

Prophylactic Measures to Prevent Soft Tissue Abnormalities after Trauma

Raja Sawhney, MD, MFA, FACS¹ Mofiyinfolu Sokoya, MD² Yadranko Ducic, MD, FRCS(C), FACS³

¹Department of Otolaryngology, University of Florida, Gainesville, Florida

²Department of Otolaryngology, University of Colorado at Denver, Anschutz Medical Campus, Aurora, Colorado

³Department of Facial Plastics, Otolaryngology and Facial Plastic Surgery Associates, Fort Worth, Texas

Address for correspondence Raja Sawhney, MD, MFA, FACS, Department of Otolaryngology, University of Florida, 1324 SW, 98th Street, Gainesville, FL 32607 (e-mail: sawhneyraja@gmail.com).

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Abstract

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The goal of any reconstructive procedure is a complete return to premorbid form and function. Unfortunately, a return of pretraumatic form is routinely not considered during surgical planning. This leads to uncontrolled contracture of the soft tissue elements and permanent disfigurement. The goal of this article is to review interventions that improve soft tissue healing and long-term outcomes.

The goal of any reconstructive procedure is a complete return to premorbid form and function. In reconstructing facial trauma, correcting functional deficits routinely takes precedence over cosmetic concerns. Our objective as reconstructive surgeons cannot simply stop at achieving functional return. The goal must be a complete return to the preinjury state.

Unfortunately, a return of pretraumatic form is routinely an afterthought during surgical planning. Bony defects are reduced with little consideration paid to the overlying tissue, leading to irreversible alterations in appearance. Some feel that scars and soft tissue deformities can be treated secondarily through revision surgery. While beneficial in some cases, it is exponentially more difficult to correct these deformities in a delayed fashion. One should endeavor to intervene early and mitigate their occurrence. Once soft tissue injuries formalize and contract, there is little in the surgical armamentarium adequate to completely reverse a suboptimal cosmetic appearance.

Factors Impacting Outcomes

There are numerous variables that play a role in soft tissue outcomes. Understanding the factors that lead to poor cosmesis gives the surgeon clairvoyance to know where and when to intervene.

A patient's age and overall skin quality play a large role in surgical outcomes. Younger patients have greater elasticity to their soft tissue, resulting in wider scars. Injuries that occur over thicker skin or areas of movement such as perioral tissue may also lead to wider scars. Patients who smoke or drink heavily can be expected to have poor tissue quality requiring alterations in surgical closure. This is also the case with those suffering from systemic diseases such as diabetes or chronic kidney issues. Those with hypermobile skin including those suffering from collagen disorders should also be expected to have wider scars.

The mechanism of injury must also be considered. The amount of force generated by a fist or a fall from standing varies greatly from the force generated in a motor vehicle accident. As surgeons, we expect the bony deformity to be significant in a full-speed collision. The same force that resulted in the fractures of the bone is also applied to the overlying soft tissue. Therefore, the overlying soft tissue should be expected to undergo significant contracture and fat absorption.

Timing

The time between the traumatic event and surgical intervention can play a significant impact on outcomes. In general, the shorter the delay between trauma and treatment, the better

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the outcome. Optimal timing should also be balanced with improvement in posttraumatic edema. With early surgical intervention, preoperative assessment and planning are more accurate. A greater variety of treatment options are available to the surgeon and final results are more predictable. In some instances, treatment delays are due to issues that are outside of the surgeon's control. Urgent or life-threatening comorbid disease, social issues, poor compliance, or patient's fear or lack of understanding may delay treatment. Even when timely intervention with appropriate repair is performed, infection or poor healing may still complicate reconstruction.

Planning

As part of the reconstructive planning, the surgeon must identify all bony and soft tissue deformities. This begins with a thorough physical exam with attention toward functional deficits. Lacerations are evaluated as well as their relationship to facial subunits. Sensory and motor nerve deficits should be noted and serially examined. Computed tomography imaging is performed to evaluate for fractures, hematomas, and soft tissue deformity of the orbital content into the nasal cavity or maxillary sinus. Furthermore, as part of the planning process, surgical approaches should be determined. Bony and soft tissue attachments released during fracture exposure should be reattached. If not rearticulated at the end of the case, the soft tissue envelope can contract, leading to iatrogenic deformity.

Minimally Invasive Interventions

There are many reasons that the surgeon must defer definitive surgical treatment. In orbital trauma, for example, the delay is often due to soft tissue swelling. Medical comorbidities or other more immediate surgical intervention elsewhere in the body can also contribute to the delay in surgical management. There are several bedside interventions that can be performed prior to definitive surgical treatment that may improve outcomes, or at least shorten the period between injury and surgical intervention.

Simple head elevation above the level of the heart may resolve a significant portion of facial swelling. Early and frequent application of ice to the site of injury during the first few days after injury, followed by warm compresses may also be beneficial.

