Scalp and cranial deformities are common after trauma or ablative surgery. Local flaps and free flaps may be used in reconstruction of soft tissue defects, and autogenous bone or alloplastic bone substitutes may be used for cranioplasty procedures. Injuries to the frontal sinus, particularly when complicated by leak of cerebrospinal fluid or obstruction of the nasofrontal outflow tract, represent special challenges. Further studies are recommended to improve the multidisciplinary management of these complex, debilitating conditions, in anticipation of enhanced function and cosmesis, reduced donor site morbidity, and improved surgical outcomes.

Nasal injuries coupled with midface fractures of the orbit and ethmoids constitute a nasoorbitoethmoid (NOE) fracture pattern, which is typically the most challenging facial fracture to repair. Hard and soft tissue defects of this region may require advanced reconstruction techniques, including local rotational flaps, free tissue transfer, and even prosthetics. The restoration of form and function dictates treatment, and the success of primary repair is paramount, because secondary correction is challenging in this area of the midface. Because of the complex nature of this region, this discussion is divided into hard tissue defects, with a focus on trauma, and soft tissue defects, with a focus on oncology.

The repair and restoration of the eyelids and orbit can be a medical and surgical challenge. Inadequate orbital volume restoration could lead to poor functional and cosmetic defects. With advances in technology, our surgical techniques are constantly improving. This article focuses on ocular and orbital reconstruction following traumatic, iatrogenic, and acquired defects. Optimal outcomes can only be expected with appropriate diagnosis treatment planning in consultation with other specialists.

Ideal reconstruction of the zygoma position is essential in restoring facial width, projection, and symmetry. Reconstruction should be focused on the zygoma’s 4 articulations and restoring the vertical and horizontal pillars of the facial skeleton. This article describes the applied surgical anatomy as it relates to zygomatic deformities, surgical approaches, and reconstruction. The basis for diagnosing and classifying
zygoma deformities as they relate to severity of injury and associated displacement, comminution, and comorbidities is also discussed. Traditional and contemporary concepts in posttraumatic, postablative, and esthetic reconstruction are also described.

**Lip Reconstruction**
Joshua E. Lubek and Robert A. Ord

This article discusses the reconstruction of full-thickness defects of the lower and upper lip. Although these may occur as a result of hereditary disorders (cleft lip) or trauma, reconstruction is described in relation to oncologic ablation for primary lip cancers. These defects will obviously be preplanned and most often of regular shape, unlike injuries sustained from penetrating trauma. Therefore, precise elective planning of reconstruction techniques must be undertaken.

**Maxillary Reconstruction**
Nathan D. Lenox and Dongsoo D. Kim

Postablative maxillary defects present a wide range of functional and esthetic challenges. Several classification schemes have added clarity to the subject, but the surgeon must maintain a clear vision of the defect and appreciate its reconstructive implications. Local tissue flaps remain valuable tools in the reconstruction of small isolated defects of the posterior maxilla and palate; however, microvascular free flaps have eclipsed prosthetic obturators as the mainstay of therapy in advanced postablative defects of the maxilla. Many excellent microvascular options exist and the overall objectives remain to preserve oral function in accordance with the needs of the patient.

**Zygoma Implant Reconstruction of Acquired Maxillary Bony Defects**
Luis G. Vega, William Gielincki, and Rui P. Fernandes

The reconstruction of acquired maxillary bony defects after pathologic ablation, infectious debridement, avulsive trauma, or previously failed reconstructions with zygoma implants represents a treatment alternative that is safe, predictable, and cost-effective. Still the single most important factor for treatment success of these complex reconstructions is the implementation of a team approach between the surgeon and the restorative dentist. The focus of this article is to review the surgical and prosthetic nuances to successfully reconstruct acquired maxillary defects with zygoma implants.

**Reconstruction of Acquired Oromandibular Defects**
Rui P. Fernandes and Jacob G. Yetzer

Acquired defects of the mandible resulting from trauma, infection, osteoradionecrosis, and ablative surgery of the oral cavity and lower face are particularly debilitating. Familiarity with mandibular and cervical anatomy is crucial in achieving mandibular reconstruction. The surgeon must evaluate which components of the hard and soft tissue are missing in selecting a method of reconstruction. Complexity of mandibular reconstruction ranges from simple rigid internal fixation to microvascular free tissue transfer, depending on defect- and patient-related factors. Modern techniques for microvascular tissue transfer provide a wide array of reconstructive options that can be tailored to patients’ specific needs.
Reconstruction of Acquired Temporomandibular Joint Defects

Luis G. Vega, Raúl González-García, and Patrick J. Louis

Various conditions are responsible for the development of acquired temporomandibular joint (TMJ) defects, the reconstruction of which represents a unique challenge, as the TMJ plays an important role in the functioning of the jaw including mastication, deglutition, and phonation. Autogenous reconstructions such as costochondral or sternoclavicular joint graft continue to be the best option in children, owing to their ability to transfer a growth center. In adults, alloplastic reconstructions are a safe and predictable option. Vascularized tissue transfers have also become a popular and reliable way to restore these defects.

Autogenous and Prosthetic Reconstruction of the Ear

Patrick J. Louis, Ruth A. Aponte-Wesson, Rui P. Fernandes, and Justin Clemow

Injuries to the ear can result in partial or complete loss of the external ear. Resection of the external ear may be necessary secondary to malignant tumor or infection. This article discusses the diagnosis and management of acquired defects of the external ear. Because autogenous reconstruction is not always possible, both autogenous and prosthetic reconstruction are presented as well as the indications for both. This information should help guide the clinician in the decision-making process. In the hands of experienced clinicians, reconstruction of the external ear can result in an excellent outcome, with improved quality of life for the patient.

Microsurgical Reconstruction of the Trigeminal Nerve

Roger A. Meyer and Shahrokh C. Bagheri

Head and neck tumor surgery or traumatic injuries in the maxillofacial region often result in discontinuity defects of peripheral branches of the trigeminal (fifth cranial) nerve, causing loss of sensation to those areas of the face, mouth, or jaws supplied by this important nerve. Injuries to the peripheral branches of the trigeminal nerve can be repaired by microsurgical techniques, either at the time of the original injury or ablative operation if conditions are favorable, or at a later date. Repair of a peripheral nerve injury has a good chance of a satisfactory outcome if done in a timely fashion.

Static and Dynamic Repairs of Facial Nerve Injuries

Hilliary White and Eben Rosenthal

The patient with facial paralysis presents a daunting challenge to the reconstructive surgeon. A thorough evaluation is key in directing the surgeon to the appropriate treatment methods. Aggressive and immediate exploration with primary repair of the facial nerve continues to be the standard of care for traumatic transection of the facial nerve. Secondary repair using dynamic techniques is preferred over static procedures, because the outcomes have proved to be superior. However, patients should be counseled that facial movement and symmetry are difficult to mimic and none of the procedures described is able to restore all of the complex vectors and overall balance of facial movement and expression.

Surgical Navigation in Reconstruction

Wolfram M.H. Kaduk, Fred Podmelle, and Patrick J. Louis

Navigational systems are paramount in solving today’s traffic dilemmas, and have important applications in the human body. Current imaging must be diagnostic.
and is often dictated by the radiologist, but it is up to the surgeon to consider surgical procedures and to decide in which case surgical navigation (SN) has advantages. Knowledge of the surgical capabilities of SN is indispensable. The aims of this article are to support real-time image-guided SN, present routine and advanced cases with precise preoperative planning, and show the scientific capabilities of SN.