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Case Reports

Orthodontic Bracket in Osteotomy Site Post BSSRO: Utmost Unusual Complicated Case Report

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Abstract

Introduction: Retained foreign bodies during surgery are considered as completely avoidable events. There is a large body of literature that has attempted to identify risk factors and create protocols to prevent the occurrence of the same. Dislodgement of orthodontic fixed appliance components [OFAC] can occur during orthognathic surgery on account of the excessive forces that they may be subjected to during the procedure. ***Case Report:*** A 19-year-old female patient underwent a bi-jaw orthognathic surgery for a hypoplastic maxilla. A routine post-operative radiograph displayed an orthodontic molar tube within the right mid ramal region on the 3rd post-operative day. The molar tube was retrieved under general anesthesia with the assistance of an intra-operative c-arm for accurate localization of the bracket. The patient recovered well after the procedure. ***Conclusion:*** A potential long-term complication [e.g. space infections] was avoided as the molar tube was identified in the immediate post-operative phase. Pre, intra and post-operative measures has been suggested to prevent such complications. Possible risk factors that may contribute to retained foreign bodies in the surgical site have also been briefly been identified.

Keywords: Retained foreign, avoidable events, orthognathic, maxilla.

INTRODUCTION

Retained foreign bodies [RFB] during surgery are considered as completely avoidable events. There is a large body of literature that has attempted to identify risk factors and create protocols to prevent the occurrence of the same. Dislodgement of orthodontic fixed appliance components [OFAC] can occur during orthognathic surgery on account of the excessive forces that they may be subjected to during the procedure. In this article, we report a case of an upper molar tube dislodged into the sagittal split osteotomy [SSO] site that was successfully retrieved in the immediate post-operative phase. A check-list of pre, intra and post-operative measures has been suggested to prevent such orthodontic appliance related complications. Possible risk factors that may contribute to retained foreign bodies in surgical site have also been briefly been identified.

CASE REPORT

A 19-year-old female patient presented to the Dept of Maxillofacial Surgery with the chief complaint of a retruded midface. The patient also suffered from a unilateral complete cleft lip and palate and was previously operated under general anesthesia for cleft lip and palatal closure, rhinoplasty and alveolar bone grafting. The patient underwent pre-surgical orthodontics for a duration of 1 year. The surgical plan was a high Le Fort 1 advancement of 8mm and a bilateral sagittal split osteotomy with setback of 4mm on account of the presence of a severe reverse over jet of 11mm (Figure 1). During the surgery, a bad split occurred at the left SSO site wherein the buccal extension of the proximal segment fractured. This complication was successfully managed by plating the ramus and the fractured segment to the body of the mandible in the distal segment with a long continuous mini-plate. Prior to the extubation of the patient, the occlusion was checked and found to be satisfactory. Post-operatively the patient was started on intravenous anti-biotics and analgesics. An orthopantomograph [OPG] taken on the third post-operative day showed a dislodged molar tube in the right SSO site. (Figure 2) An intra-oral examination confirmed that the molar tube

bonded to the right maxillary 2nd molar was missing. The patient was taken under general anesthesia and the exact three-dimensional position of the molar tube in the SSO site was determined with an intra-operative C-arm by taking images in two perpendicular planes. (Figure 3) The molar tube was successfully removed from within the osteotomy site and the same was confirmed with a post-operative OPG. (Figure 4) The patient's recovery was un-eventful.

