The Use of Minne Ties for Intraoperative MMF During Orthognathic Surgery

A 22 year-old-male with a past medical history significant for anxiety, depression, hypertension, asthma and obstructive sleep apnea (OSA) presented to the Tufts Oral and Maxillofacial Surgery Department for surgical management of his obstructive sleep apnea. A sleep study demonstrated severe OSA and he also underwent a drug induced sleep endoscopy, which demonstrated significant oropharyngeal collapse. He reported not tolerating use of the CPAP machine and was recommended to consider placement of a hypoglossal nerve stimulator (i.e. INSPIRE implant) which he denied. The patient was ultimately referred by his primary care physician to Tufts for consideration of maxillomandibular advancement surgery to treat his OSA.

On initial consultation, the patient was a well appearing male in no acute distress. He was noted to be class 1 skeletally with a straight facial profile and 0mm of incisal show at rest. On intraoral examination, he was missing all four of his third molars, in addition to the second molars on the left side and lower right side. He was in a canine class 1 relationship with no orthodontic hardware in place. The remainder of his exam was unremarkable. A lateral cephalogram xray was obtained which showed narrowing of his posterior airway space (PAS) at the level of the oropharynx (Fig 1). The patient had a hx of orthodontic treatment in the past.

Fig 1. Pre-Operative Lateral Ceph with evidence of narrowing at the level of the oropharynx

At the end of the initial consultation, we discussed the treatment option of maxillomandibular advancement for the treatment of his OSA with the use of virtual surgical planning for custom hardware and cutting guides fabrication. The patient agreed to the proposed treatment option, and a CT maxillofacial without contrast and intraoral scans were obtained for surgical planning.

At a follow up evaluation, we discussed the options for intraoperative and possible post-operative intermaxillary fixation with hybrid arch bars, MMF screws or Minne Ties. Due to the patient's good periodontal health and adequate interproximal spaces, Minne Ties would be a less invasive and comfortable treatment option. After completion of virtual surgical planning and fabrication of custom hardware, the patient was scheduled for elective surgery at Tufts Medical Center.

When the patient presented on the day of surgery, the risks and benefits of the procedure were re-discussed and all questions and concerns were addressed. Due to the large nature of the advancement, we emphasized the high probability of keeping him in intermaxillary fixation utilizing Minne Ties for a few weeks after the procedure. The patient was brought into the operating room and intubated via standard nasotracheal intubation and prepped and draped in a normal surgical fashion. Attention was first turned to the maxilla and the surgical site was injected with local anesthetic. A standard LeFort incision was used to expose the maxillary buttresses. The maxillary cutting guide was secured, all predictive holes drilled, and the predicted osteotomy line marked out. The guide was removed and the LeFort osteotomy was completed. The maxilla was down fractured and adequately mobilized. Once the interferences were removed and the soft tissue mechanically distracted, the intermediate splint was placed and the maxillary and mandibular dentition were noted to be in appropriate occlusion. An assistant held the mandible in place, while the maxillary prefabricated plates were passively seated. The plates were secured with 5mm bone screws.

Attention was then turned to the mandible. Starting with the right side, standard BSSO incision was used to expose the medial and lateral aspect of the ramus. A low-cut osteotomy was initiated on the medial aspect of the mandible and carried towards the distal surface of the right mandibular molar. The BSSO cutting guide was placed, the lateral osteotomy line was marked, and predictive screw holes were drilled. The cutting guide was then removed and a combination of chisels and a Smith spreader was used to complete the right sagittal split osteotomy. Attention was then turned to the left side and the same sequence was completed. The distal segments of the mandible were noted to be adequately mobilized and the final occlusal splint was trialed. The maxillary and mandibular dentition were passively seated into the splint without issue. At this time, the splint was removed and six large Minne Ties were placed in the embrasures between the molars and premolars bilaterally. To secure the anterior teeth, a large Minne Tie was placed in a figure of 8 configuration. Once all Minne Ties were appropriately positioned, the occlusal splint was snaked

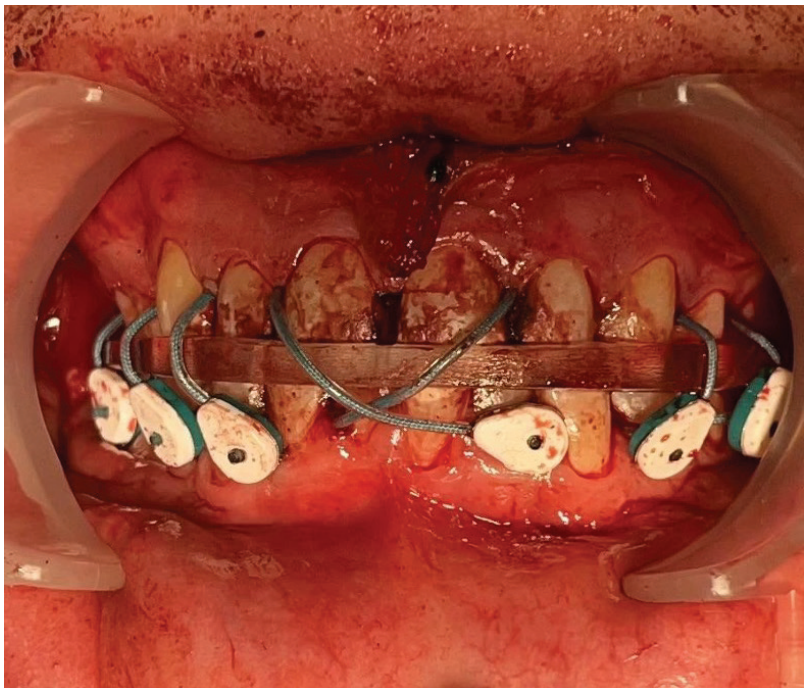

Fig 2. Intraoperative use of Minne Ties with the final splint positioned appropriately. Note the posterior Minne Ties are placed interdentally in the posterior dentition and in a figure of eight configuration across the central incisors.

