

Outcome of Flap Surgeries in Dermatological Unit at a Tertiary Care Centre in India with a Review of Literature

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ABSTRACT

Introduction: Flap surgeries are an excellent choice for closing large defects following trauma, excision of carcinomas or removal of large lesions. This article is a prospective interventional study of various flap surgeries performed at a tertiary care centre with their outcome in dermatological unit. **Materials and Methods:** A total of 35 flap surgeries performed from January 2012 to December 2014 formed part of the study. Data were recorded for each case including age, sex, indications and type of flap surgery and any occurrence of complications. **Results:** Out of the 35 patients, basal cell carcinoma was the most common indication for surgery in 22 patients, followed by Bowen's disease in five, dermatofibroma in three and porocarcinoma in two. Other indications were squamous cell carcinoma, tuberous xanthoma, myxoid cyst and nevus sebaceous. Rhomboid flap and rotation flap were done in 12 patients each, V-Y plasty in three patients, advancement flap, crescentic advancement flap and O-Z plasty were done in two patients each, O-Z plasty was done in two patients, A-T plasty and H plasty were done in one patient each. Common complications observed were flap necrosis seen in three patients and one patient developed hematoma on the second post-operative day, hypertrophic scar in one case and recurrence of BCC. **Conclusion:** Malignant and pre-malignant lesions were common indications in our study. Excellent outcome of flap surgeries promises to be a birdie stroke in the armamentarium of dermatologists.

KEYWORDS: Large defects, malignant, pre-malignant flap surgeries

INTRODUCTION

Flap surgeries are an excellent choice for closing large defects following trauma, excision of malignant, pre-malignant or large benign lesions, especially on the face which has rich vascular supply and varied contour. Apart from the age and associated comorbidities of the patient, the outcome depends on proper pre-operative planning, size and site of the defect, colour and laxity of the surrounding skin, clear understanding of the properties of local flap and skill of the surgeon. Here, we describe certain simple flap surgeries done in our Dermatological department over a duration of 3 years, mainly performed for closure of defects created from excision of skin carcinoma.

MATERIALS AND METHODS

A prospective interventional study was conducted from 2012 to 2014. Demographic data pertaining to age, sex, occupation, family history, onset and evolution and duration of the lesion were recorded. Biopsy was done to establish the diagnosis. Depending on the condition, location, size, shape and the surrounding area, a suitable flap surgery technique was planned and performed. In all cases while excising the lesion, a margin of 5 mm and 10 mm was left for pre-malignant and malignant

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lesions, respectively. The excised tissue was sent for histopathological examination to confirm that all margins were free of the tumour. All cases were followed up on day 3, day 7 and day 14 to observe for immediate complications and suture removal, at the end of 6 months and 1 year, to look for recurrence in case of pre-malignant and malignant lesions.

RESULTS

A total of 35 flap surgeries were performed from 2012 to 2014. Nineteen patients were female and 16 were male. Out of 35 patients, eight patients were <40 years, 17 were in the age group of 40–60 years and 10 were in the age group of >60 years. The mean age of presentation was 40–60 years. The most common indication was basal cell carcinoma present in 22 patients, next common being Bowen's disease present in five patients. Other indications were porocarcinoma in two patients, dermatofibroma in two patients and squamous cell carcinoma, tuberous xanthoma, nevus sebaceous and pilomatricoma on the scalp in one patient each.

Flap surgery was performed on the face in 21 patients, on the abdomen in four patients, on the scalp, gluteal region, back, and the foot in two patients each, on the chest and the hand in one patient each. Rhomboid surgery and rotation flap were done in 12 patients each, V-Y plasty on the face was done in three patients, unipedicle advancement flap was done in two patients, and crescentic advancement flap on the nose was done in two patients. Two O-Z plasty on the scalp, one A-T advancement and one H plasty on the forehead were performed. Histology of the excised tissue after surgery had shown complete clearance of tumour margin in all cases. The indication, site and size of the defect and types of flap surgeries done are shown in Table 1.

Complications

Out of 35 patients, three developed necrosis of the flap, all of which were rhomboid flaps: two on gluteal region and one on the flank that healed with secondary intention resulting in a wide scar. One patient developed hypertrophic scar following rotation flap on the chest. Recurrence was noted in one case of basal cell carcinoma on the nose.

