

The Use of Minne Ties® for Intraoperative MMF During TMJ Total Joint Replacement

Roger Moreira, MD, DMD, JD, MBA, PhD, Chad Dammling MD, DMD, Robson Garcia DMD, Ms, PhD
Oral & Maxillofacial Surgeon, Carolinas Center for Oral & Facial Surgery

A 69 year-old-female with a past medical history of hypertension, use of tobacco, arthritis and temporomandibular disorder (TMD) presented for management of her temporomandibular joint (TMJ) pain with limited dietary intake and joint noises. She reported grinding teeth history and previous clinical treatments like use of mouthguards, muscles relaxants, dry needling and laser therapy with no control of her pain. She had bilateral clicking, popping, crepitus and restricted mandibular movements. The CT images demonstrated flattening of the bilateral mandibular condyles with tiny marginal osteophyte on the right and subcortical sclerosis on her left side. A magnetic resonance imaging suggested bilateral advanced temporomandibular joint osteoarthritis. Considering that she was reporting significant worsening of the symptoms even with many previous non-surgical treatments she decided for a TMJ surgical treatment.

An established patient, previously seen for right TMJ osteoarthritis (Wilkes Stage 4), confirmed by MRI in June last year, presented to the Carolinas Center for Oral & Facial Surgery at Raleigh-NC for a new clinic evaluation. This time she reported a new onset of left-sided TMJ pain, rated 6-7/10, with joint noises and difficulty consuming certain solid foods. She related a progressively worsening situation although she had pursued conservative management with physical therapy, Botox injections, corticosteroids, NSAIDs, muscle relaxants, massage therapy, dry needling, and other modalities. While these non-surgical measures offered some relief for years, she now reports significant worsening of symptoms.



Fig. 1- Stable Class I malocclusion



Fig 2. Maximum incisal opening without pain.

Her pain has become constant and is only partially managed with regular use of analgesics and anti-inflammatories. She also reports persistent pain while chewing and progressive reduction in maximal incisal opening (MIO), which was measured at 33 mm and had mandibular excursion movements limited by pain. At bilateral palpation it was possible to feel TMJ crepitus, with audible popping and clicking. She was referred to get updated images and was asked to return with these results.

The computer tomography showed slight flattening of the bilateral mandibular condyles with tiny marginal osteophyte on the right and subcortical sclerosis on the left. Her magnetic resonance imaging showed flattening of the mandibular condyles with moderate narrowing of the joint space and marginal osteophytosis. The articular discs were displaced anteriorly in the close-mouth position and there was no recapture during mouth opening in both sides. The right articular disc was small and deformed and her right articular tubercle was eroded but there was no joint effusion or abnormal enhancement within the right joint space or its periarticular soft tissues and the bone marrow signal was normal. However, there was mixed bone marrow edema and sclerosis in the condylar head and in her articular tubercle on her left side with abnormal enhancement of periarticular

soft tissues and a small amount of joint effusion. These recent images associated with her clinic symptoms reveal degenerative changes consistent with bilateral TMJ osteoarthritis, compatible with Wilkes stage V.

The patient was counseled again regarding two options: continued non-surgical management, which she has already pursued extensively without long-term success or surgical reconstruction with bilateral total joint replacement and autologous abdominal fat grafting. After detailed discussion, the patient opted for surgical intervention, understanding that the goal is not complete pain elimination, but rather reduction to a manageable level and restoration of functional mastication. Risks including facial nerve injury, infection, heterotopic bone formation, and parotid gland injury were discussed in detail. The patient voiced understanding and desire to proceed.

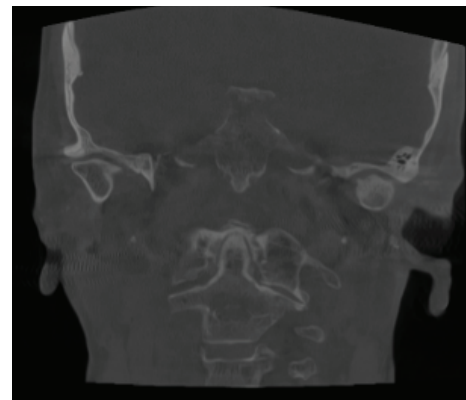


Fig 3. Cortical irregularity and flattening of the mandibular condyles with marginal osteophyte on the right and subcortical sclerosis on the left.

