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# Headaches, Migraine, and TMJ Pain Management: Medical and Surgical Intervention

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<http://dx.doi.org/10.5772/63381>

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## Abstract

The main objective of this chapter is to introduce to the readers the issue of head and neck pain, temporomandibular joint (TMJ) disorders, clicking, headaches, migraines, and neck discomfort that are likely to present in the clinic with similar signs and symptoms. This chapter deals with the introduction, clinical examination, investigation, and the use of splint therapy, muscle complex injection therapy with botox and prolotherapy, TMJ lavage, arthrocentesis, and TMJ surgery to treat such patients.

**Keywords:** TMD, migraines, headaches, botox, injection therapy, trigger points, TMJ surgery

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## 1. Introduction

In the middle of a stressful lifestyle and busy working schedule, the scenario of patients complaining of headaches, migraines, neck sores, or painful temporomandibular joint (TMJ) is very common in medical practice. Some studies show that more than 5% of the population complain some kind of head and neck pain [1]. Another study reviewed the incidence in a German population focusing on signs or symptoms of temporomandibular disorder (TMD), the incidence was as high as 50%. Moreover, the percentage of patients whom had some form of pain was only 2.7% [2]. The cause of pain incidence in a variable number in the literature is the multifactorial disease process; clinical presentation and precipitating factors are sometimes difficult to identify. Anatomically, the entities that can contribute to pain are dental, muscular, gingival, skeletal, vascular, neurogenic, or psychogenic; not to mention personal susceptibility, medications, external, and life-style factors. Due to the frequency of the disease,

a lot of practitioners are bound to see such patients and may contribute to the treatment of pain in either a successful or an unsuccessful path. The unfortunate path is when attempts are performed improperly and make the situation worse. When a patient presents to a clinic complaining of pain, discomfort, or headache in the head and neck region, the presentation can be similar to a lot of conditions at first glance; however, the etiological factors differ in the magnitude and the degree of involvement. The dynamic relation of the muscles, skeleton, TMJ, gingival tissue, and occlusion does form a sophisticated relation that can modify the etiology of the disease and or extension as unilateral or bilateral. Therefore, the clinical assessment is as challenging as the management plan [3, 4]. In this chapter, the approach will be addressed in a unique way focusing on the problem in general and showing the span of management from the pain reduction to restoring function. In addition, examples of variable cases will be presented to illustrate different approaches to management, such as the use of night guard, botox therapy, trigger point injections, transcutaneous electro-neuro-stimulator (TENS) therapy, prolotherapy, medications, and surgical interventions.

## 2. Clinical examination

The clinical examination of a patient with head and neck pain complaints should start with the routine patient medical interview. Going through the chief complaint, history of present illness, medical history, medications, allergy, social history, eating habits, life-style, postural tendency, previous interventions, etc. As easy as it sounds, the patient may not be able to present all the pertinent information the physician is looking for very clearly. Hence, the expertise of the practitioner to “fish” for the information is needed. Such points can mainly be divided into pertinent positives, which will help in diagnosis of a disorder, and pertinent negatives, which usually rule out an entity. The same can be applied while performing the clinical examination, medical consultation via investigatory methods. Due to the complexity of head and neck pain, thorough knowledge and clinical training are needed to be able to work through the examination-diagnostic part in order to reach a proper diagnosis.

For example, some points may not be presented by the patient and which is of prime importance in diagnosis; this requires a trained physician to “probe” for this information such as life-style’s habits, the amount of caffeinated drink intake, the number of cigarettes per day, the number of sleeping hours, the nature of work, and any postural tendency.

Another issue is the detailed medical status of the patient, vitamin D levels, exercise habits, and eating habits. The head and neck area should be examined thoroughly and routinely for every patient as part of the routine check; however, for head and neck pain patients, closer attention should be made to the major components of the maxillofacial skeleton. Lack of knowledge and expertise may lead practitioners to a false diagnosis, false management, and delay in proper treatment, thus complicating the definitive management.

