II. Surgical Approaches to the Maxillofacial Skeleton

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Surgical approaches in modern maxillofacial traumatology have been extensively influenced by techniques developed for craniofacial surgery. Broad exposure of the facial skeleton is achieved through incisions that avoid the central oval of the face. Aesthetically favorable incisions are placed in the scalp, intraorally, and in locations routinely used for aesthetic surgery (rhytidectomy, blepharoplasty, and open rhinoplasty). On occasion, one is able to utilize existing lacerations to view and stabilize the fracture segments. Simply extending such a laceration for a short distance may not pose a significant aesthetic detriment in terms of scarring. If only a short extension is required, the incision may be nicely camouflaged within an existing rhytid or pre-existing scar. However, this option exists infrequently, and exposure usually needs to be achieved with additional incisions.

The workhorse of approaches to the midface is the maxillary vestibular approach (facial degloving) (Fig 1). The upper gingivobuccal sulcus is injected with 1% lidocaine with 1:100,000 epinephrine solution to effect vasoconstriction. The incision is placed approximately 5 mm superior to the gingivobuccal margin, leaving a suitable cuff of tissue on the gingival side to assist in closure at the completion of the procedure. The incision generally extends from the midline to the first or second molar. Bilateral incisions also may be made to facilitate a degloving approach that may be required for exposure. Subperiosteal dissection along the margin of the pyriform and along the anterior face of the body of the maxilla continues superiorly to the level of the inferior orbital rim. One needs to be aware of, and protect the integrity of, the infraorbital nerve as it emerges from the like-named foramen about 1 cm below the rim in the mid-pupillary line. Watertight closure of the gingivobuccal incision is ensured with the routine usage of a two-layer running locked chromic or Vicryl suture. Excellent exposure to the medial and lateral vertical buttresses, medial maxilla, and anterior face of the maxilla is provided by this approach. One also has access to the body of the zygoma and inferior orbital rim via this approach. A gingivobuccal approach is required in all fractures of the maxilla in order to allow full assessment and fixation of the vertical buttresses. It is recommended in most fractures of the zygomatic complex as well, since the accuracy of zygomatic body repositioning can better be judged by such direct inspection. In some cases, the patient has lost teeth and there may be associated avulsion of the gingival tissues, including the dental papillae. In such a circumstance, rather than making an additional incision in the gingivobuccal sulcus, it is advisable to raise a flap of gingiva to include the attached dental papillae. Closure would entail suturing between the dental papillae of the lingual and buccal surfaces around existing teeth, and direct closure of the attached gingiva when there has been a loss of dentition in the area.
The mandibular vestibular approach is the mainstay approach for the treatment of the majority of mandibular fractures (Fig 2). After local infiltration into the lower gingivobuccal sulcus, an incision is made in this sulcus, leaving a cuff of at least 5 mm of mucosa on the gingival side of the incision. One needs to be wary of, and protect the integrity of, the mental nerves as they emerge from like-named foramina inferior to the second bicuspid level. One needs to be wary in performing such an incision in the treatment of mandibular fractures in edentulous patients. In such patients, resorption of alveolar bone may allow the mental nerve to exit very close to the alveolar surface of the mandible, or directly at the alveolar ridge. Elevation of soft tissues should extend below the inferior margin of the mandible. This will allow the surgeon to utilize guidelines for reduction, not only on the buccal surface of the mandible, but also on the inferior margin. Excellent exposure may be gained by this approach for treatment of symphyseal, parasymphysial, body, and low-ascending ramus fractures. High-ascending ramus and subcondylar fractures usually cannot be well accessed via this approach. Application of screws in the angle, ascending ramus, and condylar neck regions may require the utilization of transbuccal instrumentation placed through a 3-mm stab incision in the cheek. Reapproximation of the mucosa in two layers (as for the maxillary vestibular approach) is necessary to ensure a watertight closure. Application of a pressure dressing over the mentum and angle areas may help minimize the risk of postoperative hematoma formation.
A submandibular approach to the mandible also may be utilized. A skin crease approximately 2 cm below the inferior aspect of the mandible is utilized for camouflage of the incision. The incision is continued through the skin, subcutaneous tissues, and platysma muscles at this level. Now the superficial layer of the deep cervical fascia is visible as it envelops the submandibular gland. Incision of this layer at the level of the digastric muscles and superior retraction of divided facial vessels will serve to generally protect the integrity of the marginal mandibular nerve as it courses along or slightly inferior to the mandibular border. Now direct access to the mandible is possible. Closure requires reapproximation of the platysma/subcutaneous layer and the skin (two-layer closure).