Table 1: Indications, site and size of the defect, types of flap surgeries and complications

Patient	Age	Gender	Nature of the lesion	Size of defect (cm)	Site	Type of flap surgery	Complication
1	80	Female	BCC	3×3	Face	Rhomboid	-
2	50	Female	BCC	3×2	Cheek	Rotation	-
3	70	Female	BCC	2.5×2	Face	Rhomboid	-
4	86	Female	BCC	2×2	Face	Rotation	-
5	40	Male	BCC	3.2×3	Face	Rhomboid	-
6	14	Male	Dermatofibroma	2×1	Foot	Rotation	-
7	65	Female	SCC	2×3	Hand	Rotation	-
8	73	Male	BCC	3×1.5	Cheek	V-Y plasty	-
9	62	Male	BCC	4×2.5	Face	Rhomboid	-
10	46	Male	BCC	3×2.8	Face	Rhomboid	-
11	60	Female	BCC	3.2×3	Face	Rotation	-
12	40	Male	Bowen's	4×3	Abdomen	Rhomboid	-
13	35	Female	Pilomatricoma	4×5	Scalp	O-Z plasty	-
14	60	Female	BCC	3×2	Face	Rotation	-
15	30	Male	Myxoid cyst	1×1.2	Toe	Unipedicle advancement flap	-
16	48	Female	BCC	2.5×3	Face	Rotation	-
17	43	Male	Bowen's	4×4.5	Abdomen	Rhomboid	-
18	57	Female	BCC	3×2	Face	Rhomboid	-
19	42	Male	Bowen's	4×3	Back	Rhomboid	Necrosis
20	30	Male	Dermatofibroma	3×3	Back	Unipedicle advancement	-
21	42	Female	BCC	2×2.4	Ala nasi	Crescentic advancement	-
22	60	Male	BCC	3×2.5	Face	Rotation	-
23	70	Female	SCC	2.3×3	Face	Rotation	-
24	63	Female	Porocarcinoma	3×4	Abdomen	Rotation	-
25	60	Female	Bowen's	3×4	Buttocks/gluteal	Rhomboid	Necrosis
26	45	Female	Tuberous xanthoma	5×4	Buttocks/gluteal	Rhomboid	Necrosis
27	60	Female	BCC	3×3	Forehead	A-T plasty	-
28	50	Female	BCC	3×2.3	Cheeks	Rhomboid	-
29	45	Male	BCC	2×2	Nose	Crescentic advancement	Recurrence
30	20	Female	Nevus sebaceous	2×3	Forehead	H plasty	-
31	65	Female	Porocarcinoma	4×5	Scalp	O-Z plasty	Hematoma
32	62	Male	SCC	3×3	Lateral cheek	V-Y plasty	-
33	25	Male	BCC	3×3.2	Lateral cheek	V-Y plasty	-
34	41	Male	BCC	4×3	Abdomen	Rotation	-
35	45	Male	Bowen's	4×2	Chest	Rotation	Hypertrophic scar

BCC: Basal cell carcinoma, SCC: Squamous cell carcinoma

DISCUSSION

A flap is a unit of tissue transferred from one site to another while maintaining its own blood supply.^[1] The size of the defect created, skin colour, tissue composition, location and subunits involved are the important factors to be considered while planning for the flap surgery.^[2] For better aesthetic outcome, resection of the entire subunit is necessary if the defect involves >50% of the subunit. If all the layers are absent, a reconstruction of full-thickness graft has to be considered. Pre-operative history taking and evaluation for diabetes, hypertension, keloidal tendencies, radiation, smoking and immunocompromised state are necessary to reduce the risk of complications. Patients should also be evaluated for any distant sites of metastasis in case of carcinomas.

Flaps range from simple advancements of skin to composites of many different types of tissue such as skin, muscle, bone, fat or fascia. Based on the method of transfer and design, flap surgery can be local or distant. Local flap surgery includes rotational, advancement and transposition flaps. Distant includes pedicle and free flaps.^[3] Most medium-sized defects on the face can be closed by a local flap.

Rotational flaps are pivoted around a fixed point at the base of the flap and rotated along an arc towards the defect, the arc is 30° or less with the radius approximately two to three times the diameter of the defect and the length approximately four to five times the width of the defect. Most rotational flaps may invariably possess a component of advancement in them and are termed rotation-advancement flaps.^[4,5]

Flaps that rotate or transpose around a cutaneous pedicle are restrained by the tethering effect of that base of tissue. Flap design that fails to adjust for this force may end up with unwanted degree of tension and/or surrounding tissue displacement.^[6] Rotation flaps are ideal to close cheek defect which is 3–4 cm in diameter. The arc of the incision is placed along the relaxed skin tension line to close along the aesthetic border [Figure 1]. In case of forehead defect <2 cm size, this incision is placed along the hairline. A modification of rotation flap is double opposing rotation-advancement closure which

