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Original Article

A Prospective Study of Reconstructive Modalities of Soft-Tissue Defect around the Knee Joint

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Abstract

Introduction: Defects of soft tissue of the knee represent a challenge in reconstruction. These may occur due to multi-factorial causes such as traffic accidents, shotguns, post-burn contracture release, and post-tumor excision.

Materials and methods: The study was conducted in the Department of Burns and Plastic Surgery B. J. Medical College and Civil Hospital Ahmedabad for from May 2021 to May 2023. Twenty cases of flap coverage for soft-tissue defects around the knee joint have been included in the study. The pro forma for the collection of data is made.

Results: From May 2021 to May 2023, 20 patients were treated with different types of flap coverage. Out of 20 patients, 16 were male and 4 were female patients. The mean age was 40 years (Range: 20–60 years).

Conclusion: From the study of 20 patients with soft-tissue defects in the age range of 20–60 years it is concluded that the following are the modalities for reconstruction. The proximally based medial sural artery fasciocutanous flaps provides tissues similar in skin texture and thickness to the lost ones and is thin and pliable. Rotation advancement flaps and transposition flaps are the best options when there are small-to-moderate anterior knee defects and external fixators in situ. P.

Key words: Knee Joint, Reconstructive, Soft-Tissue Defect

INTRODUCTION

Defects of soft tissue of the knee represent a challenge in reconstruction. These may occur due to multi-factorial causes such as traffic accidents, shotguns, post-burn contracture release, and post-tumor excision. A vivid number of reconstructive options for covering soft-tissue defects around the knee, including several muscle flaps, fasciocutaneous flaps, and free flaps, each with its inherent advantages and disadvantages, have been documented.

Management of soft-tissue defects of the knee remains a challenge for both modalities of specialists of the Plastic Surgeon and Orthopedician. Soft tissue management in knee surgery forms an integral factor in determining the success or failure of the entire procedure. Historically, soft-tissue coverage procedures were most commonly used during knee surgery when problems with wound closure were encountered or in salvage circumstances when primary wound healing problems occurred in the post-operative period, often in association with infection and exposed prosthesis.

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Aims and Objectives

The aim of this study was to successfully use different types of flaps for soft-tissue reconstruction around the knee while preserving its function and cosmetic characteristics.

To provide a reconstructive algorithm for different sizes and locations of soft-tissue defects around the knee joint using pedicled flaps and free flaps.[2-4]

MATERIALS AND METHODS

The study was conducted in the Department of Burns and Plastic Surgery B. J. Medical College and Civil Hospital

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Ahmedabad for from May 2021 to May 2023. Twenty cases of flap coverage for soft-tissue defects around the knee joint have been included in the study. The pro forma for the collection of data is made. All the relevant details of the patient during pre-operative, surgical, and post-operative and follow-up periods will be collected and analyzed.

Inclusion Criteria

In the following study, small, medium, and large-size defects around the knee joint in patients with acute trauma, with post-surgical defect with implant exposure, post-traumatic contracture release defects of posterior knee joints, post-burn contracture release defects of posterior knee joints, post-electric burn defects were included in the study.

Exclusion Criteria

Patients with age >60, chronic smokers with peripheral vascular disease, uncontrolled diabetic patients, infected wounds, patients with peripheral vascular diseases, debilitated patients, raw area over knee joints covered with only STSG, irradiated patients were all excluded from the study.

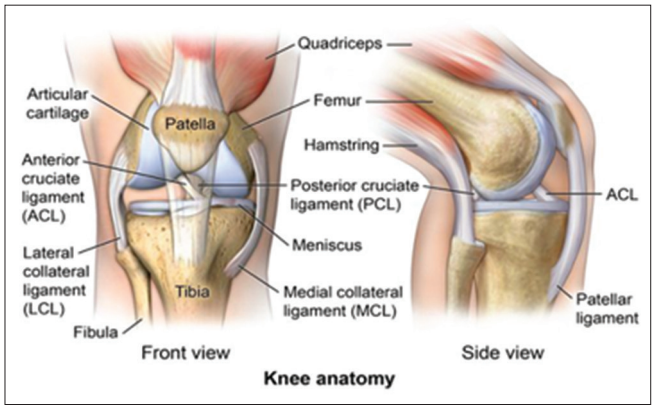


Figure 1: Knee Anatomy

Regional Anatomy

Knee joint anatomy and blood supply [Figures 1 and 2]

The structure of the knee joint is determined by its adaptations for weight bearing, locomotion, and the maintenance of equilibrium. Functional requirements of a reconstructed knee joint are a stable post with adequate soft-tissue coverage and protective sensation. The anatomical features relevant in the context of soft-tissue reconstruction of knee joint are discussed below.