A preauricular approach may be required for access to subcondylar fractures and the temporomandibular joint (Fig 3). The incision (after local infiltration) is made in a natural rhytid at the junction of the helix and the facial skin. The incision extends through the skin, subcutaneous tissue, and temporoparietal fascia to the superficial layer of the deep temporal fascia. This layer is undermined above the level of the zygomatic arch (in a plane that is immediately superficial to the superficial fat pad—see coronal approach) for 1.5 cm (retracting the superficial temporal vessels and auriculotemporal nerve anteriorly in the flap). Below the arch, dissection along the external auditory canal will meet the upper dissection at the level of the joint capsule. Opening the joint space is facilitated by injecting some local anesthetic into the joint, balloonning the capsule. This will serve to clearly identify the margins of the capsule, allowing for accurate penetration into the joint space. During closure, one needs to reapproximate the incised edges of any remaining capsular attachments. The deep temporal fascia should be reapproximated prior to subcutaneous and skin closure.
Fig 3.—The preauricular approach allows access to subcondylar fractures and to the temporomandibular joint.

When dealing with a Le Fort II, Le Fort III, inferior orbital rim, or orbital floor fracture, broad safe exposure of the inferior orbit is required. This can variably be performed via a subciliary or transconjunctival approach. We prefer to use the transconjunctival approach because it has less postoperative edema and lower lid ectropion than the subciliary approach, and it usually avoids a facial incision. After injection of local anesthetic with epinephrine into the lower conjunctival fornix, the lower lid is retracted away from the globe with an insulated Daegmar lid retractor. Meanwhile, the globe is protected with an insulated Jaegr plate. The incision in the conjunctiva is made with a fine
needle-tip cautery (or preferably, a Teflon-coated fine cautery, if available) midway between the inferior margin of the tarsal plate and the inferior conjunctival fornix. A traction suture through the cut edge of the bulbar conjunctiva is then used to drape this conjunctiva superiorly over the globe for protection during the procedure. Use of a scleral shield over the cornea to avoid corneal abrasion is also acceptable. The dissection then proceeds in a retroseptal (some surgeons prefer a preseptal) manner directly to the anterior aspect of the inferior orbital rim (Figs 4 and 5). During closure, it is important to first reapproximate the periosteum prior to closing the conjunctival incision with a few fast-absorbing gut sutures. Some surgeons routinely pass a Frost suture through the lower lid and suspend it for 24 to 48 hours from the forehead. This may serve to decrease the incidence of lower lid ectropion. If further lateral exposure is required, one can easily perform a lateral canthotomy with cantholysis (Fig 6). This is performed by first transversely incising the skin overlying the lateral canthus for a distance of 1 cm. Next, one limb of a straight fine-tipped scissors is inserted on the conjunctival aspect of the lateral canthus. The second limb is inserted on the outside (skin side). Accurate transection of the inferior limb of the lateral canthus is now possible. Occasionally, enough of an increase in exposure may be achieved by simply performing the skin incision and separating the attachment between the upper and lower limbs of the canthal tendon, without actually transecting either one. Excellent exposure of the

Fig 4.—Transconjunctival approach to the inferior orbital rim and floor.
Fig 5.—Transconjunctival approach shown in a sagittal plane through the orbit showing level and plane of incision. Conjunctiva and lower lid retractors are incised with scissors or electrocautery.

lateral orbital rim and frontozygomatic suture can now be obtained. Closure is accomplished by resuspending the detached inferior limb of the canthal tendon with a semi-permanent suture, e.g., PDS (5.0). The skin incision is best closed with a series of fast-absorbing gut sutures (6.0).
A subciliary approach also may be utilized. As is the case with the development of a skin muscle flap in traditional blepharoplasty, the incision is ideally placed in the skin immediately subjacent to the lower lid margin (approximately 2 mm inferior to the lash line). After adequate infiltration of local anesthetic, the incision is made through the skin only. It may be extended laterally into a natural skin crease for a distance of approximately 1 cm. Next, subcutaneous dissection should proceed (superficial to the pre-tarsal orbicularis oculi muscle) for a distance of 5 mm. At this point, sharp fine-tipped scissors may be used to separate the fibers of the orbicularis to allow direct access to the periosteum of the inferior and lateral orbital rims. Closure is accomplished in a two-layer manner by reapproximating the periosteum and the skin. This will help to avoid ptosis of the malar fat pad and the unfavorable development of a groove along the orbital rim. Such a groove can exacerbate deepened nasojugal grooves that occur with aging. Closure of the orbicularis is usually not required. Rim incisions were extensively used in the past. They may still provide for good exposure with reasonable cosmetic results. When making this incision, it should not be extended for more than two thirds of the length of the palpebral fissure in order to avoid prolonged lower lid edema.

