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A PROSPECTIVE STUDY ON THE RECONSTRUCTION OF THE SOFT TISSUE INJURIES OF FACE IN A TERTIARY CARE CENTRE

Plastic Surgery

Dr S. Anuradha Assistant Professor, Department of Plastic Surgery, Govt. Rajaji Hospital, Madurai.

Dr. V. Jeyakodish* Senior Assistant Professor, Department of Plastic Surgery, Govt. Rajaji Hospital, Madurai. *Corresponding Author

ABSTRACT

Facial injuries are indicators of the energy of injury. The aetiology of facial soft tissue trauma varies considerably depending on age, sex and geographic location. Mechanism of injury for facial injuries varies from place to place depending on the degree of urbanization, socioeconomic status and cultural background. In rural areas domestic violence contribute to majority and in metropolitan areas Road traffic accidents contribute the main cause. Alcohol consumption is a major factor for those between the ages of 30 and 50 years. We have analysed the various parameters associated with facial soft tissue injuries – mode of injury, site of injury and different methods of reconstruction.

KEYWORDS

Rotation flap, chondrocutaneous advancement flap, helical rim defects

INTRODUCTION

Scalp Defects:

< 3cm: Primary closure is possible. Galeal scoring parallel to the axis of the defect relieves tension. Larger defects – scalp flaps, pin wheel flaps, skin grafts (full thickness or split thickness), tissue expansion, free tissue transfer.

3-6 cm: Rotation advancement flaps, Primary and secondary defects can be closed primarily.

6-9 cm: One large flap based on a major pedicle can be used, but the secondary defect may require skin grafting. Flaps used – bucket handle flap, Orticochea flap, tissue expansion, free tissue transfer.

> 9cm: Free tissue transfer for resurfacing large scalp defects. Flaps used – Latissmus dorsi muscle flap, rectus abdominis, anterolateral thigh flap.

Eyelid Defects

Transverse incisions will help to camouflage scars and symmetry with contralateral structures should be preserved whenever possible. Vertical incisions should be avoided so as to avoid contracture and eyelid distortion. Approximation of lid margins should be achieved with alignment of all layers for good functional and aesthetic outcome. Suture materials and knots should be placed to avoid direct contact with surface of cornea and globe.

Upper eyelid reconstruction:

Partial thickness defects that measure less than 50% of lid length closed primarily with tissue advancement. Partial thickness defects that measure more than 50% of lid length reconstructed with a full thickness skin graft from the contralateral upper eyelid.

Full thickness defects

< 25% -Primary closure with canthotomy and cantholysis, local tissue advanced.

25% - 75% -Hughes sliding tarso-conjunctival flap, levator recession, composite graft, Cutler-Beard advancement flap from the lower lid.

>75% -Lower lid switch flap.

Lower eyelid reconstruction:

- Partial thickness defect

<50% - Primary closure with local tissue advancement

>50% - Full thickness graft from opposite upper eyelid, Fricke transposition flap from ipsilateral upper eyelid. Bidpedicled myocutaneous Tripier flap.

- Full thickness defect

<50%-Primary closure with canthotomy and cantholysis, Local Tissue advancement, Hughes tarso-conjunctival flap with skin graft.

50% - 75%- Hughes tarso-conjuctival flap with skin graft.

>75% - Composite graft with cheek advancement, cervico facial Flaps.

Medial canthal reconstruction :

Routine lacrimal stenting by silicone tube intubation and measures to ensure medial canthal tendon support are recommended in zone III. Defects of the anterior layer are reconstructed with a medially based myocutaneous flap from the upper eyelid, other local flaps such as V-Y glabellar flap and healing by secondary intention.

Lateral canthal reconstruction:

Reconstruction in zone IV requires canthal support procedure or canthopexy. Complete disruption requires canthoplasty. Reconstruction of superficial component of the defect requires cheek advancement flap or full thickness skin graft.