Fig 3. Post-operative panoramic x-ray showing appropriate seating of the condyles and the patient in maxillomandibular fixation with Minne Ties and splint in place

through the loose loops and seated. The Minne Ties were then tightened from posterior to anterior and a 15 blade was used to cut the Minne Ties flush with each clasp (Fig 2).

Once adequate occlusion was confirmed, attention was turned back to the osteotomies for final plating. The custom plate was noted to adequately seat on the left side and was secured with 6 monocortical screws. The custom plate was not well adapted on the right side due to an anatomic feature created after the advancement. Instead, a 4 hole mini plate was placed and secured using monocortical screws. Due to the non-rigid fixation of the right sagittal split osteotomy and the large nature of the advancement, the decision was made to keep the patient in MMF using Minne Ties. All sites were irrigated and incisions closed. The patient was turned back over to the anesthesia team for an uncomplicated extubation.

The patient was admitted for overnight observation, and postoperative imaging was obtained in the OMFS clinic. A panoramic x-ray confirmed anatomic seating of bilateral condyles (Fig 3) and a lateral cephalogram showed increase in width of his oropharynx (Fig 4).

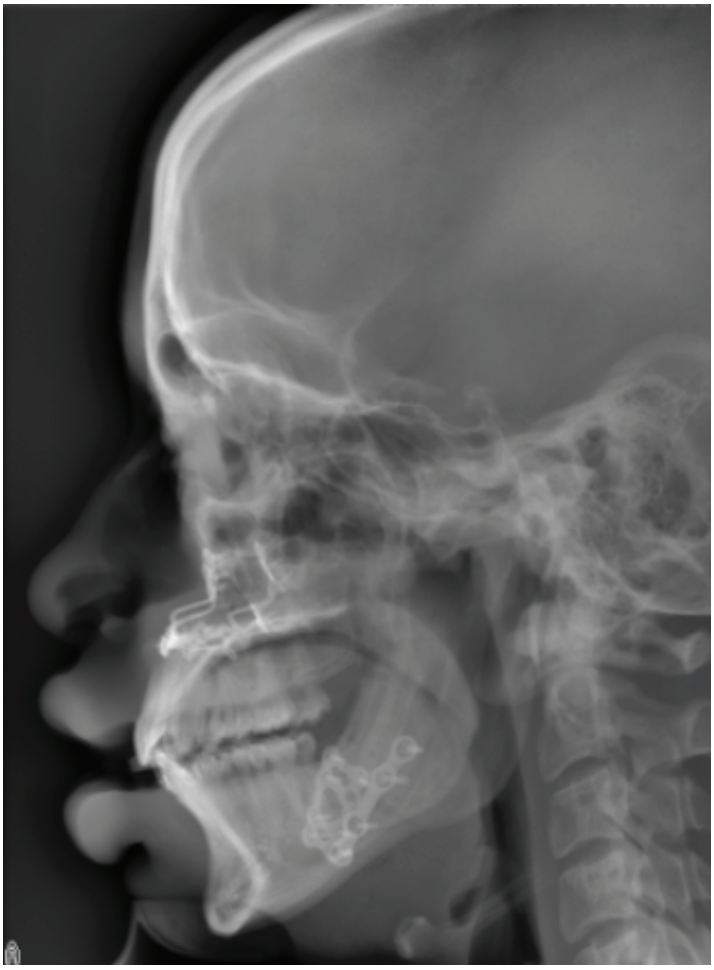

Fig 4. Post-operative lateral ceph showing widening of the oropharynx

The patient was discharged on postoperative day one. On presentation at his two week follow up, the patient reported a dramatic increase in his sleep quality and ability to breath, despite remaining in maxillomandibular fixation.

The Minne Ties were removed utilizing scissors without the need for local anesthesia. His postoperative occlusion appeared stable with bilateral posterior contacts and midlines coincident. The use of Minne Ties for this case allowed for a reduced total operative time in addition to a less invasive alternative to traditional hybrid arch bars and MMF screws. Minne Ties have been a great asset to our institution for application of MMF in patients without orthodontic hardware, specifically during total joint replacements, orthognathic surgery and craniomaxillofacial trauma. The ease of use and continued positive outcomes associated with Minne Ties make it a viable option for operating room, clinic and emergency department-based procedures. This case presentation serves to add to the arsenal of uses Minne Ties has in the realm of craniomaxillofacial surgery.

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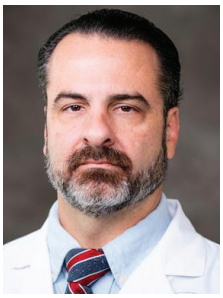

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