Elastic compression head wrap or jaw bra can be worn to help limit or resolve swelling. Depending on comorbidities, the patient may also be given oral or intravenous steroids. Studies have shown presurgical treatment of steroids can significantly reduce edema and pain in dental patients. Antunes et al¹ found that preoperative oral administration of dexamethasone reduced postoperative pain, edema, and trismus when compared with the control group in patients undergoing dental extraction. In rhinoplasty patients, Griffig et al² found preoperative steroids to be "beneficial in decreasing edema and ecchymosis" postoperatively.

The benefits of the herbal supplements such as *Arnica montana* are debatable. A study performed by Totonchi and

Guyuron³ compared the effectiveness of steroids and *Arnica* on postoperative swelling. The steroid cohort had significantly less ecchymosis and edema than the control group. The *Arnica* group had similar ecchymosis when compared with control but had less edema. Lee et al⁴ performed a review of the literature that compared *Arnica* to control group in rhinoplasty patients. They found that eyelid edema and ecchymosis during the first 7 days postoperatively were statistically decreased in the *Arnica* group versus the control group.

When possible, lacerations should be closed. Allowing secondary healing to take place, when primary closure is a viable option opens the door for unpredictable contracture and wound healing. This is especially true with lacerations occurring close to mobile structures such as the lip, external nasal valve, or eyelids. Wound contracture leading to ectropion or notching of the soft tissue triangle of the nose is exceedingly difficult to repair secondarily (see ►Figs. 1 and 2). Deeper lacerations should be closed in a layered fashion. Placement of drains may be warranted, especially in cases where there is significant dead space. Small passive drains evacuate debris and fluid and decrease the risk of seroma, hematoma, or abscess formation. If fluid accumulation does occur, it should be drained either through needle or incision. Bedside ultrasound guidance can be beneficial for both identification and drainage.⁵ In cases with severe periorbital trauma, placement of a Frost suture or taping to support the lower lid can help with edema and protect the eye.

Surgical Intervention

Noninvasive maneuvers help mitigate symptoms until formal surgery can be performed. Surgical intervention of facial trauma routinely begins with reduction and fixation of fractures. Any loss of underlying bony support will negatively impact the overlying soft tissue, opening the door for contracture. Fractures should be reduced back into anatomic position. Depending on the quality of the bone, level of comminution, and contractile forces placed on bony buttresses, the surgeon may wish to use thicker reconstructive plates for rigid support. Where there is significant bone loss



Fig. 1 Patient 1—Seen 3 months after injury, prior to any intervention. Patient had lip laceration and nasal injury that were left untreated after falling from horseback. (A) Note vermilion asymmetry and retraction. (B) Worm's eye view. Anterior septum is deflected to the right causing loss of nasal tip projection and nostril asymmetry.



Fig. 2 Patient 2—Patient involved in motorcycle accident. Severe bony fractures corrected at the time of injury at outside institution. (A) Soft tissue elements beyond laceration repair were not performed. (B) Over rotation and loss of nasal projection.

or deformation, the use of free bone grafts is warranted.⁶ In cases with maxilla, palate, or mandible fractures with associated severe mucosal injury, 7 to 10 days of mandibular–maxillary fixation may restrict soft tissue movement, giving the tissue time to heal.

Facial trauma reconstruction can lead to the appearance of premature aging of the face. There are multiple features commonly seen in midface aging. They include gradual ptosis of the cheek skin below the inferior orbital rim with descent of the attenuated lower eyelid skin. This creates a skeletonized appearance and infraorbital hollowing. Aging also leads to descent of the malar fat pad and loss of the malar prominence. There may also be deepening of the tear trough and prominence of the nasolabial fold.⁷ These same soft tissue changes can be seen in many trauma patients who have undergone wide facial degloving for facial fracture repair. This is due to weakening or loss of soft tissue attachments to the underlying bone. During trauma repair, the periosteum is elevated to expose fractures. When this is performed along the arcus marginalis of the orbit or malar prominence, the overlying soft tissue is significantly mobilized. Therefore, after completion on bony repair, it is imperative to reattach the periosteum to these fixation points. This can be done by reanastomosing the midface periosteum to the arcus marginalis of the inferior or lateral orbital rim. Suspension of the midface periosteum to reconstructive plates or passing suture through tunnels drilled in the bone are also viable options. The same is true when closing bicoronal incisions. The deep temporal fascia needs to be resuspended. Redraping the soft tissue envelope without resuspension of the periosteum or fascia eventually leads to downward displacement of the soft tissue envelope and poor cosmetic outcomes. Yaremchuk and Kim examined patients undergoing wide facial degloving. Associated complications identified included cheek ptosis, ectropion, and lateral canthal displacement.⁸ In elderly or otherwise premorbid lax lower lids, prophylactic tarsal strip may also be beneficial to avoid lid malposition.

When performing a subperiosteal midface lift, the attachment points of the periosteum along the malar prominence and orbit must be released prior to obtaining any upward

excursion of soft tissue.⁷ As noted previously, these attachment points are routinely released in facial degloving. Another option involves prophylactic endoscopic midface suspension.⁹ After fracture reduction and fixation, a posttrichial incision is made in the ipsilateral temporal fossa. Dissection is carried downward to the deep temporal fascia. Under endoscopic guidance, a periosteal elevator is used to dissect into the subperiosteal midface pocket. Nonresorbable sutures are then passed from the midface soft tissue pocket at the malar eminence to the deep temporal fascia. This helps resuspend the soft tissue envelope and return facial symmetry.