Reconstruction of periocular defect:

Zone V defects are defined as those outside of, but contiguous with Zones I – IV. Zone V defects should be reconstructed with attention to the proper functioning and appearance of the lips and canthi in all 4 of the periocular zones. Adjuvant procedures like lateral canthoplasty/ canthopexy should be performed. Cervico –facial flap may also be used.

Ear defects

Options of ear reconstruction includes primary closure, skin grafts, composite grafts, local regional flaps and replantation

Primary closure:

Simple laceration involving skin only can be closed in a single layer. In complex laceration involving full thickness, layered closure is done. Small skin defects of helical rim can be closed by undermining and advancement. Small defects,1.5 cm involving helix and antihelix may be amenable to primary closure by converting to wedge excision.

Skin grafts

Skin grafts are useful in skin loss in lateral and medial surface when perichondrium is intact. Contralateral postauricular skin can be harvested as full thickness skin graft. Defects between 1.5 – 2 cm involving helix and antihelix can be reconstructed by using composite graft.

Local and Regional Flaps

Local flap provide good colour and texture match. Preauricular, postauricular, retromandibular and cervical skin have been used. Temporal fascial flap is a well vascularised flap available in the vicinity for reconstruction.

Helical defects

Upper third defects

Defects < 2 cm

- Antia Buch's chondrocutaneous advancement flap.
- Composite flaps.

Defects > 2 cm

- Staged tube flap from postauricular skin – Eave's procedure.

- Converse tunnel flap. .
- Cartilage framework covered with temporoparietal fascia with skin grafting.

Middle third defects
- Composite grafts.
- Staged tubed Post auricular flap
- Bipedicled flap
- Antia Buch's chnondrocutaneous advancement flap.
- Converse tunnel procedure.
- Cartilage graft with temporoparietal fascial flap with skin grafting.

Lobule defect
- Pre-auricular flap
- Post-auricular flap
- Gavello's flap
- Two Flap technique of Converse
- Wynn method
- Nelation and Ombredanne method.
- Double cross skin flap of Fadi Steilati

Subtotal or total loss of Pinna
- Replantation (the size should not be more than 5mm)
- Staged reconstruction
- Single staged reconstruction using cartilage or alloplastic framework with temporoparietal fascia and skin graft.
- Prosthesis implantation.

Nose defects

Small and superficial defects
1. Healing by secondary intention in non-critical areas and concave surfaces.
2. Primary suturing – if the defect is less than 0.5cm in dorsum and sidewalls.
3. Full thickness skin grafts harvested from supraclavicular and post auricular areas.
4. Split Skin grafting used as temporary dressing
5. Composite chondrocutaneous grafts < 5mm harvested form helix, ear lobe for reconstruction of alar rim and columella.
6. Local Falps

a) Banner Flaps for upper third defects.
b) Esser's bilobed flap for alar and tip defects.
c) Dorsal nasal flaps with or without glabellar extension as a rotation-advancement flap (Miter Flap) for Lower third dorsal defects.
d) Glabellar flap – Gillies for upper third defects.
e) Superiorly based single staged nasolabial flap for alar and sidewall defects.
f) Islanded perforator flaps based on facial artery for alar rim defects.

Large and deep defects

The size of the defect is more than 1.5cm and it requires support and lining replacement.

The choices are
1) Two stage nasolabial flap - for alar defects.
2) Forehead flap - median (seagull flap), Gillies up and down flap, Converse's scalping forehead flap.
3) Fronto temporal flap (Meyer) – for tip, Columella and alar defects.
4) Retroauricular temporal flaps – Washio.
5) Temporoparietal fascial flap.
6) Reversed superficial temporal artery post auricular compound skin and cartilage flap.
7) Distnat Flap – Upper arm (Tagliacozzi flap), Cervical, deltopectoral, abdominal tube pedicle flaps, Trapezius musculocutaneous islanded flap.
8) Free flap – radial free forearm flap, retroauricular flap, auricular microvascular transplant.