The knee joint is a hinge-type synovial joint which permits flexion and extension about transverse axis, and a small medial and lateral rotation about the axis of the lower leg in the flexed position. The minimal range of knee motion that is associated with everyday activities is a near-full extension to approximately 120° of flexion. Walking on a flat surface requires 70° of flexion, descending stairs 90° of knee flexion, and normal sitting 100° of flexion. Consequently, the near-normal motion of the knee joint is essential for comfortable function hence a pre-requisite for complex reconstructions of the lower leg.

The blood supply around the knee comes mainly from the femoral and the popliteal vessels. The branches and perforators which arise from these vessels form an anastomosis around the knee which forms the basis for distally based flaps. On the medial side, there are perforators from the descending genicular artery and the recurrent artery from the anterior tibial artery. On the lateral side, superior and inferior lateral genicular arteries arising

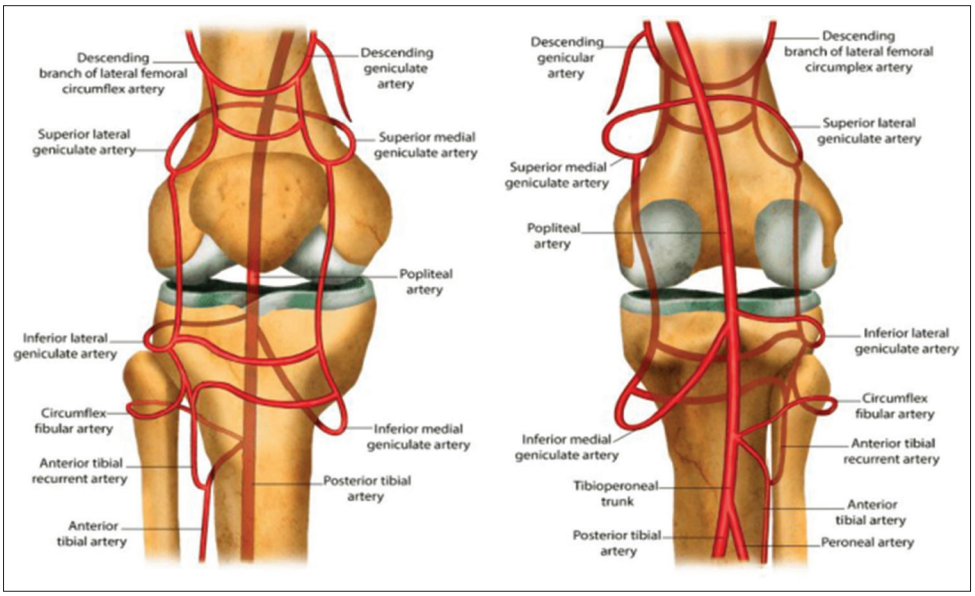


Figure 2: Knee Joint

from the popliteal artery contribute to anastomosis. The flaps can be raised based just on the perforators or along with the underlying muscles and their feeding vessels. In the leg, they can be based on the perforators from the anterior tibial, posterior tibial, or peroneal arteries or along with the muscle and their feeding vessels.

Different Modalities of Coverage

The defect can be covered based on the size of the defect and exposure of the tendon or both. There are different modalities of treatment for anterior knee defects such as a skin graft, fasciocutaneous flaps such as transposition flap, rotation flap, pedicles muscle-only flaps and musculocutaneous flaps, and free flaps. If the defect size is, <4 cm it is covered with STG if the defect is 4–8 cm and exposing only tendons then fasciocutaneous flaps such as transposition flap and rotation flap, could be used to cover the defect. If the defect exposed bone, pedicled muscle flaps would be a good option for coverage and those that are in depth wounds are covered with musculocutaneous flaps. If the defect is very large, then it is covered with free flaps.

Here the defect coverage is described under fasciocutaneous flaps, muscle-only flaps, musculocutaneous flaps, and free flaps.

