A Rare Complication of the Non-Union of Maxilla After Lefort I Osteotomy

R. Manikandhan[1], Ratna Parameswaran[2], Arun M. Krishnan[3], Godwin Alex Kiruba[4], M. Monisha[5]

[1]Professor, Department of Oral and Maxillofacial Surgery, Meenakshi Ammal Dental College and Hospital, MAHER University, Chennai- 600095, Tamilnadu, India, [2]Professor, Department of Orthodontics and Dentofacial Orthopedics, Meenakshi Ammal Dental College and Hospital, MAHER University, Chennai- 600095, Tamilnadu, India, [3]Oral and Maxillofacial Surgeon, NMC Healthcare, United Arab Emirates, [4]Surgical Fellow, Meenakshi Cleft and Craniofacial Centre, MAHER University, Chennai-600095, Tamilnadu, India, [5]Oral and Maxillofacial Surgeon, Sadras Upgraded Primary Health Centre, Chengalpattu-603204, Tamilnadu, India

Abstract

Lefort I osteotomies are routinely performed for correction of dentofacial deformities. There are reports of a wide number of complications after Lefort I osteotomies. Due to the rich vascular supply of maxilla, non-union is a very rare complication. The authors present two cases of non-union of maxillaafter Lefort I osteotomy, with a brief discussion on the probable etiologies and their management.

Keywords: *Lefort I osteotomy, Non-union of maxilla, Iliacbonegraft, Maxillarymobility, Floating Maxilla.*

Introduction

Lefort I osteotomy is one of the most widely performed surgeries across the maxillofacial spectrum. In the United States of America, there were about fifteen thousand Le fort I osteotomies performed over the course of 9 years[1]. Lefort I osteotomiesare associated with various intra-operative and post-operative complications[2] which can be further divided into anatomic, septic, neurologic, otologic and vascular categories[3]. Non- union at the osteotomy siteis a serious complication, which invariably demands surgical intervention.

In this article, the authors report two cases of this complication after Lefort I osteotomy and review the literature.

Corresponding Author:
Dr. J. Godwin Alex Kiruba MDS
Surgical Fellow, Meenakshi Cleft and Craniofacial Centre, MAHER University, Chennai- 600095, Tamilnadu, India
e-mail: drgodalba@gmail.com

Case Reports:

Case 1: A 29year old patient reported to Meenakshi Ammal Dental College and Hospital with a complaint of pain and mobility in the maxilla for a time period of about 5 years. She gave a history of being operated thrice in a different hospital within a time span of 2 years. She underwent the first surgery for bimaxillary protrusion in 2011. She had an uneventful immediate post-operative recovery but had reported back to them with a complaint of mobility of the maxilla and underwent two surgeries for the same in 2012. In both the instances, the pre-existing implants were removed, followed by freshening the edges of the non-united bone segments and resecuring them with a newer set of implants.

Clinical examination revealed the presence of mobility of maxilla and tenderness on the maxillary vestibule. Radiographic examination showed that the edge of the osteotomized segment was in close proximity to the infraorbital foramen (Fig. 1). The authors diagnosed her with maxillary non-union and planned for a surgical intervention. Pre-surgical orthodontics was carried out and bite planes were cementedto the mandibular posterior teeth bilaterally (Figs. 2, 3).

Intra-operatively, the authors observed the

eburnation of bone edges at the osteotomy site and they completely mobilized the maxillary segment. Autogenous cortico-cancellous iliac bone graft was harvested and sandwiched in between the osteotomized segments. Mandibular subapical osteotomy was also performed and the osteotomized segment was moved downwards. A stable internal fixation was performed in both the jaws (Figs. 4,5).

The patient had a post-operative follow-up of 2 years and the authors observed a satisfactory healing with a stable maxilla and recorded a significant improvement in the vertical dimension.

Case 2: A 23year old patient who reported to Meenakshi Ammal Dental College and Hospital with malocclusion and facial deformity was examined and diagnosed with vertical maxillary excess. After pre-surgical orthodontics and cephalometric analysis, it was planned to impact the maxilla. Intra-operatively, the patient underwent Lefort I impaction, after complete mobilization of the maxilla. Internal fixation was performed in the maxilla using indigenous titanium implants.