Lip defects

The aim in lip reconstruction includes
1. Maintenance of oral competence.
2. Preserve the sensation of lips.
3. Preserve the continuity of vermilion border.
4. There should be no microstomia.
5. There should be adequate lip appearance.
6. A balance in the length of the upper and lower lip is important and whom tissue should be near equally shared by the two lips.
7. Functional reconstruction is not as critical in the upper lip as in the lower lip. A static upper lip can allow for competence if the lower lip is normal.
8. Alignment of the vermilion is a key element in any lip procedure from simple lacerations to complex reconstructions with the flap. Step offs in the vermilion of 1mm are noticeable at conversational distance.

MATERIALS AND METHODS

This study was conducted in the Department of Plastic and Reconstructive surgery, Madurai Medical College & Hospital from August 2010 to March 2013. The patients with history of facial soft tissue injuries who were admitted in the emergency ward were included in the study. Patients with severe life threatening CNS injuries, skeletal injuries and other injuries were excluded from the study. All patients with soft tissue injuries of the scalp, cheek, lip, ear, nose and eyelids accounting to 90 cases were included in the study.

METHODS

The methods included obtaining a thorough history of mode of injury, site of injury, thorough clinical examination and necessary investigations with appropriate surgical reconstruction. Proper preoperative planning was done. Pattern & template were made as per tissue loss. Digital photographs of the patients were recorded preoperatively, intraoperatively and postoperatively.

In stable patients with clean uncontaminated wounds primary single staged repair was done or the first stage of the staged reconstruction was done on the day of injury. In patients with contaminated injuries secondary reconstruction was planned.

Procedures, outcomes, complications were explained to the patients and informed written consent were obtained from all patients. Cases were followed up after 1 week, and 2 weeks and then monthly for atleast 3 months after the final stage of reconstruction.

Pic 1: Helical rim defect: Chondrocutaneous advancement flap

Pic:2. Scalp Defect: Rotation flap

OBSERVATION AND RESULTS

Table - 1. Age incidence

S.NO	Age in years	No. of cases	Percentage
1	< 20	11	12%
2	21-40	46	51%
3	41-60	33	37%

The data shows that about 51% (n=46) patients belonged to 21-40 years. 37% (n=33) of patients belonged to 41-60years age group and 12% (n=11) of patients were less than 20years.

Table – 2 sex incidence

S.NO	Male	Female
1	64	26

Table – 3 Mode of injury

S.No	Mode of Injury	No. of Patients	Percentage
1	Road Traffic Accidents	44	49%
2	Accidental falls	11	12%
3	Assaults	17	19%
4	Occupational	5	6%
5	Human Bite	10	11%
6	Animal Bite	3	3%

Road traffic accidents were the commonest cause for facial injuries contributing 49% (n=4) and other causes being accidental falls 12% (n=11), Assault 19% ((n=17) Occupational 6% (n=5), Human bite 11% (n=10) and Animal bites 3% (n=3).

Table – 4 Site of Injury

S.No	Site of Injury	No. of Patients	Percentage
1	Scalp & Forehead	12	13%
2	Eye Lid	14	15%
3	Cheek	7	8%
4	Ear	27	30%
5	Nose	8	9%
6	Lips	14	16%
7	Multiples sites	8	9%

Ear injuries predominated being 30% (n=7) followed by Eyelid and lip injuries contributing 15% (n=14each) then the scalp and forehead 13% each (n=12each), Nose 9% (n=8) and Cheek 8% (n=7).

Table - 5 Methods of reconstruction in scalp defects

S.No	Procedures	No.of Cases	Percentage
1	Rotation Flap	4	30%
2	Transposition Flap	3	24%
3	Galeal Flap	1	8%
4	Split Skin Thickness Graft	1	8%
5	Full Thickness Skin Graft	2	15%
6	Primary Suturing	2	15%

Rotation flaps were done in 4 cases (30%), Transposition flap in 3 cases (23%), Galeal Falps and Split Skin thickness graft in 1 case each (8%), Full Thickness skin graft and primary suturing in 2 cases each (15%).