Fasciocutaneous Flaps

Rotation flap [Figures 3 and 4]

The medial thigh-based rotation advancement flap and wound debridement was done for the soft-tissue defect in the anterior knee region. An incision was extended to the thigh laterally with the base of the flap on the medial side. The vascular basis of this flap was based on the perforators from the medial genicular arteries and the musculocutaneous perforators. Depending on the wound size, a rotation flap was constructed and a flap inset was given with skin graft.

Transposition sliding flap [Figures 5 and 6]

A sliding transposition flap adjacent to the defect was used in a patient with a suprapatellar defect of size 5 and 3 cm defect with a heavy external fixator for fracture reduction. Here, the medial base is taken to the defect. From the lower end of the defect, an oblique line is drawn, this being the distal edge of the flap. Its length should be equal to the contralateral side of the defect. From the end of this line, the lateral edge of the flap is drawn proximally toward its base. The width of the flap is adequate to sustain the circulation of the flap. The length-to-width ratio was taken as 3:2. After marking the flap, the recipient site is prepared and the fasciocutaneous flap was raised and the flap is transposed by sliding toward the recipient site. The inset of the flap was done so that its long lateral edge is sutured to the contralateral side of the defect. The donor site is covered with STSG. Due to the degree of excursion, there was a dog-ear, but Kater regressed with time Figures 3-7.

Figure 3: Pre-operative

Figure 4: Post-operative

Figure 5: Pre-operative

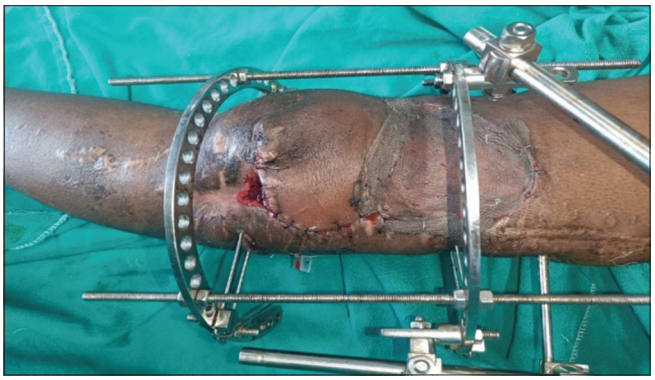


Figure 6: Post-operative

Figure 7: Pre-operative

Figure 8: Post-operative

Propeller flap [Figures 7 and 8]

Once the wound has been adequately prepared, the cutaneous skin paddle was designed within the area of the proposed perforating vessel. These can be identified using a hand-held Doppler at the time of surgery, or in more complex cases, these vessels may be mapped preoperatively using duplex ultrasound. This can potentially avoid problems related to variability in local anatomy. After designing a flap that fully incorporates the perforating vessel, microsurgical dissection of the perforator is performed. The entire cutaneous flap may be reliably raised on this single skeletonized vessel and can then be fully rotated as a propeller flap up to 180° around this pedicle. The pedicle should be carefully dissected in all directions to allow adequate mobility of the perforator in the direction of its transfer. The flap was transferred directly into the defect as it is designed adjacent to the wound. It is recommended that this bridge be at least 5 cm in width to avoid any compromise of its vascularity. It is recommended to connect the 2 areas in these cases, therefore avoiding any additional compromise of the flap through compression or kinking of the pedicle from the overlying skin bridge. The donor site is the primary closure and split-thickness skin graft.

Proximally based median sural flap

Preoperatively, the superficial sural artery is first detected with a Doppler flow meter. The operation can be performed with the patient in any position but the prone position is usually best. The flap territory extends from the superior flexion crease of the calf at the popliteal fossa to the junction of the middle and inferior thirds of the posterior calf. The flap is designed in the calf and includes a line representing the course of the superficial sural artery, either in the center or in the lateral part of the calf. Medially and laterally, the midaxial lines serve as the anterior limits. After marking the flap boundaries according to the above guidelines, elevate the flap distally with an incision through the skin, subcutaneous tissues, and deep fascia.

The flap is elevated subfascial to avoid damaging the vessels. When incising both sides and exposing the pedicle, take care to prevent injury to the common peroneal nerve and the pedicle of the flap, preserving both medial and lateral superficial sural arteries until both are observed. Furthermore, both fasciocutaneous vessels may unite before their junction with the popliteal artery and vein. Once clearly defined, the larger vessel is included in the mid-axis of the flap. Proximal superficial draining veins are also preserved to enhance venous drainage in standard flap transposition or for use in micro vascular composite tissue transplantation.