Fig-1: Pre-Operative OPG

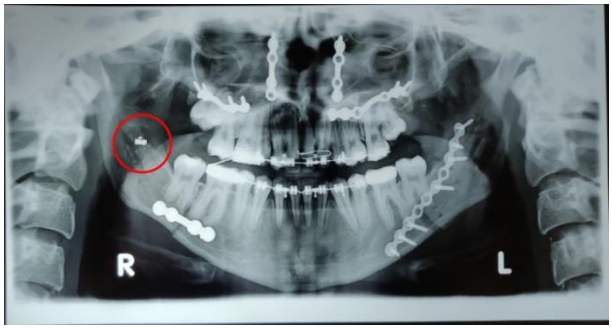

Fig-2: Post-Operative OPG showing Orthodontic Bracket

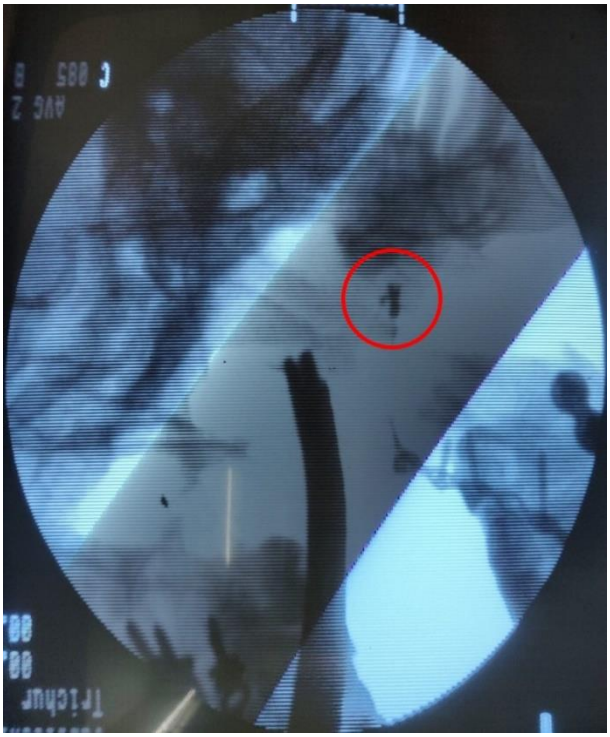

Fig-3: Intra-Operative C Arm showing Orthodontic Bracket

Fig-4: Post-Operative OPG after Removal of Orthodontic Bracket

DISCUSSION

A patient suffering from a dento-facial deformity and/or severe occlusal discrepancy, that is not amenable to treatment by routine orthodontics alone, is a candidate for orthognathic surgery. Treatment is divided into three phases: pre-surgical orthodontics, orthognathic surgery and post-surgical orthodontics. The orthodontic phase frequently requires bonding and banding of OFACs to the molars. During orthognathic surgery, the OFACs are exposed to a large amount of force when mobilizing the osteotomized segments and securing the desired occlusion. The amount and duration of the applied force would be greater in a two-jaw surgery as there is need to secure an interim splint in addition to the final splint. Thus, there is a higher prevalence of OFAC failure in two-jaw surgery cases which can be similarly observed in the case report above [1].

In preparation for surgery, it is necessary to confirm that all the OFACs are intact and firmly bonded to the teeth to prevent intra-operative failure. Ligating the arch wire to the brackets and curling it at the ends help reduce the risk of such events as the brackets can't slide off [2]. Recently, there has been a rising trend of bonding molar tubes on account of the ease of application, better periodontal health and comfort to the patient. Studies have routinely showed that, though bonding strengths have improved, failure rates are higher for bonded molars [33.7%] as compared to banded molars [18.8%] in routine orthodontic cases [3]. The causes cited for such failure include sub-standard etching quality, poor adaptation of the bracket base, increased bite forces posteriorly and inadequate moisture isolation during bonding due to cheek proximity and partial eruption. From the surgical viewpoint, the 2nd molars are closer to the surgical site and hence are exposed to a greater magnitude of force [e.g. pterygomaxillary disjunction in Le Fort 1 osteotomy and vertical and connecting bony cuts in SSO]. In line with the reasons stated above, prevalence studies have shown there is a 3:1 probability for bond failure in 2nd molars versus 1st molars, mandibular molars versus maxillary molars and right side versus left side. A similar scenario is noted in our case report wherein the bonded 2nd maxillary molar tube on the right side was dislodged into the surgical site. Thus, bonding of components to molars [e.g. molar tubes] should be limited to non-orthognathic cases [4-7]. Ideally, both molars should be banded in orthognathic cases with a preference for the more terminal molar [i.e. the 2nd molar] so that even in the event of the bonded 1st molar tube failing, it would not be able to slide off the arch wire due to the position of the second molar band. As a precaution, the arch wire may be annealed and cinched to prevent OFAC loss during surgery but this adds to the difficulty of removing it in the post-operative phase, if need arises. The orthodontist should always inform the surgeon and the patient if the molar tubes have been bonded and attention should be drawn towards the risk of mechanical failure during surgery. The surgeon should also perform a total count of the OFACs and check for the presence of bonded molar tubes prior to surgery and before extubating the patient [5]. Surgical hooks [crimped, soldered or brackets with pre-attached hooks] are incorporated into the orthodontic appliance to facilitate maxillomandibular fixation [MMF] intra-operatively and occlusal guidance post-operatively. Crimpable hooks can be placed accurately with a pair of crimping pliers within the oral cavity itself. As the arch wire does not need to be removed from the oral cavity, it requires minimal chair side time. However, there is a limit to the amount of force that can be applied while crimping within the oral cavity. Alternatively, crimping the hooks outside the oral cavity is a more reliable method on account of the larger force that can be applied. However, placement is more difficult and removal of the wires is required which extends the length of the appointment. Though easy to apply, inadequate crimping might lead to lose hooks which can increase the risk of dislodgement of the hook [8]. If the hooks are soldered, there is a lower chance of loosening as compared to crimping. However, soldering is technically challenging, requires additional machinery, is time-consuming and has a risk of annealing of the arch wires [9,10]. Therefore, this technique has more or less lost favor amongst clinicians. Though brackets with pre-attached hooks can be used, engaging them might be difficult on account of their short length. Furthermore, such a design is restricted to the posterior brackets only and the clinician will still have to crimp or solder hooks in the anterior region. Oral hygiene also becomes difficult and there is an increased risk for plaque accumulation and