Subsequently she had intraoral scanning and photographic documentation were obtained and those information with the DICOM files were sent to Biomet for the total TMJ prostheses planning. For intraoperative maxillomandibular fixation (MMF), the possibilities would be 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, the patient was scheduled for elective surgery at UNC Rex at Raleigh-NC.

When the patient presented preoperatively at the hospital an informed consent was verified with her, and any questions were invited and answered after reviewing risks and benefits to the procedure. The patient was then transferred to the operating room and onto the operating room table without issues. All appropriate monitors were attached and verified to be working correctly. The patient then underwent nasal endotracheal intubation without complication. End-tidal CO₂ as well as bilateral breath sounds were verified. The tube was then secured by the surgical team. Subsequently, both right preauricular and submandibular incisions were marked, then lidocaine with epinephrine was injected.

Next, Minne Ties® were placed on the posterior aspect of the arches and MMF was achieved. The patient was then prepped and draped in standard sterile fashion. Attention was turned to the abdomen. A semilunar incision along the inferior aspect of the umbilicus was made using an #11 blade through skin and subcutaneous tissue. Metzenbaum scissors were used to dissect through fascia until fat was identified. The fat was grasped using hemostats and a segment of fat was freed using scissors. This fat graft was divided in two pieces and set on the back table. Copious irrigation of the wound was done, then it was closed in layers.



Fig 4. Intraoperative use of Minne Ties® placed interdentally posteriorly with the splint positioned before the TMJ prosthesis fixation.

Then, attention was directed to the right submandibular incision. A 15 blade was used to incise through skin and blunt dissection was performed down to the level of platysma. An incision was made into the platysma and nerve stimulator was used to protect the marginal mandibular nerve. The marginal mandibular nerve was not identified. Ligasure was utilized to dissect deep to the platysma. Once the pterygomasseteric sling was identified the area was tested with the nerve stimulator and sharp incision was performed down to the mandible with electrocautery. Subperiosteal dissection was carried along the lateral ramus to the condyle. A Sonopet® was utilized to make the condylotomy according to the virtual planning. Hemostasis was obtained and the wound was packed and covered with sterile dressing.

Attention was then drawn to the right preauricular incision. A 15 blade was used to incise through the skin. Dissection was then carried down to the zygomatic arch with electrocautery. Subperiosteal dissection was carried anteriorly along the zygomatic arch, exposing the articular eminence. Inferior blunt dissection was performed using a 9 Molt periosteal elevator to fully expose the lateral capsule of the TMJ. Next, the superior joint space was entered using electrocautery. A Seldin elevator was placed into the joint space. The disc and condyle were retracted inferiorly then a 15 blade was used to finish the incision of the capsule along the zygomatic arch.