The patient had an uneventful immediate postoperative recovery. In the third post-operative month, the patient presented with a complaint of pain and discomfort in the maxilla at the Lefort I level with no signs of inflammation or oro-antral communication. On radiographic evaluation, the internal fixation was right in place, and there was no evident maxillary sinus pathology. He was treated with analgesics and anti-inflammatory drugs. In the sixth post-operative month, the patient reported of recurrent pain and mild mobility of the maxillary segment with clicking noise on mastication.

Clinical examination confirmed the mobility of maxilla and an orthopantomogram revealed broken titanium plates at the osteotomy site. He was diagnosed with maxillary non-union and was planned for surgical intervention. Intra-operatively,the authors observed fracture of two plates, loosening of screws and eburnation of the bone edges at the osteotomy site (Fig. 6). The rounded bone margins were freshened, and the vascularity was ensured with adequate bleeding points. Onlay bone grafting was performed with autogenous cortico-cancellous iliac bone graft, which was secured through titanium anchor screws (Fig. 7). The patient had an uneventful post-operative recovery phase with no discomfort. Post-operative radiographs showed good uptake of the bone graft with intact titanium plates and screws.

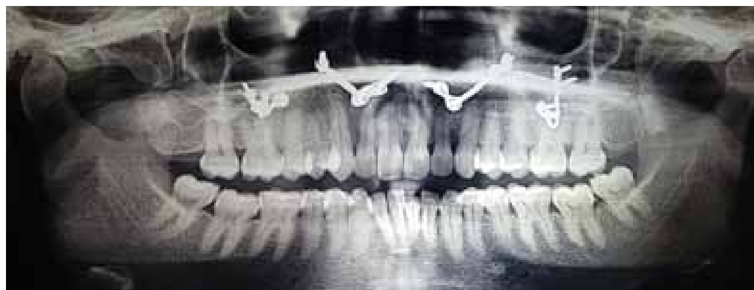
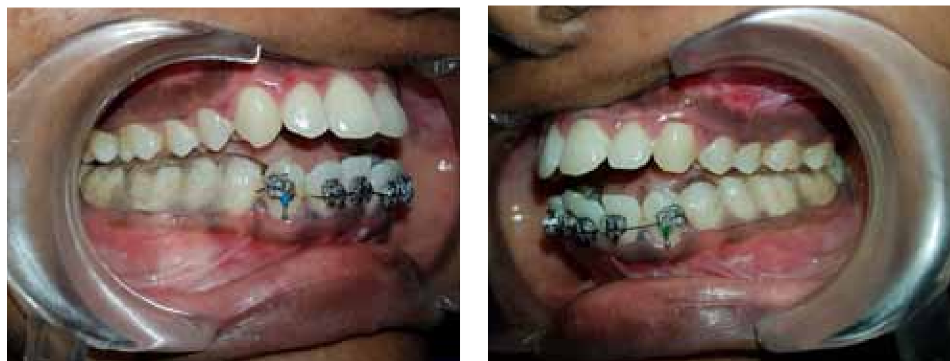