Regarding nasal injuries, nasal bone fractures should ideally be reduced within the first 2 weeks after an injury though some patients may still have mobility of the bones up to 21 days. It is generally accepted that injuries to the septum and the soft tissue components of the nose should be treated in a delayed fashion with many surgeons waiting 6 months or more prior to offering surgery. In certain cases, delayed treatment is not advisable. Patients with significant deformity of the dorsal septum or anterior septal angle may need earlier intervention. The concern is that the loss of underlying structures leads to collapse and eventual contraction of the overlying soft tissue (→Fig. 2). Early septoplasty with removal of significant cartilage or bone should be avoided when possible. This will weaken support, risking greater mobility and scar contracture. Instead, the goal is to return structural elements back to anatomic position. Splinting of the septum may be beneficial. This may be done with quilting stitches, Doyle splints, or supporting cartilage grafts. A markedly displaced caudal septum benefits from reduction and reattachment to the periosteum of the maxillary crest.

Early intervention is also employed when there is significant risk of nostril narrowing or cicatrix formation (→Fig. 2). Repair and support of the lateral crus of the lower lateral cartilage should be performed, especially when there is loss of its natural convex shape. Intranasal sutures, Doyle splint, nasal trumpet, or even a short segment of endotracheal tube can be placed to keep the nasal valve patent during healing and limit contracture.

When there is loss of a significant portion of an aesthetic unit, consider early flap or graft placement to prevent scar contracture. Again, this is especially true with subunits close to mobile structures such as the eyelid, lip, or alar rim.

Postoperative Care

Close monitoring of postoperative trauma patients is important especially in the first few months. Early identification of soft tissue contracture or inappropriate scarring that may lead to retraction of facial subunits including the nasal soft triangle or lip vermilion border can be addressed with early intervention, resulting in improved outcomes. Post-surgical massage, especially in the direction directly opposite of contraction can also be beneficial. Steroid injection is also advocated by many surgeons. Taping can be beneficial at times to direct or limit scarring in certain directions. The nasal tip and lateral periorbital region may benefit from directional taping.¹⁰ Elastic compression dressing placement

can help support the lower and midface and again improve long-term outcomes.¹¹ For unsightly scars, such as a poorly aligned vermilion border, consider early repair to prevent contracture of surrounding tissue.

Conclusion

The reconstructive goal after facial trauma is a complete return of form and function. Attention must be paid to all elements of an injury, including both bony and soft tissue elements. Often, simple interventions and forethought can create marked improvement in outcomes.

References

- 1 Antunes AA, Avelar RL, Martins Neto EC, Frota R, Dias E. Effect of two routes of administration of dexamethasone on pain, edema, and trismus in impacted lower third molar surgery. *Oral Maxillofac Surg* 2011;15(04):217–223
- 2 Griffies WS, Kennedy K, Gasser C, Fankhauser C, Taylor R. Steroids in rhinoplasty. *Laryngoscope* 1989;99(11):1161–1164
- 3 Totonchi A, Guyuron B. A randomized, controlled comparison between *Arnica* and steroids in the management of postrhinoplasty ecchymosis and edema. *Plast Reconstr Surg* 2007;120(01):271–274
- 4 Lee HS, Yoon HY, Kim IH, Hwang SH. The effectiveness of post-operative intervention in patients after rhinoplasty: a meta-analysis. *Eur Arch Otorhinolaryngol* 2017;274(07):2685–2694
- 5 Noh JY, Cheong HJ, Song JY, et al. Skin and soft tissue infections: experience over a five-year period and clinical usefulness of ultrasonography-guided gun biopsy-based culture. *Scand J Infect Dis* 2011;43(11-12):870–876
- 6 Gruss JS, Whelan MF, Rand RP, Ellenbogen RG. Lessons learnt from the management of 1500 complex facial fractures. *Ann Acad Med Singapore* 1999;28(05):677–686
- 7 Paul MD, Calvert JW, Evans GR. The evolution of the midface lift in aesthetic plastic surgery. *Plast Reconstr Surg* 2006;117(06):1809–1827
- 8 Yaremchuk MJ, Kim WK. Soft-tissue alterations associated with acute, extended open reduction and internal fixation of orbital fractures. *J Craniofac Surg* 1992;3(03):134–140
- 9 Brown R, Lozada K, Kadakia S, Gordin E, Ducic Y. Prophylactic midface lift in midfacial trauma. *Facial Plast Surg* 2017;33(03):347–351
- 10 Schrom T, Habermann A. Temporary ectropion therapy by adhesive taping: a case study. *Head Face Med* 2008;4:12
- 11 Friedman E, Conforti PJ. Postsurgical compressive dressings for the maxillofacial area. *J Oral Surg* 1981;39(07):542–544



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