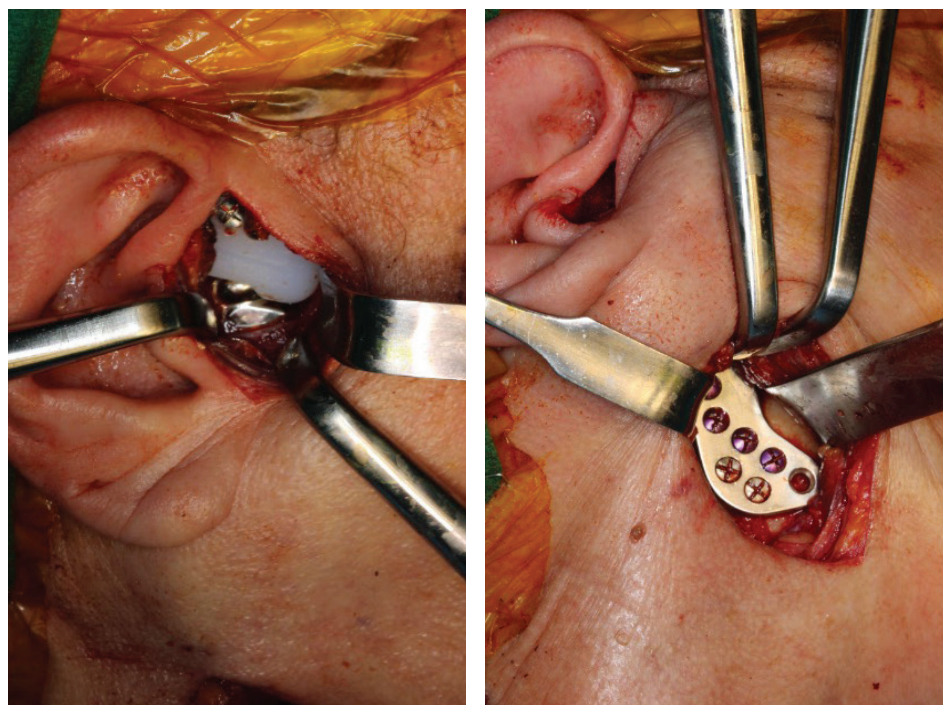


Fig 5. Right mandibular and condyle components fixed as previously planned.

Bovie electrocautery was then used to create a vertical incision through the disc exposing the degenerative condyle which was removed. The joint space and remaining disc were cleaned with a 9 Molt periosteal elevator and the remaining disc was removed with electrocautery.

The right Biomet® fossa component was then soaked in betadine, then placed into the wound and adapted to the bone with good stability. The bone was sounded in each of the four holes to ensure there was excellent adaptation and bone according to the surgical plan. Superior pressure was used to maintain position while the holes were drilled on under copious irrigation, and the fossa component was then stabilized with Biomet® screws according to the pre-surgical planning. The wound was copiously irrigated with normal saline, next a moist ray-tec was packed into the wound.

Attention was then returned to the right submandibular incision. The prepared right Biomet® mandibular component was soaked in betadine. The condylar component was then applied along the lateral surface of the mandibular ramus from the submandibular incision. The condyle component was visualized from the preauricular incision and found to be seated posteromedially in the fossa component. From the retromandibular incision, the mandibular component was found to be adapted and fitted appropriately to the lateral ramus. It was secured with Biomet® screws according to the pre-operative plan. It was again confirmed that the condylar head portion of the prosthesis was seated firmly, medially, and slightly posteriorly in the prosthetic fossa component. Copious irrigation of the wound with saline was done, then, attention was returned to the right preauricular approach, hemostasis was ensured using electrocautery. The harvested fat was then placed in the wound along the prosthesis and the approaches were closed in layers.

The same surgical technique was done on the left side to provide the treatment according to the virtual planning. As the procedure had been completed, drapes were removed, the patient was cleaned and turned back to the Anesthesia Care Team to be awakened and transferred to the PACU for postoperative recovery.

The patient returned 10 days after the bilateral total joint prosthesis replacement for her first post operative evaluation. She reported doing well overall, and had a facial edema consistent with the procedure. There was a mild left mandibular ecchymosis, no facial nerve weakness, sutures were removed and she was educated about avoiding the sun and using a scar gel formula. Her occlusion

was stable and reproducible and she had 25mm of MIO. Then she was educated about physiotherapy and about using Therabite that was adjusted to 35mm. The CBCT showed well positioned implants and no abnormalities. She was discontinued on oxycodone and oriented to use paracetamol just if necessary.

