



A PROSPECTIVE STUDY ON THE USE OF ISLAND FLAPS IN PLASTIC SURGERY- A RELIABLE RECONSTRUCTIVE OPTION

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ABSTRACT

Major advances in the field of Plastic surgery have been made possible by the use of muscle flap, musculocutaneous flap, fasciocutaneous flap and various techniques of microvascular composite tissue transplantation. Island flaps are designed on the principle of transfer of tissue without an intact epithelialized skin pedicle. Further refinements in design and techniques has reached a point where flaps are transferred on vascular and neurovascular bundles. This study is done at Govt. Rajaji hospital, Madurai over a period of 3 years. Totally 60 patients were operated for various defects in the body.

KEYWORDS :

INTRODUCTION

Cover form and function are the three most important factors in determining the successful outcome in plastic surgery. Island flaps are designed on the principle of transfer of tissue without an intact epithelialized skin pedicle. Further refinements in design and techniques has reached a point where flaps are transferred on vascular and neurovascular bundles.

AIM OF STUDY

The main objectives of this clinical study are

1. To study the role of island flaps in modern plastic surgery.
2. To discuss the types, anatomical regions, planning and techniques of execution of island flaps.
3. To study the post operative management and complications.
4. To assess the outcome of reconstruction on the basis of form, function and aesthesis.

ISLAND FLAPS

In island flaps, the pedicle consists of only vessels with out Skin Bridge. It has greater mobility about its pivot point. Island flaps are designed on the principle of transfer of tissue without an intact epithelialized skin pedicle. Further refinements in design and techniques has reached a point where flaps are transferred on vascular and neurovascular bundles.

Examples are superficial temporal artery island flap with island of scalp for eyebrow reconstruction and neurovascular island flap from the ulnar side of the ring finger to provide sensory cover to the thumb.

Advantages of islanding a Flap

1. Flexibility, Mobility, arc of rotation is better compare to other conventional flap.
2. Allows more distal reach of the flap.
3. Complete inset
4. Better local tissue match.

Classification of island flaps

By nature of blood supply

1. Random island flap

Eg. V-Y advancement flap, nasolabial subcutaneous pedicle skin island flap, Key stone flap.

2. Axial pattern island flap

Eg. Reverse sural artery island flap, Posterior interosseous artery island flap, Neurovascular island flap

3. Perforator island flap:

Eg: Superior gluteal artery perforator, Inferior epigastric artery perforator flap, Anterolateral thigh perforator flap.

Propeller Flap

The "perforator flap" and "propeller flap" methods have been combined as "perforator pedicled propeller flaps", a new local flap method. The minimal definition of the propeller flap method is: a "skin island flap with axial rotation". Eg. Peroneal perforator flaps in leg defects.

By the tissue components

1. Skin island flap

Eg. Nasolabial island flap, Postauricular island flap.

2. Fasciocutaneous island flap

Eg. Radial forearm island flap, Peroneal perforator island flap.

3. Musculocutaneous island flap

Eg. Tensor fascia lata island flaps, Lattismus dorsi island flap.

4. Osteomyocutaneous island flap

Eg. Pectoralis major osteomyocutaneous island flap, Trapezius osteomyocutaneous island flap.

In our Study following island flaps were performed and included from head to foot

1. Retroauricular island flap

Based on retroauricular branch of superficial temporal artery. Used to cover the defect of lateral canthal region and exposed bony part of the zygoma. This flap is having three distinct components: The skin dermis and facial portion. This flap can be rotated 360°, pivot point being located at the level of tragus.

2. Temperoparietal island flap

Contains axial superficial temporal vessels. Used for post irradiated oro-cutaneous cheek defects because of its excellent blood supply and hair bearing region.

3. Pectoralis Major myocutaneous island flap

Dominant blood supply is the thoracoacromial artery a branch of subclavian artery which traverse laterally from the mid portion of the clavicle for about 4 cm until it reaches the axis from the acromion to xiphoid, where it turns and runs along this line. Main artery lies close to the lower border of the muscle, so careful handling is needed. Used for carcinoma thyroid neck defect.

4. Lattismus Dorsi myocutaneous island flap

5. Supplied by Thoracodorsal artery. With the pivot point in the axilla, LDMC island flap can reach not only the anterior or posterior neck also the chin, cheek and lateral scalp. Used for mastectomy defect.

6. Neurovascular island flap

Common digital artery communicate to palmar metacarpal

artery before dividing into proper digital artery in the palm. This communication has to be divided while raising the flap. Dorsal cutaneous artery to be divided before raising the flap in the finger. Used for thumb pulp tip reconstruction.