A special care is required when examining the head and neck area as TMJ constitutes only part of the problem not all of it. Hence, in addition to examining the TMJ by palpation, inspection range of motion, excursions, and clicking, further correlation with other components are

necessary. Dental occlusion, attrition of teeth or restorations, rotated teeth, edge-to-edge teeth, multiple fractured restorations on bicusps and molars, sharp dental edges, and indentations on surrounding soft tissue such as cheeks or tongue should all be carefully inspected as signs dictating precipitating factors [3].

The muscles of the head and neck area should also be evaluated for size, symmetry, tenderness on occlusion or on palpation, presence of trigger points, radiating pain, pain extension to the scalp, back, neck, shoulder girdle, and the paravertebral musculature. The patients should be asked if pain is associated with any neurological deficits, such as tingling peripheries, or motor deficits. Such may dictate other associated problems especially at the cervical vertebral spine level, where consultation with a neurologist or orthopedic surgeon is necessary.

The maxillomandibular complex should be inspected thoroughly, and selectively to palpate the pertinent muscular origins and insertions. The most common muscles of attention are the zygomaticus, orbicularis oris, temporalis, pterygoids, masseter, buccinator, occipitalis, suboccipitalis, and trapezius.

Assessment of the ear, nose, and throat region is definitely important. TMD pain can be present either at or about the ear. Palpating the TMJ or assessing the range of mouth opening is important (**Figure 1**).

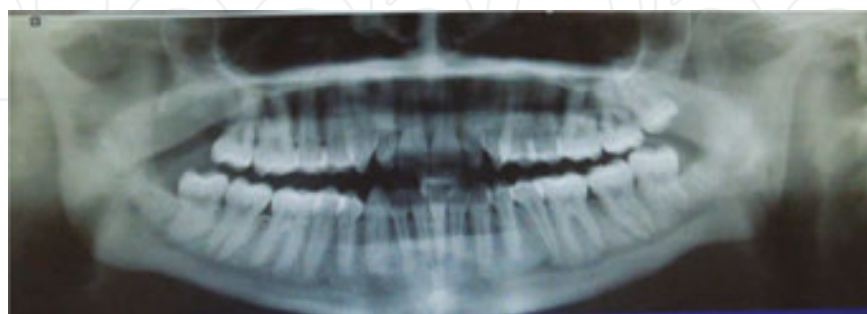


**Figure 1.** A patient presented with onset of abnormal occlusion just after completing a 2-h dental treatment. The picture shows open bite at the posterior teeth and barely touching anterior occlusion, which suggest acute TMJ derangement, likely in the form of disk displacement.

### 3. Investigation

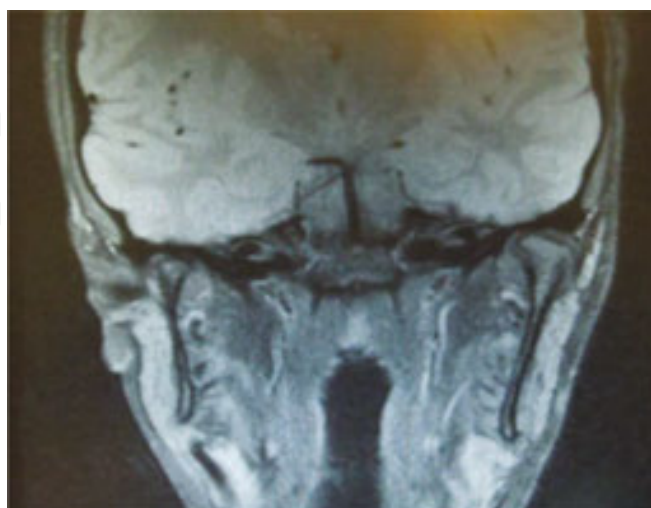
Once the clinical interview and examination are accomplished, usually the clinical outcome can dictate the type of images that might be needed to correlate the findings. Of the most common ones is the orthopantomography or panoramic radiography. The advantage of this

image is that it is easy, available in most dental offices or medical centers, relatively has low cost, and shows a wide panoramic view of the maxillofacial complex. It includes the TMJ, the maxillomandibular skeleton, the associated erupted and impacted teeth, the mastoid—styloid complex, the maxillary sinuses, and other findings such as external objects and piercings (**Figure 2**). A lateral cephalometric or anteroposterior radiograph can be used as well to document the maxillomandibular relation or discrepancies in anteroposterior dimension [3–5].