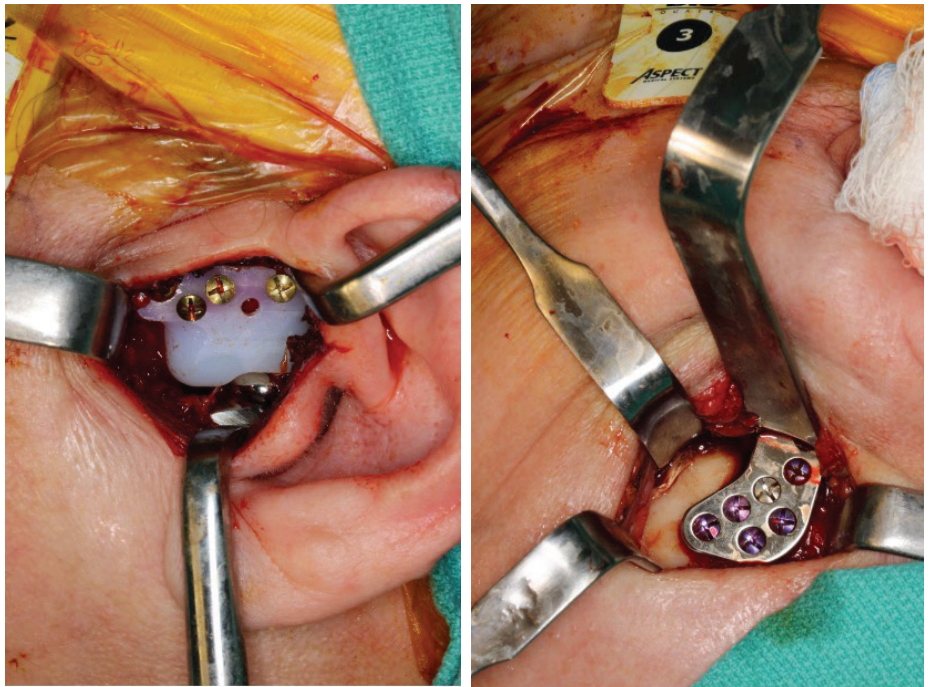


Fig 6. Left mandibular and condyle components fixed as previously planned.

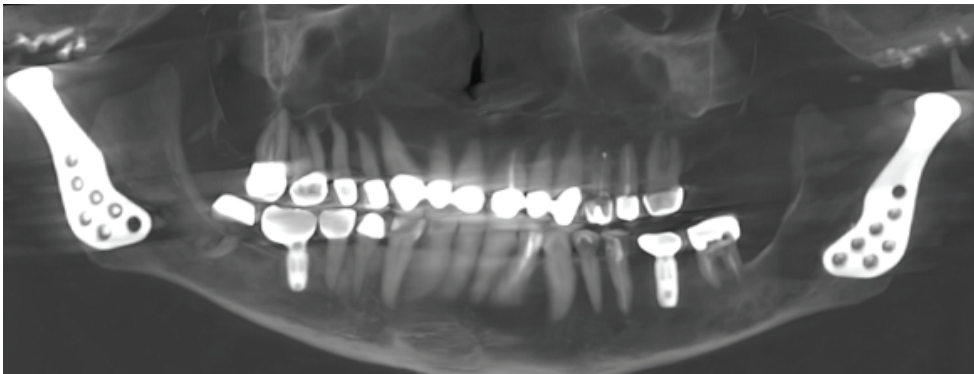
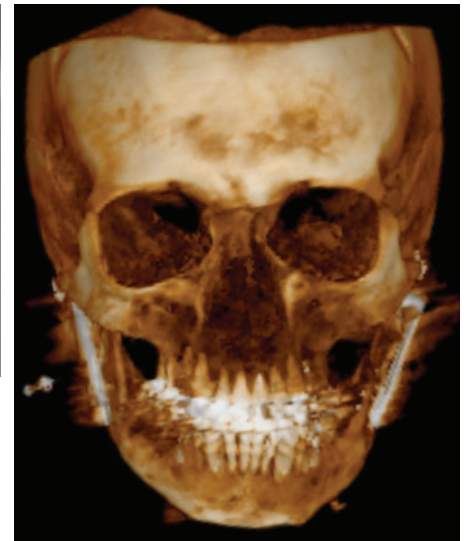


Fig 7. Images showing both prostheses in good position.



For her one month post operative return, she reported significant improvement compared to preoperative pain levels, transitioning back to a normal diet, she reported sleeping better and denied any episodes of numbness, nerve weakness, swelling or signs of infection. A prescription of cyclobenzaprine 5mg nightly was provided to optimize muscle relaxation and facilitate the Therabite use and maximize postoperative MIO.

The use of Minne Ties® for this case of bilateral total temporomandibular joint replacement was a safe, fast, and effective alternative to IMF screws or hybrid arch bar devices in achieving MMF. Minne Ties® have demonstrated advantages over traditional MMF, offering a less invasive alternative and contributing to reduced overall operative time. They have proven particularly valuable for achieving MMF in patients that need total joint replacement procedures and are not in orthodontic treatment as patients that come for orthognathic surgeries.



Roger Moreira, MD, DMD, JD, MBA, PhD
rmoreira@mycenters.com



Chad Dammling MD, DMD
cdammling@mycenters.com



Robson Garcia DMD, Ms, PhD
dr.robsongarcia@gmail.com