Table – 6 Methods of reconstruction in eyelid defects

S.No	Methods	No.of Patients	Percentage
1	Mustarde Flap	5	29%
2	Nasolabial Flap	2	12%
3	Full thickness skin graft	1	6%
4	Primary suturing	9	53%

Eyelid injuries were primarily sutured in 9 cases (53%) and common flaps used was Mustarde Flap in 5 cases (29%), Nasolabial flap in 2 cases (12%) and full thickness skin graft in 1 case (6%).

Table – 7 Methods of reconstruction in cheek defects

S.No	Procedure	No.of Cases	Percentage
1	Local Flaps	6	60%
2	Primary suturing	4	40%

Local flaps like transposition flap, Limberg flap, Cheek advancement flap were used in 6 cases (60%) and Primary suturing was done in 4 cases (40%).

Table – 8 methods of reconstruction in ear defects

S.No	Procedures	No.of Cases	Percentage
1	Antia Chondrocutaneous advancement	3	11%
2	Postauricular flap	4	14%
3	Converse tunnel procedure	2	7%
4	Dieffenbach procedure	5	18%
5	Postauricular Bipedicaled flap	1	4%
6	Double cross skin flap	3	11%
7	Cervical Tubing	2	7%
8	Primary suturing	8	28%

Table – 9 methods of reconstruction in nose defects

S.No	Procedures	No.of Cases	Percentage
1	Paramedian forehead flap	5	40%
2	Nasolabial	3	24%
3	Full thickness skin graft	1	8%
4	Primary suturing	4	32%

Nose defect were reconstructed with pramedian forehead flap in 5 cases (40%), Nasolabial flap in 3 cases (24%), Full thickness skin graft in 1 cases (8%) and primary suturing in 4 cases (32%).

Table – 10 methods of reconstruction in lip defects

S.No	Methods	No.of Cases	Percentage
1	Vermilion advancement	2	14%
2	Schuchardt Advancement	3	21%
3	Stair step advancement	2	14%
4	Gillies Fan Flap	2	14%
5	Primary Suturing	5	35%

Lip injuries were primarily repaired in 5 cases (35%), Schuchardt advancement done in 3 cases (21%) and Vermilion advancement, Stair-step advancement, Gillies Fan flap were done in 2 cases each (14%).