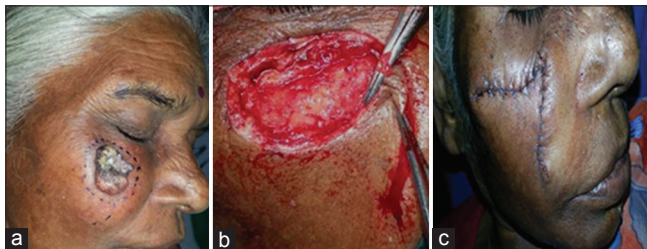


Figure 1: Rotation flap. (a) Pre-operative marking. (b) Intra-operative rotation of flap. (c) Immediate post-operative period

can be used to close small, medium and large defects of the forehead. This technique avoids alterations in the brow position or the hairline, even in the lateral temple region.^[7] In our study, 12 rotation flap surgeries were performed, most of which were on the face and abdomen. All cases healed well except one on the chest that developed hypertrophic scar which was treated with intralesional triamcinolone (20 mg/ml) injection.

O-Z reconstruction is a double rotation flap, where rotation flap is designed on opposite orientation on both sides of the defect. The two flaps are opposed with a z-shaped repair [Figure 2]. The optimum design for wound closure is an acute-angled flap closure with length four times the radius of the defect. This type of double rotation is especially useful in the scalp for recruitment of tissue from different locations to use two or more rotation flap, the defect should be located in the centre of the scalp.^[8] In this study, two O-Z plasty procedures were done for closing the defect on the scalp, which healed with minimal scarring. Another variation of O-Z plasty to close large scalp defect is double hatchet flap, which has both rotational and advancement component.^[9]

Advancement flaps refer to flaps created by incisions that allow sliding movement of tissue, along a linear axis to close a defect. It is moved in a linear direction from the donor site to the recipient site. Classically, advancement flaps have a length-to-width ratio of 1:1 or 2:1.^[10] The advancement flap can be single pedicle, bipedicle, A-T plasty or V-Y plasty. The defect can also be closed by a T or H plasty, where depending on the size of defect and incision taken, the line of closure will be a T or H shaped.

Unipedicle advancement flaps have single cutaneous pedicle, incision is placed parallel to the defect, with



Figure 2: Double rotation flap. (a) Pre-operative marking. (b) Intra-operative. (c) Final flap closure. (d) Three months postoperatively

movement of flap being unidirectional towards the defect. Thorough undermining of the flap and surrounding tissue is necessary to allow easy movement of the tissue. A unipedicle advancement is designed with defect width-to-flap width ratio of 1:3.^[10,11] In this study, two single advancement flaps were done to close the primary defect on the back and toe, respectively.

A variation of the true advancement flap that is effective for both lateral and paramedian forehead suprabrow defects is the rotation O-T, A-T and O-Z repairs.^[12]

We have performed H plasty on the forehead to close the defect near hairline and A-T plasty for lateral forehead defect. In H plasty, the incision is extended parallel on both sides of the defect and advanced towards each other. Each portion of the flap on both sides is responsible for covering the portion of the defect [Figure 3]. The flap length need not be equal on both sides, it can be altered based on elasticity and redundancy of the adjacent tissue.^[13,14]

In A-T plasty, a triangular defect is transformed into a T-shaped scar. Here, instead of placing two incisions parallel to the defect, a single incision on the opposing side of defect is made. A standing cutaneous deformity develops at the defect site opposite to the two incisions made, which can be excised and closed, the final suture line is in a T configuration. The advantage of this design is that it creates two small defects instead of a single large defect, which may be difficult to harvest in the area of limited mobility. These flaps can also be performed above the eyebrow and vermilion border of the lip and eyes. An A-T plasty was performed on lateral forehead defect in this study with incision line parallel to the eyebrow [Figure 4].^[15-16]

Two crescentic advancement flaps were performed to close the defect on the nasal side wall [Figure 5]. Here, one of the curvilinear incisions hides under the alar crease; curvilinear crescent of tissue that is excised prevents dog-ear formation.^[17,18] The island pedicle flap is also called V-Y plasty, owing to its final configuration of closure.^[19,20] As the dermal margins are severed, the flap can be advanced as far as the deep pedicle allows, and it has a rich vascular supply from the underlying vessels, hence chances of necrosis are minimal with this reconstruction. The island pedicle flap can be utilised to close defects on the upper lip, nose-lip-cheek junction.^[21-25] In this study, three V-Y plasty procedures were done to close the defect on the lateral cheek. We observed an excellent cosmetic outcome with minimal scarring with this procedure [Figure 6].