Deep to the fascia, the distal lesser saphenous vein is identified, divided, and included with the flap. The sural nerve, which runs close to the arterial supply, is also transected distally and included. Dissection of the sural nerve from the vascular pedicle places the artery and its venae comitantes at undue risk of injury.

As the dissection proceeds superiorly, gastrocnemius perforators must be divided. In elevating the flap, musculocutaneous perforators that anastomose with the sural cutaneous artery may be encountered. Ligation of these can result in poor perfusion to the flap, and sequentially ligating or performing a trial occlusion may be safer. Small sural cutaneous arteries are often found concurrently with large perforators, and the sacrifice of these perforators may compromise the flap. Only after the vascular pedicle has been identified on the deep surface of the flap may the superior skin margin be incised safely. If the venous congestion which is uniformly noted after initial flap elevation, is irreversible or the venae comitantes prove to be exceedingly small, then a subcutaneous vein should be included with the flap proximally to serve as an additional source of venous outflow.

After cleaning the recipient site, the flap is transferred to the skin defect. It can be transposed as a peninsular fasciocutaneous flap or isolated on its vascular pedicle alone for transposition as an island flap. The rotation point of the pedicle is usually located at the popliteal fossa. Tension

and kinking or twisting of the pedicle must be avoided. Drains are placed under the flap. Primary closure of the donor site is possible with a flap having a width of 6 cm or less, but larger flaps require a skin graft of the donor site. Inevitably, the sural nerve is divided; consequently, the outer aspect of the foot is rendered numb. The transection of this nerve also carries the risk of neuroma formation in the transferred flap.

Median genicular artery perforator based flap [Figures 9 and 10]

The avulsion wound involved the popliteal fossa extending to the posterior border of the proposed flap making it a favorable option. His hemogram and serum electrolytes were within normal limits. The patient had debridement and was planned for popliteal fossa resurfacing with medial genicular artery flap about 8 days after injury. Flap was raised under spinal anesthesia and a tourniquet. Flap was planned in reverse and about 16 × 10 cm flap was raised as fasciocutaneous tissue designed about the midpoint of an imaginary line joining the midpoint of the inguinal ligament to the medial femoral condyle as the axis. Flap was inset on the defect with nylon sutures over a corrugated drain. The secondary defect was resurfaced with split-thickness skin grafting. Nearly 100% flap survival was achieved except for slight marginal tip necrosis that healed with dressing. Knee function was satisfactory and the patient was discharged to continue follow-up on an out-patient basis.

Lateral genicular artery perforator flap [Figures 11 and 12]

Pre-operative marking was done by identification of superior lateral genicular artery perforators by an 8 MHz hand-held Doppler at the septum between the vastus lateralis and short head of biceps femoris, from the knee level proximally. The flap was marked from knee level up to midpoint between the femoral condyle and greater trochanter, with flap axis laying over that intermuscular septum, Figure 1a. The procedures were done under spinal anesthesia with tourniquet control without exsanguination to easily detect the LGA perforators. The anterior margin of the flap was incised down to deep fascia with subfascial dissection toward the intermuscular septum to identify the LGA perforators. We did not skeletonize the perforators, only dissect them to allow tension-free flap inset without perforator kinking or spasm. After dissection and isolation of the LGA perforators, dissection continued in the subfascial plane toward the flap posterior margin, which was incised to completely island the flap, to be only hinged by the perforators. The tourniquet was deflated, flap viability was checked, and the minor perforator was clamped, preserving only the dominant perforator. The perforator flap could be rotated 90° clockwise to cover the anterior surface of the knee or popliteal fossa, respectively,

Figure 9: Pre-operative

Figure 10: Post-operative

Figure 11: Pre-operative

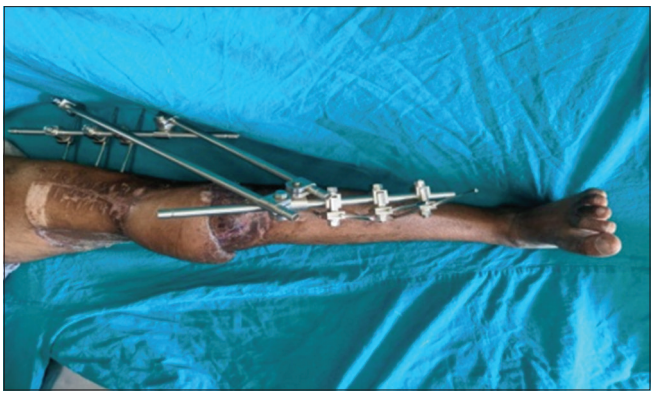


Figure 12: Post-operative

or even rotated 180° in a propeller fashion to cover the proximal one-third of the leg. The LGA perforator flap was transferred into the defect, with excision of any intervening skin bridge, with a suction drain inserted on need. The flap

was inset tension-free to avoid spasms or kinking of the pedicle and the flap donor site was either closed primarily or split-skin grafted.

