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REVISITING ABDOMINAL FLAPS AND ASSESSING THEIR RELIABLITY FOR COVERAGE OF UPPER EXTREMITY DEFECTS

Plastic Surgery

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ABSTRACT

Abdominal flaps have been a workhorse flaps for complex upper extremity defects since last 5 decades. Since the evolution of microsurgery, free flaps have revolutionised the upper extremity defect reconstruction and have invariably replaced abdominal flaps as the primary option for reconstruction. Abdominal flaps due to their reliablity still continue to be the lifeboat and primary surgical option in centres where microsurgery is not possible and in events of failure of free flaps. It is documented in the literature that long term outcomes of successful pedicled flaps are equal or even better than free flaps. With their lesser learning curve, requiring lesser resources and very reliable outcomes abdominal flaps will stay as a primary option for reconstruction in some centres and as a life boat for free flap failure in some.

KEYWORDS

Abdominal pedicled flaps, upper extremity defects, reliability.

INTRODUCTION-

Pedicled abdominal and groin flaps have been used since decades for coverage of upper extremity complex defects specifically hand. Since the advent of microsurgery and its constant refinement and increasing understanding of vascular anatomy of the body, free flaps have taken over the majority of reconstructive role in complex defects. They have their disadvantages such as 2 stage surgery, cumbersome positioning of the patient and post operative stiffness in joints and increased hospital stay. On the other hand microsurgery have their own set of demerits flap failure, restricted use in compromised vascularity defects and limited use in children, old age and vascular disorder patients. Foremost limitation among these is steep learning curve and requirement of microsurgical facilities. Reliability and minimum complications is the prime aim of the operating surgeon as well as the patient undergoing surgery. In the developing world not many centres are equipped with microsurgical facilities and skilled workforce. And also in developing region there are more number of patients with complex injuries due to thermal/electrical burns, crush injuries due to RTA, safe and reliable procedures are the most required in need of hour. In such centres free tissue transfer failures can be devastating to the patient and surgeon both. In such cases abdominal flap can be planned for salvage of such failed procedures.

Vascular Anatomy Of Abdominal Skin :-

The blood supply of the lower abdominal skin is well-described and includes :

- The right and left Superficial External Pudendal Artery (SEPA)
- The right and left aSuperficial Inferior Epigastric Artery (SIEA)
- The Paraumbilical Perforators on either side(PUP on from deep inferior epigastric artery)
- Musculocutaneous perforators from external oblique muscles
- Medial perforator of intercoastal artery

Figure 1 Arterial anatomy of abdominal wall (Lamberty, B. George H. and George C. Cormack. "The arterial anatomy of skin flaps." (1989).)

1.Transverse cervical artery, 2. Direct cutaneous branch of thoracoacromial artery, 3. Anterior perforators of the internal thoracic artery, 4. Superficial thoracic artery, 5. Intercoastal perforators, 6. Perforators from epigastric and superficial epigastric artery, 7. Possible contribution from deep circumflex iliac artery, 8. Superficial circumflex artery, 9. Superficial inferior epigastric artery, 10. Superficial external pudendal artery, 11. Deep external pudendal artery.

Reliability of pedicled abdominal flaps is a well documented and well described procedure in literature and due to these reasons abdominal and groin flaps continue to be the workhorse flaps in the developing world as well as at our centre for complex upper extremity defect with composite tissue loss[1-5]. We present a review of cases of upper extremity defects operated for abdominal flaps in our centre with assessment of their outcomes and complications.

2. MATERIALS and METHODS

20 patients who underwent abdominal flap surgery during 2021–2022 were analyzed for this study. The indication was complex defects in the hand and forearm exposing vital structures for which loco-regional flaps were not feasible and the inclusion criteria was patients with mutilating hand injuries, Co-morbidities/ infants, young and very old age, Multiple & extensive defects, Electrical burns, defect after a failed free flap.. After pre operative assessment debridement of the wound and appropriate abdominal flap cover was done. Regular standard monitoring of flap and dressings were done. Flap detachment was done on post op 15-21 days (Depending upon inset- >75% inset- early detachment). Planning of flap was done after assessment of cause of injury, mode of injury, associated injury, area of upper limb involved, demography of the patient and flap related complications were noted. Patients were followed up 1 and 3 months post operatively.

3. OBSERVATIONS

20 patients were assessed from 2021 to 2022. 7 of them were males (35%) and 13 were females(65%). The mean age was 31 years (range 9–73years). Most common mode of injuries were due to high tension electric burns (40%) and crush injuries due to workplace accidents (30%). Major portion of paatients belonged to the low socio economic group. Most common site of defects involved dorsum of hand(50%) followed by forearm (30%) and than digits(20%). Out of 20 patients in 16 patients donor area was closed primarily and 4 patients required

skin grafting. Out of 20 patients 18 patients(90%) patients had uneventful recovery with complete survival of the flap and 2 patients had partial marginal necrosis(10%) which was debrided and then was skin grafted.