7. Tensor fascia lata myocutaneous island flap

Supplied by the ascending branch of the lateral circumflex femoral artery and its anastomosis circumflex iliac artery (external iliac system) and superior gluteal artery (internal iliac system). We used after the inguinal block dissection, TFL island flaps to the groin defects which prevents the lymphedema by transfer of the lymphatics to internal iliac system through the flap. Dual purpose of the flap – coverage of the defect & transport of lymphatics.

8. Gluteus maximus myocutaneous island flap

It gives excellent soft tissue coverage for the sacral pressure sore defects and it is simpler to elevate the superior half of the gluteus maximus muscle. It is based on superior gluteal artery and musculocutaneous perforators. Donor defect was closed in a V-Y advancement primarily. Used for sacral pressure sore defect.

9. Saphenous artery neurocutaneous island flap.

Used for the defect in the upper end of tibia with plenty of scar around the defect. Supplied by perivenous and perineuro capillary network along the long saphenous vein. The base of the island flap consist of only the long saphenous vein with its adventitia and surrounding areolar tissue. This narrow base allows for flap mobility in an arc from 0 to 170°.

10. Peroneal artery perforator based flap.

Used for the exposed tendo Achilles. Since the peroneal vessels are not affected even in diabetics, inferiorly based flaps based on peroneal perforators laterally are more reliable than the flaps based on posterior tibial artery perforators medially.

11. Median Forehead island Flap

Flap based on Supratrochlear artery. It is used to resurface medial canthal and defects of dorsum of nose it gives better colour match, texture and from. Used for the defect in the dorsum of the nose following BCC excision.

12. Reversed sural artery island flap.

Distally based sural island flap is based on Vascular Axis around sural nerve and its communications with lower perforator from the peroneal artery. This communications are present at the level of Ankle joint 5cm above tip of lateral malleolus. The upper limit of the flap lies at junction between upper and middle 1/3rd of calf. Any extension proximal to that point has to be considered as random extension. The distal end of this conventional flap at its maximum will reach the instep area and not distal to it. Used for coverage of the calcaneal defect in the heel pad region.

13. Medial Plantar instep island flap

Flap is based on medial plantar artery branch of Posterior tibial artery. It is an excellent flap for coverage of calcaneal defects. Supplied by medial plantar artery is one of terminal branch of posterior tibial artery. Medial plantar nerve arise from tibial nerve accompanies the medial plantar artery. It has the advantage of being an arterialized sensory flap and is of good quality for the special requirements of plantar surface. Used for the defect of melanoma foot excision.

13. Transverse rectus abdominis Myocutaneous island flap

TRAM island flaps based on circulation to the anterior abdominal wall that derives from perforating vessels through the rectus abdominis muscle and deep epigastric system branch from deep inferior and superior epigastric artery. It can provide aesthetically both appearance and feel and also benefit of an abdominoplasty. Used for post excisional defect of CA breast.

14. Posterior interosseous artery island flap

Flap is supplied by retrograde perforating branches of anterior interosseous artery. Used to cover dorsum of hand and first web space without interference to the two main arteries.

15. Nasolabial island flap

Flap is based on communication between angular and facial

artery. We used for reconstruction of the ala of the nose lip. It gives better colour match, texture, form, and the donor site can be closed primarily.

MATERIALS AND METHODS

This work includes the study of 30 patients who underwent reconstruction using island flaps for resurfacing defects from head to foot due to trauma, congenital lesions or surgical extirpation of tumour. The patients who were admitted to Plastic Surgery, Surgical Oncology and General Surgery wards at Government Rajaji Hospital, Madurai.

The patient's name, age, sex, history of presenting illness and its duration was obtained. Past history of chronic medical and surgical illness noted. Personal history like smoking, alcohol consumption and diet pattern were obtained. Detailed physical examination of the defect was made and tissue diagnosis was recorded and reconstruction planned accordingly.

MANAGEMENT

All the patients were informed about the surgical procedures, the intraoperative, post operative complications and rehabilitation. Preoperative preparations were done and preoperative antibiotics were given. Patients were operated under general anaesthesia or regional anaesthesia. Postoperatively all the patients were managed by plastic surgeons until recovery of the patient. Blood transfusion was given if indicated. After surgery patients were discharged and advised for follow up.

The patients were followed up every fifteen days, one month, two months, three months, six months and one year. The maximum follow up was for two years.