Muscle Flap

Gastrocnemius muscle flap

This is the first choice in case of knee and upper third leg defects. Either the medial or the lateral belly or both can be used for coverage. They get their blood supply from the femoral artery with the branches that originate above the knee joint. As the origin of these vessels is deep inside the popliteal fossa, the pedicles are usually protected in case of trauma and are available for use. The flap is raised proximally up to its origin. The reach of the flap can be increased by dividing the tendinous fibers at the origin on the superficial surface or scoring the aponeurotic layer in the undersurface of the muscle or totally islanding the flap based on its vascular pedicle. In the case of the gastrocnemius muscle flap, the incision was extended from the defect downward the leg vertically either in the posterior midline or medially 2 cm from the medial border of the tibia depending on the defect. The skin flap was undermined and the gastrocnemius muscle was dissected and elevated along with 1 cm of the tendinous portion of Achilles tendon and the muscle flap is tunneled subcutaneously into the defect and inset given. The raw area is covered with STSG and the donor area is closed with primary suturing.

Musculocutaneous Flaps

When the reach of the muscle alone is not good or when we need a cutaneous component to provide a better cover that can be opened later for secondary procedures, a musculocutaneous flap is planned. The following are the musculocutaneous flaps that are commonly used.

Gastrocnemius musculocutaneous flap [Figures 13 and 14]

This skin overlying the muscle is elevated along with it as a flap. This can extend distally onto a point 5 cm proximal to the ankle. This skin component of the flap is supplied by a perforator arising from the muscle belly and the fascial network of vessels. This provides a longer flap with more skin when only the gastrocnemius muscle flap will not be sufficient to cover the defect. In the traditional design, both the muscle and the skin flap move together in the same direction. Some modifications are described which can facilitate the differential movement of the muscle and the skin component which can better cover the defects as per the needs. This modification describes the skin component as islanded on the perforator, which comes out of the muscle belly and supplies the overlying skin, especially the lateral row of the perforator. Soft-tissue defects were thoroughly debrided surgically. In the case of the medial gastrocnemius myocutaneous flap, the incision

Figure 13: Post-operative

Figure 14: Post-operative

was extended downward vertically from the wound in the anterior knee, 2 cm from the medial border of the tibia bone, and a posterior incision in the posterior midline was made to include the cutaneous flap. These two incisions were connected to raise the flap about 10 cm above the medial malleolus. The medial gastrocnemius muscle was dissected. The musculotendinous junction at the tendon Achilles was identified and divided with one cm of tendon Achilles extension with the muscle. The muscle flap was tagged to the cutaneous paddle with 3–0 vicryl suture. The myocutaneous flap was elevated and rotated to the anterior knee defect. The flap inset was given to the knee defect with 3–0 ethanol. The muscle and donor site were covered with a skin graft taken from the thigh.

Reverse flow anterolateral thigh (ALT) flap [Figures 15 and 16]

ALT flap can be used as a distally based pedicled musculocutaneous flap to cover the defects over the knee. The descending branch of the lateral circumflex femoral artery has rich communications distally with perforators of

Figure 15: Post-operative

Figure 16: Post-operative

the lateral genicular artery and anastomosis around the knee joint. This flap has a large size and can reach up to 14 cm below the knee joint. The fascia lata can be utilized for reconstructing the quadriceps tendon if required. Reverse ALT flap is based on the perforators from reverse flow from the lateral genicular artery which will be about 8–10 cm from the superolateral border of the patella, which forms the pivot point of the flap and the skin paddle is on the anterolateral region of the thigh. The flap design was done according to the defect size. The skin flap was raised along with the perforators arising from the descending branch of the lateral circumflex femoral artery, which has communication to the lateral genicular artery and also included a part of the vastus lateralis muscle for the venous drainage. The flap was dissected up to the pivot point. Skin incision was made connecting the flap and defect and the flap was transposed to the defect along with the vascular pedicle dissected. Flap inset was given with 3–0 nylon. The donor site was covered with a skin graft taken from the thigh.