**Figure 2.** A panoramic radiograph of a 27-year-old patient with chronic pain of the head and neck muscles. The radiograph is showing signs of chronic condylar overload presented in the form of bilateral degenerative changes.

The CT scan of the head and neck is usually used as well to verify the relation of the maxillo-mandibular status with the base of skull. Conditions such as impacted teeth or associated lesions, or abnormal position of such an impaction are usually present. A hard bony lesion of the joint, condyle, coronoid, or base of skull is investigated and can be seen in difficult situations. An MRI of the head and neck region is of great value to investigate the internal status of the TMJ region, showing the disk, effusion, and abnormal enlargements [5]. In addition to evaluating soft tissue abnormalities more clearly when compared to CT scans, it is useful if neurogenic, vascular, or mesenchyme disease is anticipated (**Figure 3**).



**Figure 3.** An MRI coronal view of a patient with left TMJ pain and hypomobility. The view shows left disk displacement toward the anterior-medial aspect.



The use of 12.5 MHZ ultrasonography has been presented to be a useful aid for TMD evaluation with some limited application in detecting the presence or absence of derangements more than specifically identifying a precise type of the disease [6]. Some other investigatory tools have been used to help verify the status such as the stethoscope to listen closely to clicking or crepitus and the use of electromyography for objectively measuring the activity of some muscles of mastication especially temporalis and masseter but with limited application in the clinical field [4–7].

#### **4. Management strategy**

Managing such problems is thought to be easy by a lot of practitioners as considering the same regime for almost all their patients. The drawback of doing so, is worsening the situation over time, decreasing the pain threshold level, emotionally disturbs the patient and families, causing more depression, causing less tolerance to treatment, and further difficulty in treating those patients eventually when referred to a specialized center.

Management always begins with the correct diagnosis as discussed in the previous section. Furthermore, it is crucial to identify the contributing factors to address them while planning the treatment strategy. Hence, the primary visits are usually directed toward counseling the patients and identify the possible conservative strategy [2, 3]. Using soft diet, cutting food into smaller pieces, avoiding chewing gum, and minimizing extreme opening of the mouth are strategies that can be applied in order to alleviate the load on the joint and muscles. The addition of medications is commonly used; however, care should be taken to customize the medications to the appropriate case. Analgesics, nonsteroidal anti-inflammatory drugs, muscle relaxants, anxiolytics, opioids, antidepressants, anticonvulsants, antihistamines, and local anesthetics are all examples of extrinsic treatment that can be added carefully. The dose, frequency, duration, and possible combination are all aspects to consider [8]. The management protocol usually includes behavioral therapy as the case dictates, which include, self-determination, relaxation, meditation, yoga, self-hypnosis, cognitive therapy, and finally, a psychiatric evaluation if needed. It is imperative to understand that customizing a protocol is a difficult task, not to mention that the patient responded partially or completely to the treatment or did not respond at all. That's when the practitioner should revisit the case, starting from diagnosis, patient cooperation, and finally the treatment protocol as the response can vary according to the treatment given, the patient's cooperation, and the nature of the disease.

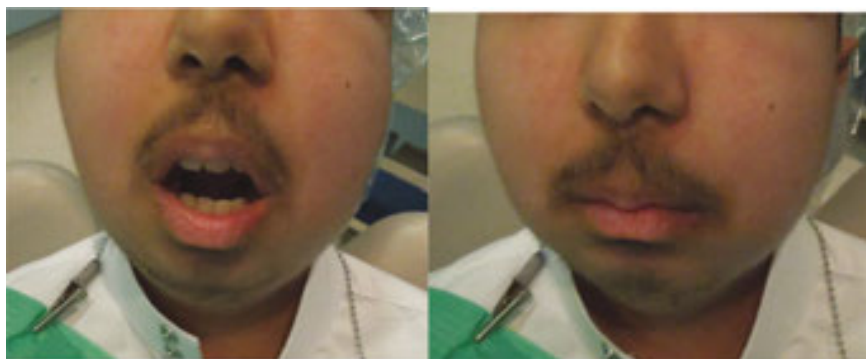
#### **5. Occlusal evaluation**

The physiologic harmony of occlusion in accordance with the TMJ and muscle complex is of prime importance. One of the reasons that lead to losing such harmony is the loss of occlusal equilibrium. Missing posterior teeth can be very devastating to the patient especially if more than one is missing. Such will lead to directing the occlusal force and chewing asymmetrically.

