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Original Research Paper

Feasibility of Various Local And Regional Flaps Cover for Leg Defects; A Prospective Clinical Study

Medical Science

KEYWORDS :

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Background:
In cases of defects of the lower extremities, there is a paucity of local soft tissue and blood supply. This poses challenging problems for surgeons [6].

Open wounds and defects in the lower extremity result from trauma, tumor resection, and chronic diseases such as peripheral vascular disease and diabetes.

The goal of lower extremity reconstruction is the coverage of defects and open wounds of the leg to give patients a healed wound and to let them resume their life, ambulate, and go back to work while preventing amputation [7].

Among the methods for reconstructing defects of the lower extremities, there are direct closure, skin grafting, and local flaps including the muscle flap, cross-leg flap, and free flap [6].

Local flaps use tissue adjacent to the wound and regional flaps use tissue nearby in the leg based on a named or random blood supply. Local and regional flaps are useful to cover small to moderate defects in the leg and can cover bone or exposed vessels or tendons [14].

Local and regional flaps can more easily cover defects of the proximal or middle third of the leg; while defects in the lower third of the leg have more limited local flap options [10].

Some of common local and regional flaps used in lower limb defects:-

Flap	Blood Supply	Indications
Transposition Fasciocutaneous Flap	Random	throughout the lower leg using adjacent undamaged soft tissue
Medial/lateral Gastrocnemius Muscle Flap	Sural artery	Defect in the knee region and proximal third of the tibia
Soleus Muscle Flap	Posterior tibial and peroneal artery	Defects in the middle third of the tibia
Reverse Sural Artery Flap	Peroneal artery perforators	Defects of the ankle region, heel, dorsum of foot
Posterior Tibial Artery Perforator Flap	Posterior tibial artery perforators	Small to medium sized defects of the middle and distal third of the antero-medial leg
Lateral Calcaneal Artery Flap	Lateral calcaneal artery	Heel and lateral ankle defects
Medial Plantar Artery Flap	Medial plantar artery	Heel and medial ankle defects
Dorsalis Pedis Flap	Dorsalis pedis artery	Lateral and medial ankle defects

Aim: Prospective clinical study on various flaps cover for leg defects admitted in Department of plastic Surgery, Gauhati Medical College over the period 1st May 2015 to 31st April 2016

Materials and methods
All patients with leg defect admitted in Deptt. of Plastic Surgery, Gauhati Medical College & Hospital.

Exclusion criteria
1. Defects which required only split skin grafting.
2. Defects above knee joints.
3. Non- salvageable defects which required amputations.

Pre-operative Hand Held Doppler study evaluation were done to major vessels of lower limb and Perforators locations for axial flaps.

Nature of defect and dimension were evaluated pre-operative. Donor site assessment including template in the principle of planning on reverse, pedicle marking, and perforators' location were done. Donor site were covered with split skin grafting.

Post-operative flap monitoring including parameters; temperature, colour, turgor and capillary refilling were used.

In case of regional flaps like cross leg flap, Reverse Sural flap, detachment and insetting of flap were done at 21 days.

Data was compiled and evaluated accordingly.

Result and observation
Total 47 patients of male 32 (68.1%), female 15 (31.9 %). Average age 26 years, trauma 45 (95.7%), marjolin's ulcer 2 (4.2 %). Proximal leg defects 7 (14.8%), mid-leg defects 22 (46.8%), lower leg defect 11 (23.4%), heel defects 7 (14.8%). Medial head gastrocnemius myocutaneous flap 4 (8.5%), lateral head of gastrocnemius myocutaneous flap 2 (4.25%), transposition fasciocutaneous flap 25 (53.19%), cross-leg flap 5 (10.6%), Reverse sural flap 11 (23.4%).

Post-operative complications
Flap suture line infection:
Out of 6 cases of suture line infections, 1 case had pre-operative bone infection and 5 cases had suture line infections.

All 6 cases were managed by antibiotic based on wound pus culture and sensitivity. Daily antiseptic dressing using betadine solution was done.

Flap necrosis
2 cases had flap necrosis and were managed by debridement and split skin grafting was done after 1 week.