Free flaps

When the defects are large and when the local flap options are either not available or used up, free flaps are chosen. The commonly used free flaps are the ALT flap. The recipient vessels have to be chosen according to availability. The major vessels such as superficial femoral vessels and popliteal vessels can be used and the anastomosis to these can be performed in end to side fashion. The tibial vessels lie deep and can be exposed using a posterior incision and splitting the gastrocnemius and soleus muscles in the prone position and used as recipient vessels. Descending branch of the lateral circumflex femoral artery too has been used. The other vessels nearby are the medial sural artery which supplies the medial belly of gastrocnemius which can be detached and used. Descending genicular branch of the femoral artery which runs in the adductor canal can be used to attach the free flap. These obviate the need for changing the position of the patient during surgery as they can be exposed in the supine position. In case there is no ideal vessel nearby, procedures such as vessel loops and vein grafts have been described, but the failure rate is more with

OBSERVATION AND RESULTS

From May 2021 to May 2023, 20 patients were treated with different types of flap coverage. Out of 20 patients, 16 were male and 4 were female patients. The mean age was 40 years (Range: 20–60 years).

Etiology Distribution

In the present study, the etiology of defects is distributed as post-traumatic which are further divided into low-velocity trauma, moderate velocity, and high-velocity trauma which include major cause a total of 17 cases are due to post-traumatic causes which comprises 85% and the rest are due to post-electric burn defect and post-traumatic contracture release and post-burn contracture release.

Location of the Defect

Out of 20, 13 patients which is more than 50% had defect over the anterior region, 3 were on the posterior aspect, 2 cases were on the medial aspect and 2 were on the lateral aspect of the knee joint.

Sizes of the Defect

In the following study, the defects are categorized into different sizes as small (<4 cm), moderate (4 –8 cm), and large defects (>8 cm) based on the size of the defect.

Types of Defects

There are different types of defects in this study exposing tendon, defect opening into the joint, or exposed orthopedic implants. There were a total of 8 patients with tendon defects, 10 patients with joint exposure, and 2 patients with orthopedic plate exposure.

Phases of Coverage

Out of 20 patients operated, 1 patient was operated in the acute phase which is within 72 h of injury and 17 patients were operated in the subacute phase which is from 72 h to 6 weeks, and 2 patients were operated in the chronic phase which is >6 weeks.