OBSERVATION

Reconstruction using flaps are performed regularly in all operation theatres for defects from head to foot. Out of these 16 interesting island flaps executed in 60 patients during the period of Sep 2014 to Jan 2017 and were taken up for this study.

**Table I
Age Vs Gender**

Gender	1-15	16-30	31-45	46-60	61-75	>76	Total
Male	4	4	10	12	4	2	36
Female	2	2	6	6	6	2	24
Total	6	6	16	18	10	4	60

- All cases were in the age group from 6 – 80 years.
- 60% cases were male and 40% were female in our study.

Table II Aetiology of Defect

Aetiology of defect	No. of cases	%
Tumour surgery	30	50
Trauma	24	40
Congenital	6	10

- Majority of the defects were either due to trauma or post tumour resection.

Table III Anatomical site of defects

Report	No. of cases	%
Head and Neck	16	26.6
Trunk	20	33.3
Upper limb	10	16.6
Lower limb	14	23.3

- In this study majority of the defects were of the trunk, followed by head and neck region.

Table IV Anatomical sites of flap

Site of island flap	No. of cases	%
Forehead	4	6.6
Retroauricular	2	3.3
Nasolabial	2	3.3
PMMC	8	13.3
LD	4	6.6
TRAM	2	3.3
PIA	4	6.6
NVI hand	4	6.6
CMMC	6	10
TFL	4	6.6
RSA	6	10
Saphenous artery	2	3.3
Prepuccial skin	6	10
Peroneal perforator	4	6.6
Medial Plantar	2	3.3

Table V Complications

Complications	No. of cases	%
Haematoma	8	13.3
Wound Infection	4	6.6
Wound dehiscence	4	6.6
Vascularity Compromise	2	3.3
Flap necrosis	2	3.3
Graft Loss	4	6.6
Hypertrophic scar	8	13.3
Contour deficit	8	13.3
Functional disability	8	13.3
Aesthetic defect	12	20

- In this study, 13% of patients had haematoma. Wound dehiscence, infection and graft loss were seen in 6.6% each. One patient had flap necrosis which only partial thickness.
- As late complications, 13% each of hypertrophic scar, contour deficit and functional disability like pseudomotor skin changes were noted. 80% of patients has an excellent aesthetic outcome.



Picture: Propeller flap



Picture: Neurovascular island flap

DISCUSSION

Island flaps are based on reliable, anatomically defined vascular territory within the flap, which have been raised beyond the constraints of limited Length to breath ratio, usually associated with random flaps, depending upon the vascular pattern flap may be random, Axial & perforator based.

Regarding the etiology of the defect 50% of cases was Tumour surgery with excisional defect, 40% cases was Traumatic defect and remaining 10% was congenital defects.

All the cases were in the age group from 6 – 80 years. 60% cases were male and 40% were female more than 50% cases were with in the age group of 30 60% in our study.

Diabetic mellitus, hypertension, smoking and peripheral vascular disease were commonly associated risk factors accounting 20% cases, but vascular compromise in our study was only 3.3%, hence island flaps are safer to perform even with systemic risk factors and in some cases vascular supply of the flap confirmed by Doppler.

Depending upon the location of the defect, we performed 16 cases in the head and neck region, 20 cases in the Trunk, 10 cases in the upper limb and 14 cases in the lower limb. Majority of the cases from Trunk, followed by head and neck region.

Since all the flaps were locally base, it gibes better colour match, texture, form are aesthetically acceptable. The arc of rotation of the flap is more can be turned it around 1800. It gives better inset in to the defect without tension and dog ear, even though most of the flaps were non sensory in our study, sensory flap was also performed with good success especially in finger and foot defects with excellent tissue match.

In our studies, all the flaps used in reconstruction were single stage without delay. Almost half of the donor site defect were closed primarily and remaining defects were closed by split skin grafting.

In our studies, we encountered one case of flap necrosis with partial thickness loss which was managed with split skin graft. Late complications like hypertrophic, scar contour deficit were managed by using intralesional steroids and pressure garments. The patients were followed up regularly and the average period was upto 6 months.

CONCLUSION

- Island flaps are based on reliable anatomically defined vascular territory with in the flap – blood supply is reliable and robust.
- The reliability and volume of tissue that can be placed into the defect is markedly greater than any random pattern flap.
- Arc of rotation is more compared to pedicle flap.
- Inset is complete and satisfactory.
- Local tissue match – similarity in skin color, texture form contour and aesthesis etc., is excellent.
- Restoration of function whether motor or sensory is possible in certain flaps.
- Single stage procedure.
- Most of the donor size can be closed primarily, donor site morbidity also negligible.

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