Flap delay was done in 14 (70%) patients on the 15th post op day. And flap division was done between (15-21) post op day with mean duration being 18.3 days. All the patients were followed up post operatively for 1 and 3 months.

Figure 2 post electric burn defect of left elbow reconstructed using pedicled abdominal flap, along wth the post op result.

Figure 3 Post crush injury defect of hand in a 10y old child reconstructed using abdominal flap and post op result.

Figure 4 Post crush injury defect of elbow reconstructed using abdominal flap

Figure 5 Ring avulsion injury of the middle finger, defect reconstructed using tubed modification of abdominal flap.

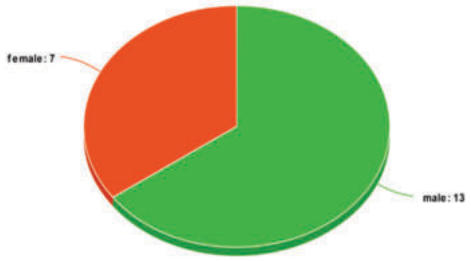

Figure 6. Sex distribution

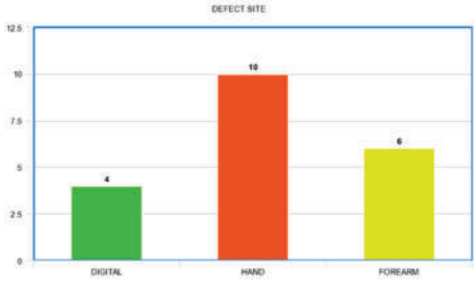

Figure 7. Site of the defect

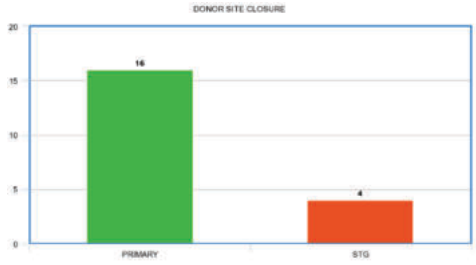

Figure 8. Donor site closure

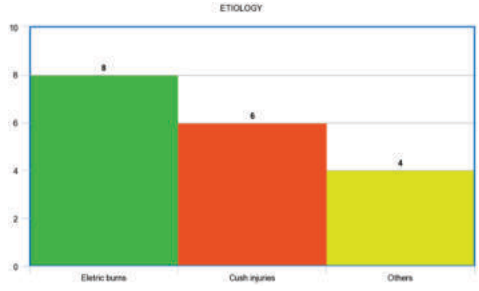

Figure 9. Etiology

DISCUSSION :-

Upper extremities defects as a sequalae of injuries due to burns, trauma etc are the most common form of injuries, and their reconstruction is specifically challenging as it not only requires coverage but also functional restoration. Abdominal flaps have been a tested method of reconstruction since long time [1,4]. Since the advent of microsurgery and development of free flaps they have invariably replaced the reconstruction of extremity defect as the first choice surgery, but like every surgery they have their limitations like chances of failure, bulky, limitations in particular age groups, limitations of size and difficult to do in resource less centres especially in the developing world. Hence abdominal flaps are a more reliable plan for the operating surgeon which is easy to do safe, reliable and is easily modifiable on table after the debridement of defect. Abdominal pedicled flaps are less used now because of their disadvantages, like being uncomfortable to the patient in bed, their bulkiness and the need of multiple stages. With the technical refinements, much of these disadvantages can be overcome. Since vascular supply of the lower abdominal flaps is very consistent as shown in various studies[1,2,5] and with proper planning they can be modified as to cover a large defect with multiple modifications without less discomfort to the patient. Abdominal pedicled flaps have an inherent advantage due to their vascularity pattern and radical thinning is possible during secondary procedures. Abdominal flaps

may be a two stage surgical procedure but can easily be done in brachial and spinal block which cuts down the cost and is affordable to patients. Only drawbacks of abdominal flap cover is the cumbersome positioning of the limb and body in bed post the procedure flap resulting into the joints stiffness and subsequent restricted range of motion post operatively, which requires the patient to go under rigorous physiotherapy for achieving normal range of motion. But this is very well managed by proper counselling and education of the patient. Flap thinning is an additional procedure which can be done if needed for aesthetic improvement.

CONCLUSION

Abdominal pedicled flaps are a reliable option for reconstruction of major upper extremity defects specially with crush injuries and exposed tendons and bone, they can be used as a primary surgical option in centers without microvascular facility and they can also be used as life boat in cases of free flap complications and failures.

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