Types of Modalities used for Coverage

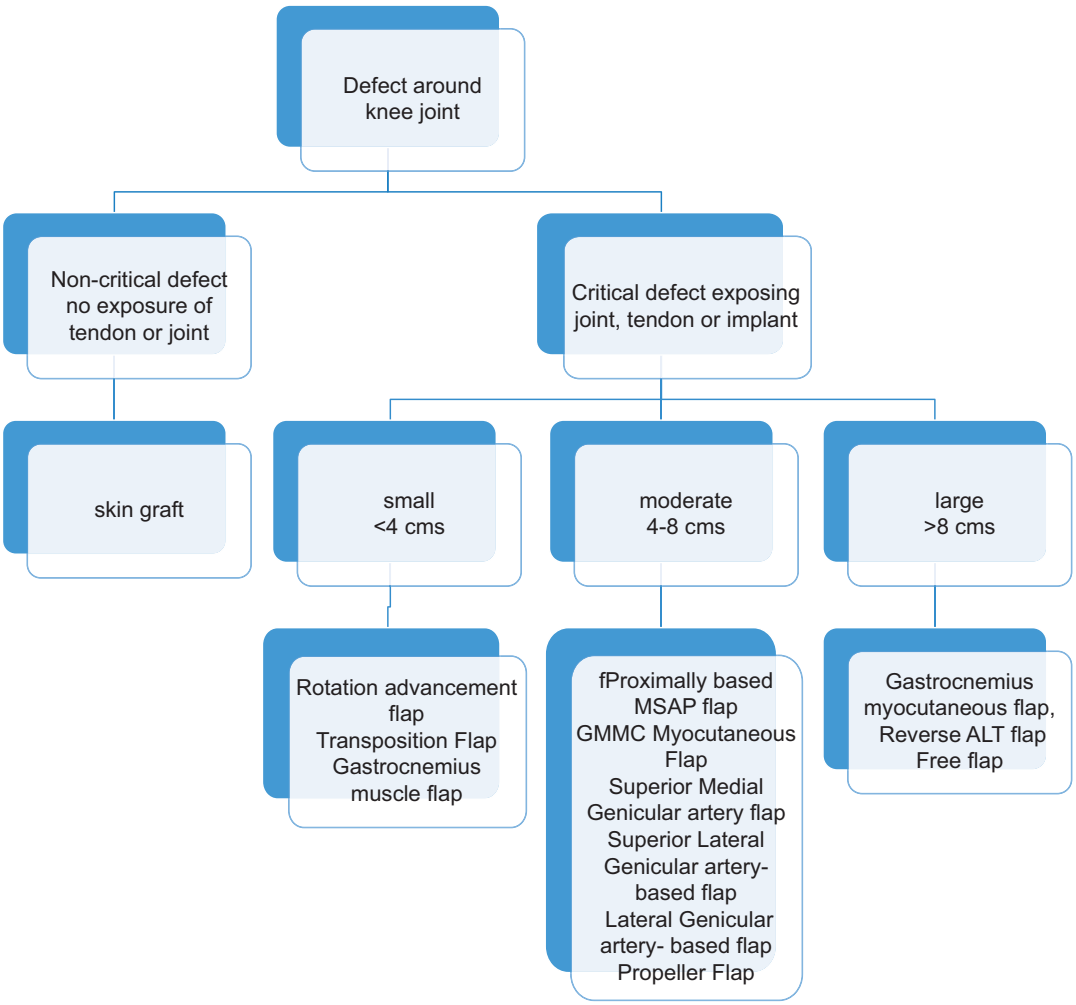
Among 20 patients operated for different locations of defects, different modalities were used. Four out of 20 patients were operated with different types of fasciocutaneous flaps, one patient was operated with a gastrocnemius muscle flap and covered with STG, 10 patients were operated with myocutaneous flaps such as medial gastrocnemius, lateral gastrocnemius and reverse ALT flaps, 4 were operated with perforator based flaps such as medial genicular perforator based flaps and lateral genicular artery perforator based flaps and one patient is operated with free ALT flap.

Different Flaps Used for coverage

Out of the total of 20 patients operated, different types of flaps were used as described above and out of the different modalities used for coverage the following are the flap surgeries done in the patients. Out of 4 fasciocutaneous flaps used for coverage, one is medial thigh-based rotation advancement thigh flap coverage for anterior suprapatellar defect, one is random pattern transposition flap, one is propeller flap based on medial genicular artery perforator, one is proximally based median sural artery flap. One patient was operated with a medial gastrocnemius muscle-only flap and coverage was done with STG. Among 10 myocutaneous flaps operated all the flaps were done for anterior knee defects of which 5 flaps were medial gastrocnemius myocutaneous flaps based on the medial sural artery, 4 flaps were lateral gastrocnemius myocutaneous flaps based on the lateral sural artery and 1 flap is reverse ALT flap included a part of vastus lateralis muscle. Out of 4 perforator-based flaps 2 were superior medial genicular perforator-based flaps and 2 were superior lateral genicular perforator-based flaps. One patient has been operated with a free ALT flap with vascular anastomosis of vessels.

Complications

Out of the 20 patients operated for reconstruction, 5 patients had suffered complications of which 2 had wound infection, 1 had wound gaping, 1 had marginal



flap necrosis, and 1 had donor site soft-tissue defect which were all managed conservatively. Overall all the flaps could provide good coverage and there was no flap loss.

Reconstructive Algorithm

DISCUSSION

The knees are the biggest and most important joints that tolerate all kinds of loads and absorb the shock.[1]

The present study included 20 patients with only soft-tissue defects around the knee joint that has tendon exposure, joint exposure, and neurovascular bundle exposure defects and implant exposure.