DISCUSSION

- Primary reconstruction of the facial defect improved the self esteem of the patients, reduced the hospital stay as well as the cost of treatment. 47 cases were reconstructed primarily in emergency operation theatre and 43 cases reconstructed secondarily in elective operation theatre.
- Road traffic accidents contributed to the majority of cases of which the two-wheeler accidents predominated. Other causes were accidental falls, assault with sharps and Occupational injuries like fall of wooden objects during construction works. Human bites were also common, females were the common victims and the assailants were usually under the influence of alcohol. Dog bite was the cause of injury in 3 patients. All 3 cases were actively and passively immunised against rabies.
- Out of 90 cases of facial soft tissue injuries 27 cases had ear injuries, the next common site being eyelid and lips (14 cases each) followed by the Scalp & Forehead (12 cases Each), Nose (8 cases), Cheek (7 cases) and multiple sites in 7 cases.
- Among the Ear injuries right ear was commonly injured compared to the left ear. Middle third defects predominated than the upper third and lower third. \ddle third defect reconstruction was done using Dieffenbach flap. In 3 cases of upper third defect Antia Buch chondroctuaneous advancement was done. Postauricular flap-superiorly based/inferiorly based was done in 4 cases. Cervical tubing was done in stages to reconstruct helical defect in 1 case and lower third defect in 1 case. Double cross skin flap was done as a single stage procedure in 3 cases. In 2 cases converse tunnel flap was done. In 1 case the helical defect was reconstructed using bipedicle flap from the post auricular skin in stages. The average hospital stay following reconstruction was 4 days. 2 cases had perichondritis which was managed conservatively with IV antibiotics and analgesics and debridement of necrotic cartilage. 2 cases had flap necrosis and 1 case had flap dehiscence.
- Lower eyelid and medial canthus were commonly involved. 10 cases were reconstructed primarily. In 5 cases with lower eyelid defect greater than half the lid width Mustarde cheek rotation flap was done and in 2 cases with total avulsion of lower eyelid nasolabial flap was planned and done. In 1 case of upper eyelid defect full thickness skin graft from contralateral upper eyelid was done.
- Out of 14 cases with Lip injuries upper and lower lip were equally involved. 10 cases were reconstructed primarily. In 5 cases lip was primarily sutured in layers. 3 cases with lower lip defect schuchardt advancement were done. Stair-step advancement was done in 2 cases with lower lip defect. Gillies fan flap was done in 2 cases. Vermilion advancement in 2 cases. There was Microstomia in 2 cases in whom Gillies fan flap was done. 2 patients had wound infection which was treated conservatively. 1 Patient had wound gapping which was resutured.
- Among the scalp injuries, the temporal region defects predominated followed by parietal, frontal and forehead regions. Most of the cases were reconstructed secondarily, using transposition flap in 3 cases, rotation flap in 4 cases, Galeal flap in 1 case, Split skin graft in 1 case and full thickness graft in 2 cases. In 2 cases the scalp was reconstructed primarily. Average hospital stay was 10 days. In 2 patients there was partial flap necrosis, in 1 patient there was graft loss and 1 patient had wound infection which was managed with cleaning and dressing and antibiotics according to pus culture and sensitivity.
- Out of 8 cases with nose injuries paramedian forehead flap was done in 5 cases in stages to reconstruct lower third defect. In 3

cases nasolabial flap was used. In one case full thickness graft was done. In 4 cases primary suturing was done. Average hospital stay was 5 days.

- Out of 10 cases with cheek injuries 1 case had laceration involving the parotid gland and facial nerve. The cut ends of the facial nerve identified and repaired primarily using 7-0 nylon epineural sutures under loupe magnification. In 5 cases the cheek defect were covered with local flaps liked transposition flaps, Limberg flap and cheek advancement flap. In 4 cases primary suturing was done. Average hospital stay was 6 days. 1 case had wound infection which as managed conservatively.
- All the cases were followed for minimum period of 3 months. The flaps settled well and scar was supple. Patients were advised scar massage.

CONCLUSION

- Facial injuries themselves are rarely life threatening, but are indicators of energy of injury. Road traffic accidents being the common cause for facial and head injuries and may be prevented by using helmets.
- The economically productive age group of 21-40 years were commonly injured there by decreasing the income of the population. Males outnumbered the females, majority of cases belonged to low socioeconomic status form village.
- In reconstruction of ear injuries for upper third defects superiorly based postauricular flap was ideal. For middle third defects converse tunnel, Dieffenbach and bipedicle flap gave good results. Double cross skin flap gave good aesthetic result in lobule reconstruction.
- Scalp defects managed with rotation flap gave good aesthetic hair-bearing skin when compared to transposition flap. Cheek injuries sutured primarily gave equal results as local flaps. Lip injuries sutured primarily and Schuchardt advancement flap gave good aesthetic results. Eye lid injuries when treated primarily gave good aesthetic and functional results. For lower lid injuries both Mustarde and Nasolabial flap gave good equal results. In nose reconstruction oblique forehead flaps gave good results.
- Primary reconstruction should be the mainstay of management and the most important responsibility of the surgeon is to convert the contaminated wound to a clean one and then to perform reconstruction.

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