Cerebral Spinal Fluid Leak After LeFort I Osteotomies

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Introduction/Background:

Maxillomandibular advancement procedures, including LeFort I osteotomies, are commonly used to correct dental malocclusion but also serve as adjunctive interventions to improve obstructive airway symptoms. These procedures generally have a low post-operative complication profile (~9%) that includes nasal septal deviation, infraorbital nerve injury, osteonecrosis of the mobilized segment, oro-antral fistula formation, ongoing dental malocculsion, and chronic maxillary sinusitis.[1] While significant complications have been reported, including massive hemorrhage following internal maxillary artery disruption as well as blindness, symptomatic injuries to the skull base have rarely been documented. Only 1 case of cerebral spinal fluid (CSF) leak following LeFort I osteotomies has previously been reported[2], and therefore risk factors and systematic analysis of this problem is difficult. The problem may be more significant than thought as a study evaluating post-operative patients with CT showed an incidence of 58% of pterygoid plate fractures[3] and cadevaric studies have shown an incidence of pterygoid fractures following LeFort I osteotomies of 75%[4]. Propagation of the fracture into the skull base is the purported mechanism of CSF leak in these cases.

Case Report:

An 18 year old morbidly obese female presented to the Oral Maxillofacial Surgery clinic with complaints of malocclusion and signs and symptoms of obstructive sleep apnea. She subsequently underwent bilateral LeFort I osteotomies, septoplasty, and genioplasty and was discharged on POD1. She re-presented 3 days later with headache, nausea/vomiting, and pneumonia. A head CT demonstrated pneumocephalus and a fracture of the dorsal aspect of the right sphenoid sinus causing a communication with the prepontine cistern. The patient subsequently underwent endoscopic repair of the skull base defect by Otolaryngology and Neurosurgery services, utilizing a vascularized pedicled mucosal nasoseptal flap. No lumbar drain was required. She was discharged from the hospital on post-operative day seven without evidence of on-going CSF leak and has had an uneventful recovery since that time.

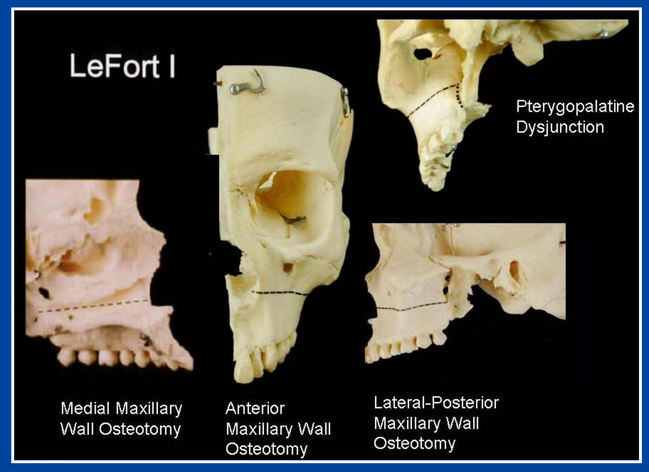

Figure 1 - The LeFort I maxillary advancement: Initially, the horizontal maxillary osteotomies are made from lateral nasal wall aross the anterior maxillary wall and through the posterior-lateral maxillary wall. He nasal septum and vomer are then separated from the maxillary crest. Finally, the pterygoid plate is separated from the maxillary tuberosity. This pterygomaxillary separation is completed with a saw or chisel. The maxilla is then down-fractured – significant force at this step can lead to unfavorable fractures. Areas that typically are incompletely disarticulated are the posterior aspect of the lateral nasal walls and the pterygopalatine dysjunction.[5]

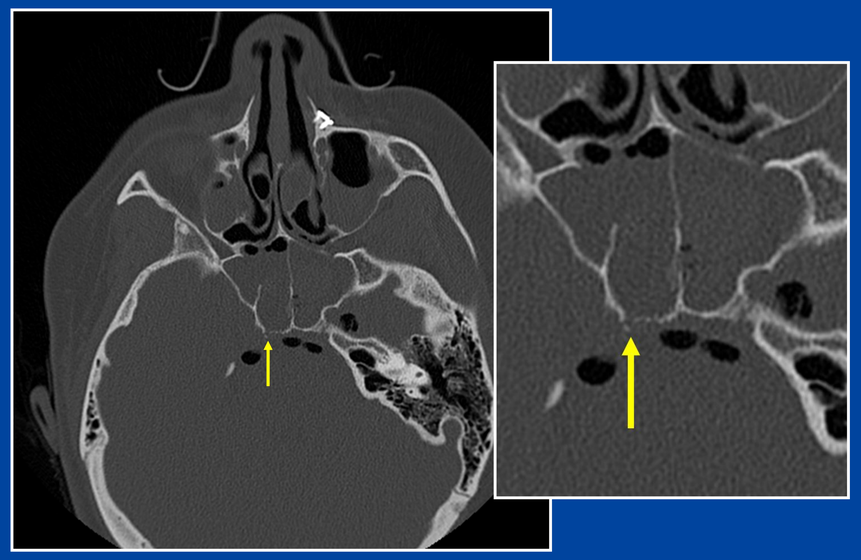

Figure 2 – Fine-cut axial CT image demonstrating disruption of the posterior-lateral aspect of the right sphenoid lamina. Note the presence of pneumocephalus adjacent to the defect.

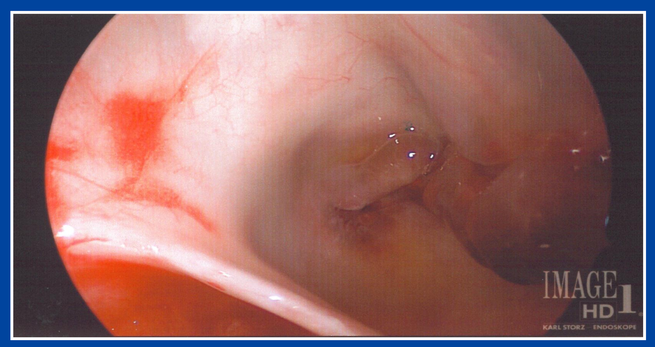

Figure 3 – Endoscopic image of the right sphenoid sinus wall demonstrating a mucosal irregularity and CSF flowing from the underlying osseous defect.

Discussion:

The rate of CSF leak following maxillomandibular advancement procedures is likely very low, however delayed recognition of this complication can be dangerous. The true incidence of fractures extending into the skull base following orthognathic surgery is not known, but it is likely that subclinical skull base defects are more frequent than previously thought. In the event of a clinically evident fracture it is important to recognize the signs and symptoms of a CSF leak in order to ensure timely repair and to prevent further serious complications. Furthermore, identification of LeFort I advancement techniques and patient-specific factors contributing to an increased risk of post-operative CSF leak is important and should be evaluated further. Reports suggest unfavorable fractures of the pterygoid plates may occur in patients with thickened bone in this region. With regards to skull base defect repair, preoperative consideration must also be given to reconstruction and the likelihood of viability of the pedicled nasoseptal flap in the context of prior intranasal and palatal surgery.

Conclusions:

- Significant complications of LeFort I osteotomies include pterygoid plate fractures with propagation to the skull base and subsequent CSF leak
- The incidence of skull base defects following LeFort I osteotomies may be higher than previously thought, but many of these injuries may be sub-clinical
- Risk factors are not well understood for CSF leak following LeFort I osteotomies
- Prior surgical interventions should be considered when planning endoscopic skull base defect repair

References:
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