Figure 3: H plasty. (a) Pre-operative marking. (b) Intra-operative. (c) Final wound closure. (d) Immediate suture removal



Figure 4: A-T plasty. (a) Pre-operative marking. (b) Intra-operative. (c) Final wound closure. (d) One week after suture removal



Figure 5: Crescentic advancement flap. (a) Excision of tumour. (b) Marking after excision of tumour. (c) Intra-operative. (d) After suture removal

Transposition flaps are versatile flaps whose design creates a second defect. The flap is raised from a donor site and rotated over an incomplete bridge of the skin to be placed onto the defect site. The donor site must also be closed as part of the design. The three classic transposition flaps include the rhombic flap, bilobed flap and Z-plasty.

The classic Limberg flap is used to repair a defect which has a configuration of a rhombus with two opposing 60° and two opposing 120° interior angles.^[26] The 60° and 120° rhombus can be taken as two equilateral triangle base to base. The short diagonal of the rhombus is equal to the sides of the rhombus. The flap is designed by extending the line of short diagonal, the length equal to that of the diagonal, which is also the length of side of the defect [Figure 7]. The majority of wound closure tension is at the donor site and has been calculated to be 20° to the short diagonal of the rhombus defect. Skin mobility and extensibility are the important factors to be considered to minimise wound closure tension to avoid distortion of the surrounding facial structures. The dufourmental modification can be used for rhombus-shaped defects that have any combination of interior angles, not just those of 60° and 120°. In this study, rhombic flap was performed for defects created on the face, larger defects of the trunk and gluteal region, where mobility of the surrounding tissue is limited. Various studies have mentioned the use of the rhomboid flap in every area of the human body and in various surgical specialities. This explains the versatility and safety of this flap.^[27-29]

Bleeding, secondary infection, failure of flap, pin-cushioning and flap necrosis are the common side effects encountered. Twelve rhomboid surgeries were done in this study, and eight patients had an excellent aesthetic outcome and three developed necrosis, which can be attributed to less yielding of surrounding tissue in the gluteal region [Figure 8]. Two of these were on the gluteal region and one on the flank. Pressure at the site of surgery and tension at the site due to limited mobility of tissue in this region may be the cause of necrosis. One patient developed haematoma on the 2nd day postoperatively, which resolved after evacuation and pressure dressing.

A well-designed flap with thorough undermining of the tissue before closing reduces wound tension and hence flap necrosis and failure. Intra-operative bleeding can be controlled by electrocautery or ligation. Formation of haematoma postoperatively can compromise the local flap by inducing vasospasm and by creating a space between the flap and recipient bed. A strict aseptic precaution during surgery and



Figure 6: V-Y plasty. (a) Pre-operative marking. (b) Intra-operative. (c) Final closure. (d) One month after suture removal

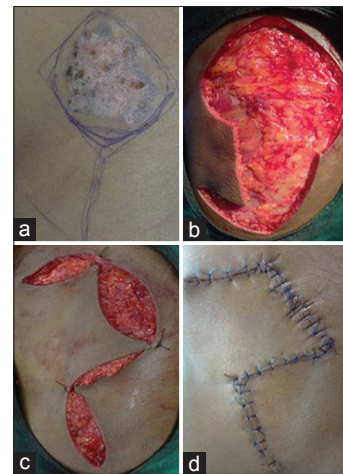


Figure 7: Rhomboid flap. (a) Pre-operative marking. (b) Intra-operative. (c) Corner stitch. (d) Final closure



Figure 8: Necrosis of flap on the 5th post-operative day

post-operative systemic antibiotics reduce secondary infection.

CONCLUSION

The principle of flap surgeries is to close large defects with minimum deformity and distortion of both the donor area and the defect. As compared to full-thickness graft, the colour and texture are maintained in flap surgeries and hence preferred in cosmetically important areas such as face. In our observation, flap surgeries done on the face healed well with no complications. Those done on the gluteal region had more chances of developing necrosis, which can be attributed to the pressure effects and limited mobility and laxity of tissue in this region. There was minimal scarring in elderly patients with lax skin. Since dermatologists encounter various malignant and pre-malignant lesions, the above-mentioned simple flap surgeries can be performed by a trained dermatosurgeon.

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Conflicts of interest

There are no conflicts of interest.

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