subsequent decalcification of the underlying teeth. In the authors experience, crimping the hooks outside the oral cavity with further reinforcement by spot welding or luting with a flowable composite creates the ideal balance between the torsional stability of the hook and maintaining the properties of the wire [11]. As a rule, the surgeon should always pay attention to the total count of OFACs, including hooks, prior to surgery and just before extubating the patient prevent the risk of RFB within the surgical site. The patient is placed in a supine position with the head rotated towards the surgeon while performing orthognathic surgery. On account of this head position and the effect of gravity, there is an increased risk of the deboned bracket entering the airway or the SSO site [soft tissues or osteotomy site] [1,5,6,12]. Teltzrow *et al*. [13] in his review on complications in SSOs calculated an incidence of 0.6% for RFB in SSO sites. There exists only a single case report by Shaeran *et al*. [4] of an orthodontic bracket dislodged into the right extra-antral space along the zygomatico-maxillary buttress region. However, one must not fail to remember that complications due to RFB are under-reported in the literature owing to the sensitive nature of the topic. Opinion differs regarding the management of a dislodged OFAC. If identified intra-operatively, then efforts are made to remove the OFAC as it is considered non-sterile. The dislodged OFAC is ideally located with an intra-operative C-arm or skull radiographs taken at different angles. If the RFB is identified post-operatively, the decision is taken jointly by the surgeon and the patient based on the anatomic location, proximity to vital structures and possible risk of future complications. If dislodged into the airway or the lateral pharyngeal wall [in the vicinity of a major vessel or nerve]; immediate removal is mandatory to prevent future airway embarrassment, neuropathy or erosion and rupture of arteries as the dislodged OFAC is susceptible to foreign body reactions on account of leaching of metallic ions. If displaced into the soft tissues [e.g. pterygomandibular space or submandibular space] or the osteotomy site, a wait and watch policy can be adopted as the presence of postoperative edema makes surgical exploration and identification of a small RFB difficult and time consuming. The RFB can be removed at the time of hardware removal or when the patient becomes symptomatic and there is literature supporting both lines of management [1,4–6,12,14,15]. In our case, the patient insisted that the dislodged bracket be removed and hence the same was successfully attempted. Studies have identified the variables responsible for retained surgical items [e.g. surgical sponges and instruments] in abdominal and pelvic surgeries and are listed as follows: intra-operative blood loss > 500ml, increased duration of operation, more than one sub-procedure, surgical count not performed, more than one surgical team, change of supporting staff [e.g. surgical nurses], unexpected intra-operative events, incorrect surgical count, emergency surgical procedure, increased body mass index and absence of trainees [16-19]. Similar variables can be identified in our case report: more than one sub-procedure being performed as a two-jaw surgery was planned, the left SSO site had a bad split which was an unexpected intra-operative event, the overall duration of the surgery was longer [two-jaw surgery and plating of the bad split], failure to perform a count of the OFACs and an absence of trainees who by their inquisitive nature and keen observation help raise the level of clinical performance and alertness of the staff surgeon.

CONCLUSION

Retained foreign bodies during orthognathic surgery are considered as completely avoidable events. Ideally, banding of terminal molars is the simplest method to reduce such complications. A simple count of all the OFACs is a must prior to surgery and just before extubation. Special attention must be paid if bonded molars are present and precautions to prevent dislodgement have been enumerated above. If the count does not match, a foreign body radiograph is essential to rule out dislodgement of the OFAC into the airway or the surgical site. If identified in the post-operative phase, it is a must to inform the patient and failure to do so constitutes as medical negligence. The decision to remove or leave the dislodged OFAC should be decided jointly by the surgeon and the patient and differs on a case to case basis.

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