Fig. 1 Pre-operative orthopantomogram



Figs. 2,3 Bilateral mandibular posterior bite planes

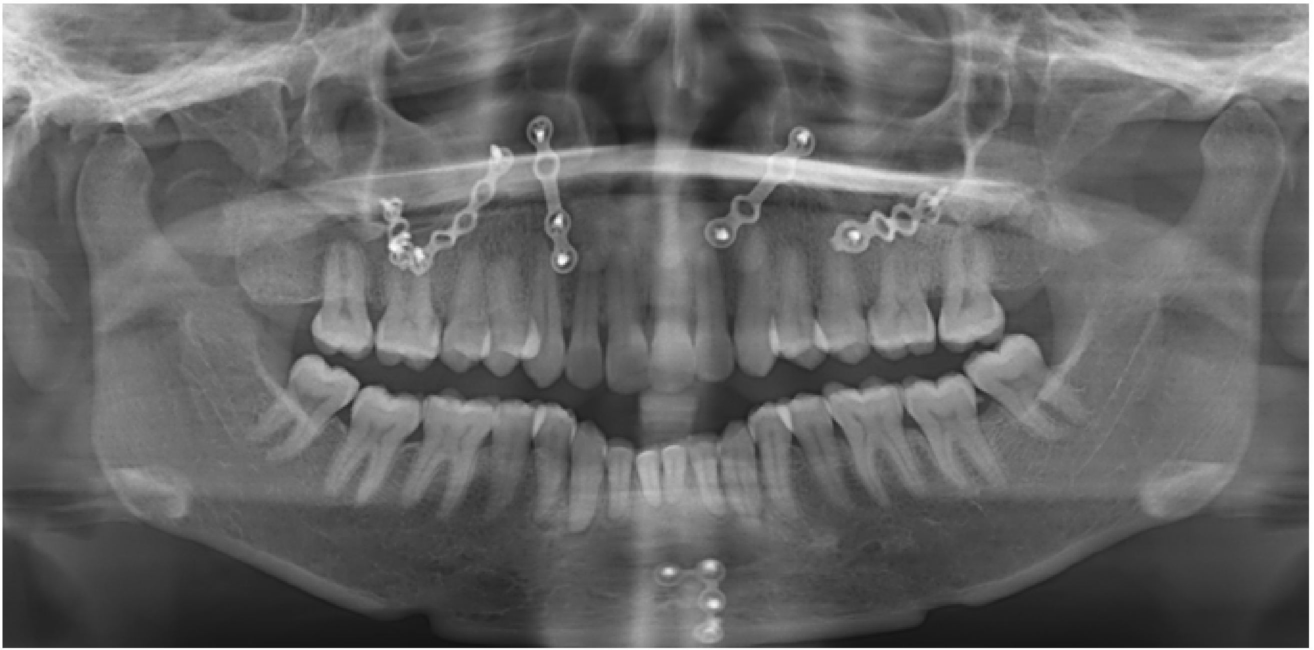


Fig. 4 Post-operative orthopantomogram

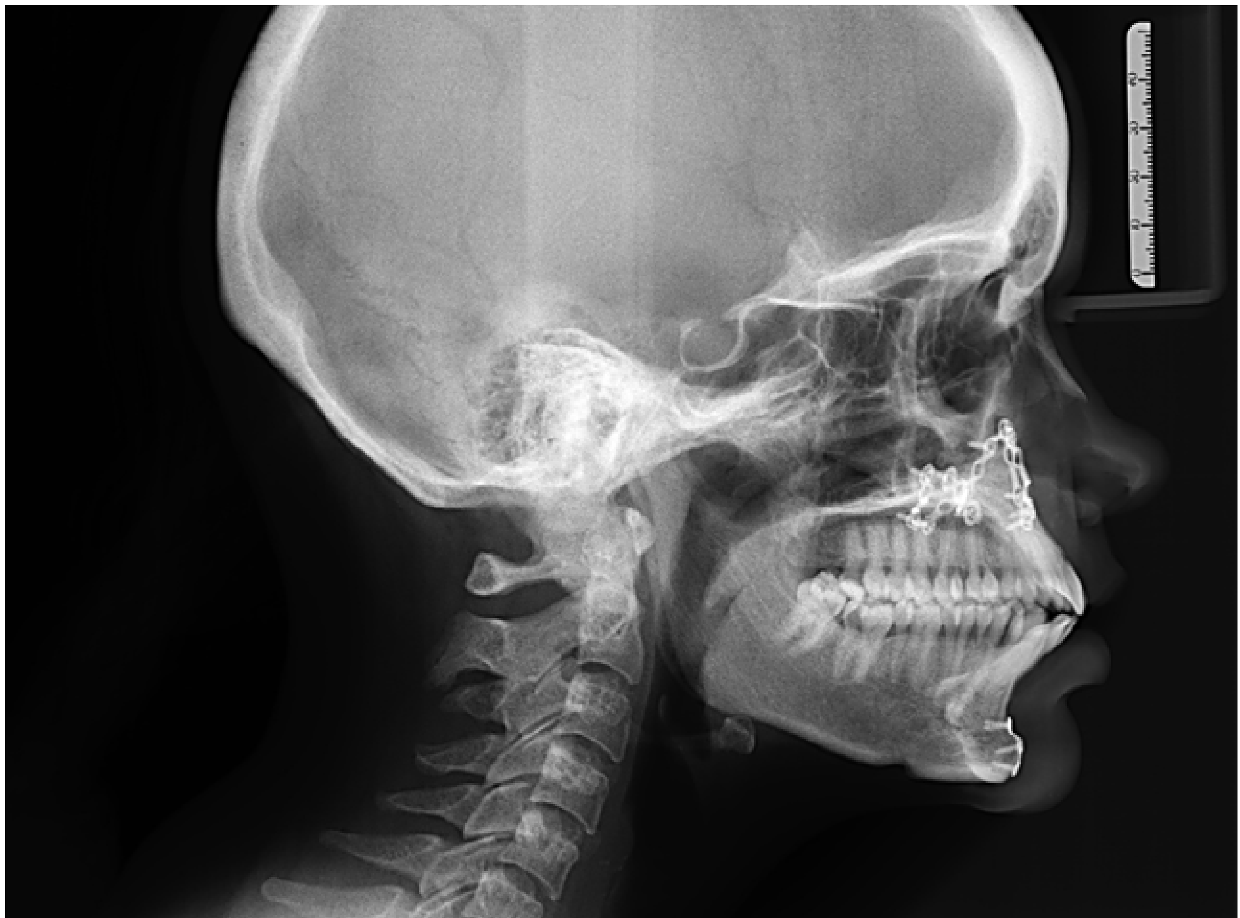


Fig. 5 Post-operative lateral cephalogram

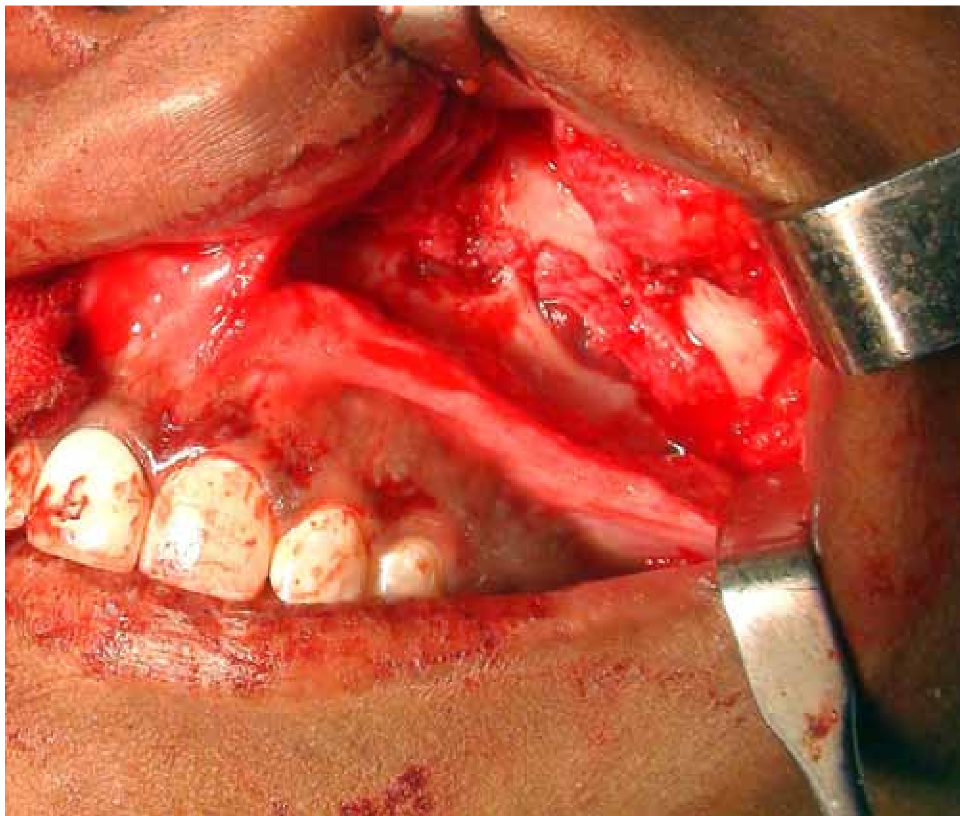


Fig. 6 Eburnated bone edges at the osteotomy site