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Mortality

1 case was 72 years/ male, chronic smoker came with traumatic leg defect died on 9 post-operatives due to acute MI

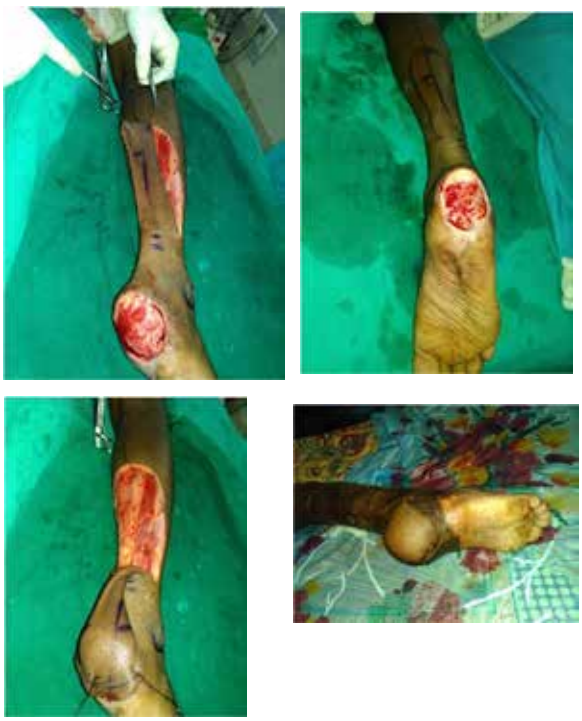
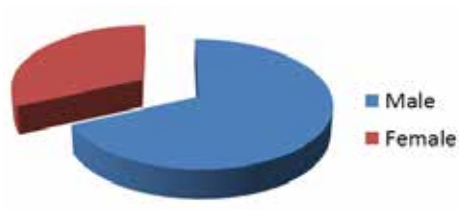


Fig 1:- Reverse Sural artery based flaps for heel defect.

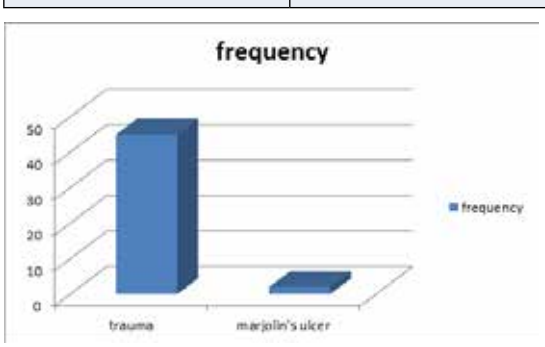
GENDER:-

Male	Female	total
32(68.1%)	15(31.9 %)	47

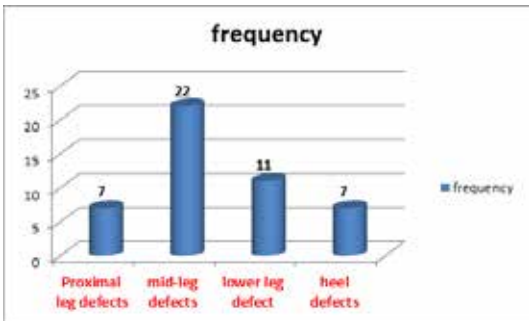


CAUSES OF DEFECT:-

Causes	frequency
trauma	45(95.7%)
marjolin's ulcer	2(4.2 %)

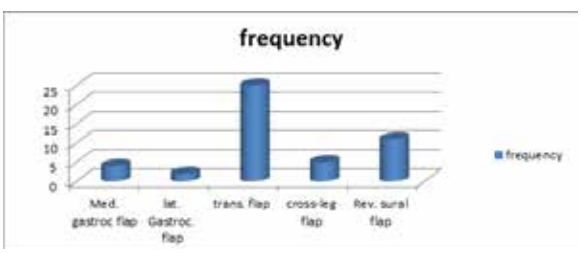


SITES OF INJURY:-

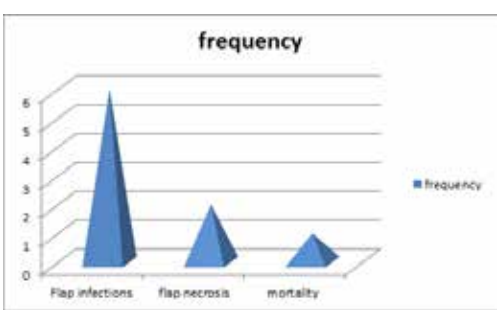


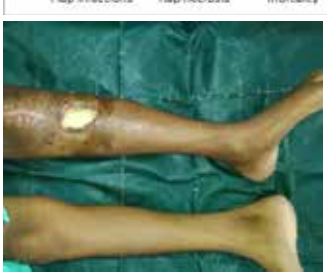
TYPES OF FLAP USED:-

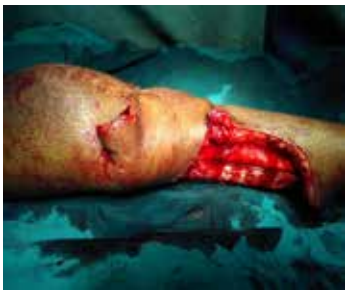
Type of flap used	frequency
Medial head gastrocnemius myocutaneous flap	4
Lateral head of gastrocnemius myocutaneous flap	2
Transposition fasciocutaneous flap	25
Cross-leg flap	5
Reverse sural flap	11