To gain access to the superolateral orbital rim, an upper blepharoplasty type approach is best utilized (Fig 7). Here, the incision is placed in the lateral aspect of the patient’s natural supratarsal fold. It is continued (after local anesthetic infiltration) and passes through both the skin and orbicularis oculi muscle. Fine-scissor dissection may then be utilized to dissect beneath the orbicularis to access the periosteum of the superolateral
rim. Closure of the periosseum and the skin in separate layers will facilitate closure. A lateral infrabrow incision will provide the same exposure but is cosmetically inferior to the blepharoplasty incision. Here, the incision is placed parallel to the infrabrow hair shafts and carried down to the level of the periosseum directly. Reapproximation of the skin and periosseum is again required at the completion of the procedure.

The coronal flap incision provides the best exposure to the frontal bar region, zygomatic arches, and root of the nose. It is the ideal approach for rigid fixation of most Le Fort III, frontal sinus, and nasoethmoid complex fractures. Brow incisions provide for reasonable access to this region but are currently utilized only for people who have existing lacerations in the region. Direct-access incisions also may be used, especially if there is a pre-existing laceration in the area of the root of the nose (Fig 8). Brow incisions are cosmetically unacceptable and are often associated with significant hypesthesia of the forehead. The coronal incision should be made 2 to 3 cm posterior to the anterior hairline. This results in a cosmetically acceptable hidden scar. A running W-plasty or undulating incision may allow for better postoperative cosmesis. The dissection can proceed inferiorly in a subperiosteal or a subgaleal plane. Either method will allow the use of a pericranial flap for repair of any concomitant fractures the patient may have (e.g., frontal sinus fracture, anterior cranial fossa fracture, etc.). Small, comminuted fragments will likely resorb (and be replaced by solid scar tissue) over time. Large
fragments of bone will likely survive with or without attachments to the pericranium. In theory, it is the intermediate-sized fragments of 2 to 3 cm that would be expected to benefit most from pericranial preservation. In the inferior part of the dissection, preserving the supraorbital neurovascular bundles is necessary. If proceeding subperiosteally, it is safe to continue in this plane over the superior orbital rim. If a subgaleal dissection is used, one should incise the peristemum about 2 cm superior to the supraorbital foramen and enter the subperiosteal plane as one approaches the nerve. Occasionally, it is necessary to release the supraorbital nerve from an intact supraorbital foramen with a 2-mm osteotome, in order to allow for further flap retraction inferiorly. In the lateral dissection, it is important to preserve the frontal branch of the seventh cranial nerve. This is best accomplished by dissecting superficial to the deep temporal fascia down to the temporal line of fusion between the superficial and deep layers of the temporal fascia. The landmark for this level is the appearance of the underlying superficial fat pad (Fig 9). This usually clearly visible structure is generally noted at about two fingerbreadths above the level of the superior aspect of the zygomatic arch. At this level, if exposure of the zygomatic area is needed, incision of the superficial layer of the deep temporal fascia will expose the superficial fat pad above which dissection may be safely taken down to the level of the zygomatic arch. The frontal branch will now be safely retracted in the superficial portion of the flap, preserving the motor innervation to the forehead. Limiting temporalis muscle exposure and dissecting within the superficial
aspect of the superficial fat pad or immediately superficial to the fat pad will serve to decrease the severity of any postoperative temporal wasting. The middle temporal vessels are often disrupted with dissection all the way down to the arch, as is sometimes required. The loss of these vessels is believed to contribute to the inevitable temporal wasting seen in such patients. Meticulous dissection in the outlined manner will limit this problem. Closure of this incision will require resuspension and reapproximation of the transected layers of the deep temporal fascia. The scalp incision is usually closed with buried Vicryl (3.0 or 4.0) sutures and surgical staples. A compression dressing should be applied if drains are not used.
Finally, external ethmoidectomy incisions may be useful for the treatment of patients with traumatic telecanthus. These incisions are approximately 1 to 1.5 cm in length and are placed midway between the dorsum of the nose and the medial canthal tendon area. The scars are aesthetically quite acceptable. Most of these patients will require a bicoronal flap for exposure of the associated nasoethmoid fractures, precluding the need for this incision.