Abnormal high contacts in the form of fillings or prosthetics will disturb the occlusal balance and might lead to TMJ internal derangement, muscle abnormal reaction, or eventually fracture of the restoration or the tooth itself. The same might occur if abnormal maxillomandibular prosthetic occlusal compatibility was not evaluated and planned; as acrylic maxillary teeth might be incompatible when opposed by porcelains (**Figure 4**).



**Figure 4.** A lateral clinical view showing the posterior open bite acutely found after prolonged dental treatment took place for a 60-year-old female patient. She presented to the oral maxillofacial surgery center right after finishing the dental treatment complaining that she cannot bite normally as used to be with pain upon mouth opening and closure.



**Figure 5.** An 18-year-old patient presented with a tender TMJ and muscle complex in addition to hypomobility of the mandible. Thorough interview and examination revealed a medical background of juvenile rheumatoid arthritis that is affecting the TMJ bilaterally leading to hypomobility likely due to fibrous ankylosis (see **Figure 6**). Such deformity will require careful management to reconstruct the deranged TMJ, ramus height, mandible opening, occlusion, and the convex facial profile by mandible advancement surgery and possibly a chin augmentation procedure [11, 12].

Clenching, bruxism, or parafunctional habits can be devastating type of forces as they direct forces to unusual points of the tooth structure in a chronic continuous fashion. The phenomena might lead to unilateral or even bilateral disease at the muscle or TMJ aspects [9]. Such patients usually will show evidence of the habits on their teeth or surrounding soft tissue in the form of attrition, loss of restorations, frequently changing restoration, or fractured tooth. The soft tissue envelope might show evidence of continuous trauma as fibrosis, leukoplakia, or indentations on the tongue and cheek mucosa [9, 10]. Maxillomandibular skeletal discrepancies such as anterior open bite, long face syndrome, short ramus, and class 2 skeletal

malocclusion are prone to have an abnormal load on the muscular or TMJ region. The patients usually complain from difficulty eating, cleaning, and mouth opening, in addition to the possibility of pain and discomfort. Such derangements can affect both the hard and soft tissue structures (**Figures 5 and 6**). Accordingly, practitioners must dictate the type of surgical intervention needed [11, 12].



**Figure 6.** An orthopantomographic (OPG) view of the patient in this figure, showing reduced ramus height bilaterally and abnormal condylar fossa shape in the form of flat condylar head, decortication, abnormal space, and osteophytic changes. Further images and CT scan are needed to investigate the joint and confirm the suspected ankylosis type and extension. An MRI scan can be used as well to confirm the soft tissue status such as the disk, joint effusion, and further fibrosis.

## 6. Splint therapy

A splint is defined as using an external device that can be worn on top of teeth as part of TMD management process. Splints can come in different forms or shapes or material. It can be hard, soft, or combined [9]. The extension of the device can be generalized to cover all the teeth or can be limited to specific teeth. Some splints are placed in the maxillary arch, mandibular, or even both, which are less commonly used nowadays. The occlusal surface of the splint can be flat, anatomical, or positional. As presented, variability in forms and shapes is available, and selections do depend mainly on the case, or according to the availability in the laboratory or the practitioner's expertise in handling one over the other. Hence, it is extremely discouraged to use similar device modality in all the patients without knowing the reasoning of prescribing so. It is unfortunate that this is considered to be one of the common pitfalls in dental practice that a specific theme is prescribed for all the patients for reasoning such as material available, lab technician skills, or dentist lack of knowledge or expertise.