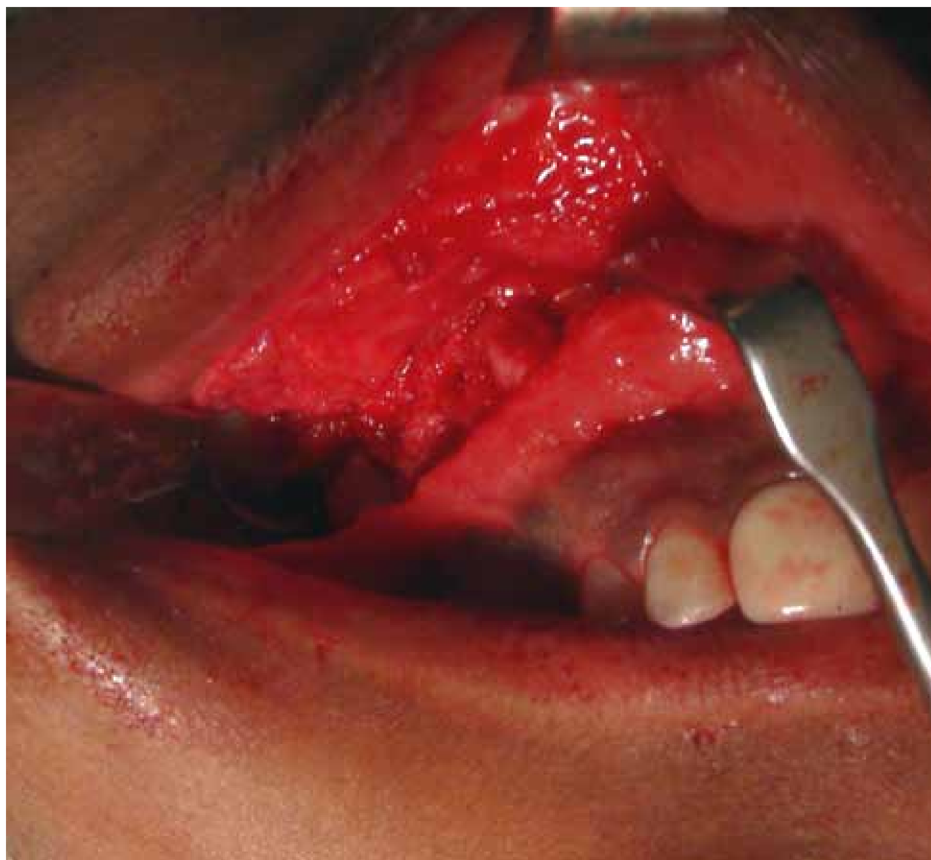


Fig. 7 Autologous cortico-cancellous iliac bone was sandwiched between the bone edges and fixed

Discussion

Lefort I osteotomies have been the mainstay for the correction of severaldentofacial deformities like maxillary excess, deficiency, malposition or asymmetry. The first description of a maxillary osteotomy was published by von Langenbeck in 1859. After Rene Lefort's landmark article in 1901, Wassmundwas the first to describe the classic Lefort I osteotomyin 1921. Through the contributions of eminent surgeons like Axhausen, Schuchardand Obwegeser[4,5], the technique of Lefort I osteotomy has evolved with better adaptation between the bone surfaces, improved stability, and lesser rate of complications.

