissue defects may occur in this area following wound breakdown in deep burns, trauma or following surgeries. It is crucial early closure of exposed knee joint to reach acceptable functional and aesthetic results [2]. Total knee arthroplasty is a successful surgery with low complication rate, but in failed surgeries, the complication rate reaches to 23.6% and infection rates to 6%. This emphasizes the importance to saving soft tissue

coverage in embedded implanted operations. It is clear that patient comorbidities like DM, smoking, previous deep infections, renal failure, poor nutrition have significant impactions [3,4]

Flap coverage to reconstruct soft tissue defects is the most acceptable option among presented solutions, which extremely depends on availability of proper muscular or cutaneous tissues around knee area. Though, still there is not universally accepted standard method over other methods. However, free flap coverage is known to replace extensive damaged soft tissues, and it depends on availability of proper recipient vessels [5].

According to mentioned details, we decided to our experiences in reconstruction of soft tissue defects around knee by propeller anterolateral and anteromedial thigh flaps.

Case Presentation

Case 1

A 28-year-old who had traffic accident around knee area. Orthopedic surgeons debrided nonviable tissues and repaired the

skin, but eventually they encountered exposed bone. Following VAC dressings, the bone in knee joint was exposed and they consulted with plastic surgery team for coverage. Primary evaluation demonstrated poor recipient vessels which was in contrast to safe free tissue transfer (Figure 1).



Figure 1: Soft tissue defect with 9*8 cm size in a 28 yrs patient with identified 2 perforators for propeller anteromedial flap.

On the other hand, muscles in the leg were crashed. Therefore we decided to select reverse fascio-cutaneous flap from thigh. We detected 2 perforators in distal vastus medialis and raised the flap in a correct direction and filled the defect with good eventual result (Figure 2).



Figure 2: Covered defect by reverse anteromedial flap with normal knee range of motion.

We did supercharge anastomosis between proximal end of saphenous vein the flap to adjacent vein to prevent probable flap congestion- as in reverse lower limb flaps venous congestion is common and can cause flap failure (Figure 3).



Figure 3: Supercharge anastomosis to overcome probable venous congestion.

Case 2

The second patient was a 36-year-old man who was admitted after orthopedic surgery and wound breakdown due to severe lower extremity trauma. He was under wound care treatment for several times, but without significant improvement. There were inflammatory manifestations around wound (Figure 4).



Figure 4: Exposed bone in knee area with thigh midline incision with 2 proper perforators in lateral side.

We chose propeller anterolateral flap for reconstruction and raised the flap promptly and covered the defect. Donor site in thigh was covered by partial thickness skin graft. There was not proper vein for supercharge anastomosis. We used leeches for partial flap congestion and could save the flap (Figure 5).



Figure 5: Final outcome after reconstruction and normal knee joint movement.

Discussion

There are numerous considerations about proper management of soft tissue defects around knee, including: size of defect, depth of defect, condition of surrounding tissues especially in fractured associations, condition of vessels around defects for free tissue transfers, availability of healthy muscles or fascio-cutaneous tissues [2].

Rao et al. gathered proper approaches in revision arthroplasty for soft tissue reconstruction. They focused on reconstruction elevator. They had an overview of all possible options and discussed about them briefly. Their article brings basic considerations when a surgeon decides to select suitable method [11].

Lakshmi et al. have patients mostly injured in traffic accidents in proximal leg around their knee. They used proximally based sural flaps successfully to cover soft tissue defects [6]. This is logic and surgeons mostly consider predictable outcomes, especially in healthy vessel origins. Mehmet reported a case of bilateral knee injury in a child who reconstruct by perforator fascio-cutaneous flaps in both sides. They used handheld doppler to identify location of perforators [7]. This can be assumed and acceptable method even in childhood injuries.

Puzzabon et al. reported their reconstructions by medial gastrocnemius muscle flap on 9 patients who had complications after total knee arthroplasty with 89% success rate unless patients had uncontrollable infections [8].

Cheng et al. presented 28 patients who had large soft tissue defects around knee. They used perforator vastus medialis flap to cover defect. For defining pivot point and marking the direction of perforator, they draw two lines, one from the midpoint of the inguinal groove to the medial femoral condyle, the other from the middle and lower third of the first line to the midpoint of the upper margin of the patella. They raised their flaps and all flaps survived [9].

Papaioannou et al. presented 16 cases who had wound breakdown following total knee arthroplasty. They treated them by unilateral or bilateral fascio-cutaneous v-y flap. Only one patient suffered partial flap necrosis [10]. This is an ideal option in healthy peripheral skin, but in recurrent breakdowns or traumatic patients, local flaps have limited function, as we decided to use regional flaps to overcome encounter challenges. These regional flaps especially perforator ones are well-known following detailed dissections in cadavers and present new era in reconstruction, as they have more little donor site morbidity and less requirements for micro anastomosis. The learning curve is steeped, but finders will be able to overcome severely injured limb challenges.

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