The general idea of using splint therapy is to hold the occlusal units together against the extreme or abnormally directed force of occlusion. It can work as a habit-breaker, redistribute the amount of force all over instead of a single location, stretching the muscles of mastication, and finally to re-orient the condyle fossa relation targeting alleviating force, proprioception,



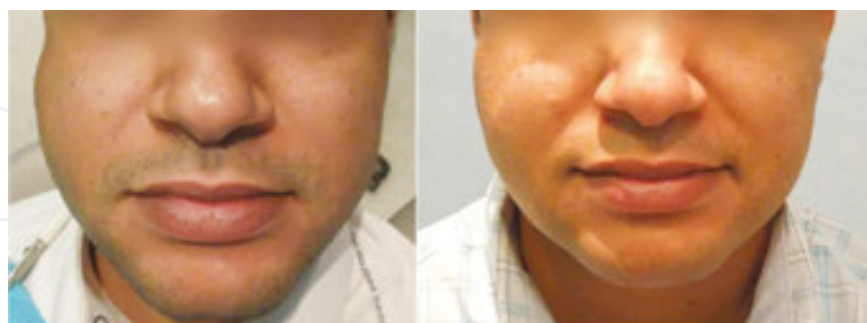
and retrodiscal tenderness. It can be beneficial to patients at the beginning of the disease and can be assuring if used during sleep where a lot of the bruxism usually takes place [10].

Splint therapy can be harmful if used on patients with occlusal disequilibrium, patients with hyperactive muscles of mastication, patients with multiple trigger points, or patients with advanced TMD and muscular disease, especially if not combined properly in the management protocol.

### 6.1. The muscle complex therapy

The muscles are the main structure stabilizing the skeleton and help in movement and functions. Muscles are integrated with their terminal tendons at the origin or insertion base, with capsules, and with the surrounding fascia of the head and neck. The anatomical and functional harmony between the muscular complex, the joint, and functional outcome can preserve a prolonged pain free well-being. However, minor disfigurement can lead to patient's dissatisfaction and discomfort. At some point during the disease process, the muscles of mastication can suffer by different pathophysiological lines. It can get hypertrophied, showing trigger points, and even worse—fibrosed or calcified. Trigger points (TPs) are defined as localized areas in the muscle, palpable, tender, and can cause extreme radiating pain if pressed for prolonged duration. TPs vary in size, shape, and number, where their presence is usually evidence of muscular advanced reaction to the disease process. Muscles can be approached by different techniques, where oral pills are usually the easiest and commonly approached by practitioners. The medications commonly used include analgesics, NSAIDS, or muscle relaxants. However, in situations of advanced muscular involvement presented by TPs and severe pain to the head and neck muscles, further interventions are needed, such as TP injection, botox, prolotherapy, TENS, or more types of systemic medications [13, 14].

TP injection is a well-known technique to manage muscle pain using variable materials such as local anesthetics, saline, or opioids. Studies of such material showed significant results with



**Figure 7.** On the left side, a frontal clinical view of a client complaining of an increased size of the right facial contour that is more noticeable when eating or speaking. On clinical examination, the right masseter muscle showed significant trigger points on palpation with tenderness and general muscle hypertrophy. The temporalis muscle is involved as well. Upon reviewing the pertinent history, the client stated heavy clenching and bruxism likely due to the stressful busy work schedule. The picture on the right, taken approximately 2 months after starting the muscle therapy and trigger point injections resulting in a significant reduction of the contour with anticipation of further reduction concomitant with time.

variable outcomes according to the confounding factors and study group criteria. When local anesthesia is used, non-epinephrine containing solution is used to get the advantage of the vasodilating effect on the muscle and trigger point. Such will facilitate better blood supply circulation and analgesic effect to allow more range of motion exercise [13, 14]. The disadvantage is that it might require multi-injection therapy over few weeks to show results that can be not convenient to the patients.

When botulinum toxin-A was introduced to treatment, it showed very good results for treating migraines, headaches, TPs, and neck pain with prolonged effect and much less visits to the hospital emergency department or hospitalization [14, 15]. Such made that choice of more convenience to the patients and practitioners with much fewer visits needed. The drawback is the possible high cost when compared to local anesthetic TP injection. Of the common pitfalls along this line is not explaining to the patients how botox works, not mixing the material in the right formula, or improperly injected by untrained practitioners. It is not uncommon that patients might think that a single visit of injection therapy might resolve a disease that has been there for few years which is unlikely. The treatment risks, benefits, and alternatives have to be discussed clearly with the patient in order to assure proper outcomes and continuity of care without unrealistic expectations. Patients will usually feel relieved and significantly improved when treated properly. However, it will still require to keep up with the instructions and other forms of the treatment strategy as well, such as, eating softer diet, changing the damaging postural habit, and possibly adding a stress reduction form into the stressful life-style (Figure 7).