Post-operative complications	frequency
Flap infections	6
Flap necrosis	2
Mortality	1







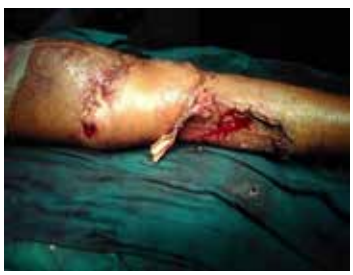


Fig 2:- Medial head Gastocnemous fasciocutaneous flap for proximal leg defect with tibia expose. Necrosis anterior cortex of tibia was excised.

DISCUSSION

Trauma is the most common cause of lower limb defect and more frequently associated with fracture bone, exposed tendons and blood vessels.

By its very location the tibia is exposed to frequent injury. Compound fractures of this bone are more frequent than of any other major long bone 17, 18.

GUSTILO GRADING SYSTEM FOR OPEN FRACTURES OF THE LOWER EXTREMITY 7

Gustilo Grade	Description of Defect
Grade I	Open wound smaller than 1 cm ;simple bone fracture with minimal comminution
Grade II	Wound 1 to 10 cm^2 , no extensive soft tissue damage; minimal crushing; moderate comminution and contamination
Grade III	Wounds larger than 10 cm , with extensive tissue damage, making it difficult to cover exposed bone or hardware; bone comminution. Divided into 3 subgroups.
Grade IIIA	Sufficient soft tissue for bone coverage
Grade IIIB	Extensive tissue damage with periosteal stripping, making local soft-tissue coverage not possible; flap closure needed
Grade IIIC	Grade IIIB injuries with major vascular injury requiring repair.

Meticulous debridement is important for the successful outcome of the treatment of lower limb trauma 13.

Coverage of a wound should be performed as efficiently as possible. Once the wound is clean and well vascularized, a reconstructive option is chosen from the reconstructive ladder 4.

Lower limb reconstruction has certainly benefited from this development of perforator flaps. A handheld Doppler ultrasound scanner is helpful to locate the most promising perforator artery to use.

Among various flaps available for lower limb defect, fasciocutaneous flaps are most often used. Although musculocutaneous or muscle flaps are more preferred for wound with low vascularity and exposed bones.

Fasciocutaneous flap should be selected depending on the site of the leg defect:

a) Upper third leg- Proximally (superiorly) based fasciocutaneous flaps based on the perforators of the post tibial, anterior tibial or peroneal artery 16.

Middle third leg- Proximally (superiorly) based fasciocutaneous flaps based on the posterior tibial or Peroneal perforators or a distally (inferiorly) based fasciocutaneous flap based on the lower posterior Tibial perforator 2

Lower third leg- Distally (inferiorly) based or cross leg fasciocutaneous flap may be used based on lower perforators of the posterior tibial and Peroneal arteries, reverse sural artery flap, posterolateral Malleolar flap 1, 9, 19.

Gastrocnemius muscle has also been used to cover the exposed implant of tibia and knee prosthesis. Early coverage of the complicated wound of the tibia by the gastrocnemius muscle flap can prevent major complications. 5, 14.

Free flaps cannot be used in patients with major lower extremity injury with axial vessel damage and a history of previous trauma and thrombosis of vessels. Failed previous free flap presents special problems in reconstruction.

The cross leg flaps have stood the test of time ever since its first description by Hamilton 12. Cross-leg flap offers the possibility of salvaging limbs that are otherwise nonreconstructable.

Even in tertiary care centers cross leg flaps is a viable procedure in failed free flap surgeries. This is quite relevant because the highest percentage of failure of free flaps is encountered in cases of resurfacing the traumatic defects of the distal leg and foot. 3

Since the discovery of distally based sural artery flap in 1992 by Masquelet et al, it has been used to cover the wound defect of distal third leg. 10

CONCLUSION

1. Local and regional flaps are highly reliable tool for the reconstruction of difficult wounds of the lower limbs.
2. Local and regional offers the possibility of salvaging limbs that are otherwise non-reconstructable.
3. It is an easy technique, not time consuming, unlike microvascular free flaps which require steep learning curve as well instruments dependent like; Operating Microscope, Microvascular instruments and additional man-power.
4. It offers a large flap dimensions to cover most of the defects of the lower extremities especially whenever bone, tendons, and neurovascular bundles are exposed.
5. Local and regional flaps must be first choice before go for more extensive microvascular free flap surgery.
6. Over all, local and regional flaps are the workhorse for soft tissue coverage of lower limb defect.

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