In this study rotation advancement flap and transposition flap coverage were used in 2 patients with small anterior knee defects and are good options for coverage when there is an external fixator *in situ* and local pedicled flaps are difficult or unavailable. The rotation flap provided good coverage whereas the transposition flap coverage had a complication of wound gap which was managed with secondary suturing

Propeller flap was used to cover the posterior knee soft-tissue defect caused due to post-traumatic contracture release. The flap was based on the superior lateral genicular artery perforator. Rao *et al.*,[9] Wagner *et al.*,[10] and Amin *et al.* articles described various reconstructive options following total knee arthroplasty. However, the etiologies included in our present study were not only the knee defect following total knee arthroplasty but also included other etiologies such as knee defects caused due to post-traumatic contracture release, post-burn contracture release, and post-traumatic defects. Gastrocnemius muscle flap is used in 1 patient having a smaller anterior knee defect and needs a short time and is esthetically good in small defects and useful when the defect depth is less and smaller. In the present study its usage has been limited in cases of knee defects as the major defects were in joint space having large internal deficit and STG for a knee defect later on could cause contracture and limit the movement of knee joint excursion would rather be the best option for upper and middle third leg defects or exposed implants. Most of the knee defects were presented with an external fixator is also one of the reasons to avoid gastrocnemius muscle-only flap with the fixator being in the way of muscle rotation.

Gastrocnemius myocutaneous flap needs a short surgery time and is rather easy to handle or inset the flap and thus is the most widely used as a workhorse for the knee defects until now. These flaps are almost always available and provide good vascular supply to the recipient area for good wound healing, even in high-velocity traumatic defects. These flaps provide the best coverage for large medial and lateral defects even in the acute phase of injury operated in <72 h of trauma. A total of 9 patients were operated with gastrocnemius myocutaneous flaps of which 5 were on a median sural artery and 4 were on lateral sural artery-based flaps and none had the complications of the flap and all provided good coverage. Only 1 patient had donor site tendon exposure defect, which was healed by secondarily on dressing and two patients had infection and discharge from the wound site, which was managed by systemic antibiotic coverage after culture sensitivity. However, there is a risk of donor site morbidity resulting from the sacrifice of muscle; defect size is likely to be large, or the site is more proximal than the patella; and the use of the surgery is limited in case of quadriceps tendons.[12-14]

In this study, perforator-based flap was done in 4 cases, of which 2 were based on superior medial genicular artery perforator flap and 2 were superior lateral genicular artery-based flaps, of which all the flaps provided good flap coverage with limited donor site morbidity. In post-burn contracture release defect covered with superior medial genicular artery flap suffered marginal flap necrosis, which was debrided STSG coverage was given.

Reverse ALT flap is performed in one patient with knee implant exposure on the anterior aspect using the descending branch of lateral circumflex femoral artery, has a number of advantages as compared with the study by Chen *et al.* This flap is able to cover the front knees, the defect of the lateral side, and especially the defect of the lower third in the thigh.

Proximally based medial sural artery perforator flap was performed in one patient and is ideal when the defect is below or inside the patella. As per the study by Lee *et al.* it is proved that the anatomy of the perforator is very consistent and this is, in fact, the most widely used. The perforator is able to be observed on the imaginary line between the popliteal crease and the midpoint of the medial malleolus. The first perforator is located in a circle of 2 cm radius about 8 cm away from the proximal of the imaginary line. Very thin and pliable flap can be obtained; flap elevation is easy; and there is a low likelihood of donor site morbidity.

Free flap was performed in one patient with a large anterior defect exposing the almost entire knee joint. A free flap is useful and provides good result yet it requires a lot of time to perform the surgery and a lot of surgical skill expertise for dissection and anastomosis to the deeper recipient vessels as comparable to the description in Lee *et al.* article.

Thus, there is a wide range of choices for flaps for defect coverage depending on the defect site, size, location of scar, and the condition of surrounding soft tissues. At the location of the defect mainly, the flap can be selected as one of the five modalities described earlier.

A simple reconstructive algorithm has been provided based on this present study for defects around the knee joint.[5-8]

CONCLUSION

From the study of 20 patients with soft-tissue defects in the age range of 20–60 years it is concluded that the following are the modalities for reconstruction. The proximally based medial sural artery fasciocutanous flaps provides tissues similar in skin texture and thickness to the lost ones and is thin and pliable. Rotation advancement flaps and transposition flaps are the best options when there are small-to-moderate anterior knee defects and external fixators *in situ*. Propeller flaps allow the surgeon the freedom to select, tailor or compose the flap independent of the limited indications of conventional flaps. Pedicle perforator flaps such as superior medial and superior lateral genicular flaps of the refined design can be used effectively in various reconstructions of medial, posterior, and lateral defects of the knee joint, especially when gastrocnemius is not available. Reverse ALT flaps provide good coverage in implant exposure and large defect coverage and have consistent and reliable anatomy-free flaps that provide the best coverage in large knee defects but need longer surgical duration.

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