Non-union of maxilla is a serious but a very rare complication after Lefort I osteotomy. The authors retrospectively reviewed the patient data and found that there were about 150 Lefort I osteotomies performed in their unit for the last 10 years. They identified 2 cases of non-union and report an incidence rate of about 3%. Kramer et al[2] reported an incidence rate of about 1% while Imholz et al[6] reported an incidence rate of about 2.6% in patients who underwent Lefort I osteotomies. Postoperative unstable dental occlusion, infection, osteosynthesis failures, insufficient bone contact are some of the probable etiological factors for non-union[7]. Maxillary mobility is the single most important diagnostic feature of non-union. Otterloo et al[8] had described this condition as a 'floating maxilla'. Radiographic investigations are mandatory to confirm the presence of fractured plates, if any. Advancements in imaging techniques like 3D reconstruction of the computed tomography sections aid in formulating a proper treatment plan. Imholz et al reported that the mean delay between osteotomy and the non-union was 15.5 months. The time elapsed from the time of surgery to the occurrence of symptoms varied from 6 to 56 months[6].

Maxilla is a membranous bone with a thin cortical structure, variable bone density and with excellent inherent vascularity. It houses the maxillary antrum with thin external walls. Any major movement involving the maxilla might not produce edge to edge bone contact unlike the mandibular movements, thereby increasing the prospect of secondary healing after maxillary osteotomies. In cases of superior repositioning of the maxilla, there is a resulting 'telescoping effect', which prevents end to end approximation of the maxillary segments[9]. This lack of approximation would create a space that might lead to pseudoarthrosis[10] and impair normal bone healing.

In the first case, the patient was treated in a different centre and was operated the first time for vertical maxillary excess and bimaxillary protrusion. Later, she underwent a couple of surgeries for non- union of maxilla, which arose as asequelae to Lefort I impaction. The authors attribute the reasons for non-union to be trauma from occlusion, deep bite, antero-posterior movements of more than 6mm without bone grafting, improper plate fixation, infection and sinus pathologies.

The impetus for the edge of the osteotomized segment to be in close proximity to the infraorbital foramen, could be due to the repetitive freshening of the bony edges and lack of bone grafting.

Bite planes were fabricated and cemented to the mandibular posterior teeth bilaterally to relieve the anterior teeth from occlusal loading. Intraoperatively, in addition to mobilizing the maxilla, an anterior subapical osteotomy was performed in the mandible and the osteotomized segment was moved downwards to alleviate trauma from occlusion. The trauma from occlusion might have produced incessant minor movements that would have been a predisposing factor of non-union.

In the second case, the patient had no remarkable medical history. The radiologic and intraoperative findings indicated that the quality and morphology of the maxilla were normal and the patient reported with maxillary mobility at six months post-operatively.

The authors believe that in this case, the non-union might have been due to the 'telescoping effect', as the maxilla was superiorly repositioned. This might have resulted in the bending of titanium plates at acute angles and probably caused stress fractures of the plate. The patient initially experienced dull ache, followed by clicking, as the fractured plate became completely mobile with loosening of the screws.

Non-union in maxilla can be initially managed by restricting the patient to a soft diet, discontinuing or decreasing the strength of elastic traction, fabricating a modified splint to balance occlusion and eliminating para functional habits. Local and systemic measures are being used to treat post-operative infection. Robl et al recommends recreation of the osteotomy with aggressive mobilization, removal of surrounding fibrous tissues and

passive repositioning of the osteotomized segments. They recommend bone grafting and stabilization with rigid fixation to resist segmental displacement[11,12]. Imholz et al stresses on the necessity of a revision surgery with a bone graft and a stronger osteosynthesis[6]. The authors also recommend strict adherence to these protocols. They suggest the use of good quality titanium plates of 1.5mm size and advocate the clearance of sinus pathologies prior to performing a Lefort I osteotomy. They emphasize the necessity of using a block cortico-cancellous graft for movements of more than 6mm and in cases of cleft maxillary hypoplasia.

Ethical Clearance: Nil

Source of Funding: Meenakshi Academy of Higher Education and Research, Chennai, India

Conflict of Interest: Nil

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