## 6.2. Prolotherapy

**Prolotherapy** is defined as a mode of treating tender joint and surrounding tendons using hypertonic fluid injections to stimulate a proliferative regeneration process. It has been used for over 70 years in TMJ and other joints showing promising results. It was first described in



**Figure 8.** A 36-year-old male patient presented with tender muscles at the left side of the face, head, and ear region. Clinical examination revealed involvement of the mastoid-styloid-muscular complex as a major point eliciting the pain. A query Eagle's syndrome was suggested as the patient has the pain increased when turning his head to the sides, excessive articulation, or sometimes swallowing. An extensive muscle therapy and postural control took place with significant improvement of the condition. The clinical picture is showing the posterior side view of the mastoid-styloid region, landmarking the region for further muscle injection therapy.

the literature as a treatment modality for TMD and pain back in 1937. The technique of injecting hypertonic solution such as dextrose 10% mixed with sterile water and lidocaine can be effective if placed at the peri-discal tissue or at the muscle tender trigger points or terminal attachments [16]. The application is used on a case-by-case selection according to the origin of the pain and the response to treatment modalities. It requires three to four injection sessions done in 4–12 weeks intervals, which might be counted as a disadvantage (**Figures 8 and 9**). However, the availability of the injection material and the relatively lower cost is considered as advantages [16–18].



**Figure 9.** A 24-year-old female patient presented with chronic unilateral face, head, and neck pain that was diagnosed as TMD and myofascial disease with query Eagle's syndrome character. Part of the management protocol presented to her was prolotherapy injection at the TMJ complex. The marking is showing the anatomical topography of the area and illustrating the retrodiskal ligaments and anterior diskal attachment. The masseter muscle origin from the zygomatic arch is identified as well as the location of the major trigger points for evaluation and management. The patient responded very well to the TMJ/MFD protocol used and showed significant reduction of pain and improved functional ability.

### 6.3. TMJ lavage, arthrocentesis, and arthroscopy

Arthrocentesis is defined as using needles of particular size in order to reach inside the joint for the management of intracapsular disease. The procedure aims to flush the joint from the inflammatory effusions, break the fibrous adhesions, mobilize the disc, and inject a lubricating viscoelastic agent, mainly comprising sodium hyaluronate [19]. Arthroscopy may add more to the benefit of this mode of treatment such as the ability to visualize any internal derangements using an endoscope, coagulate inflamed synovial lining with laser, and to manipulate or reposition of the disc as needed. Hence, the procedure is indicated toward cases of intracapsular disease primarily [20].

The success rate of this treatment modality is over 90% in some studies, and patients usually improve in a matter of 5–10 days postoperatively with increase in range of mouth opening. However, further follow-up visits, physiotherapy, occlusal therapy, and continuous care are necessary to avoid relapse. It is indicated in cases of internal TMD, painful clicks, decrease range of motion, or symptoms of disc displacement. MRI is usually performed preoperatively

to confirm the type of derangements and stage of involvement. It might be contraindicated to use this treatment in cases of advanced TMD, ankylosis, or primary muscular disease that requires preemptive consideration [19–21]. The technique is directed toward inserting a circulatory flush to the superior joint space. The literature describes variable techniques to do so, starting from single-entry point, two, or even three while other literature reported that inferior joint space, although smaller in size, is reported to be effective in arthrocentesis [20, 21]. A line drawn from the mid-posterior tragus to lateral canthus can be used as an anatomical landmark to determine the entrance point. Points anterior to the mid-tragus of 10, 20, or 30 mm is another landmark to identify possible entry sites as following the area between the head of the condyle and inferior glenoid fossa margin. Asking the patient to slightly open the mouth or distracting the condyle antero-inferior can help locate the proper space. A lot of factors may change the entrance point such as age, remodeling, pathological disease, condyle shape, and different translational modes [20, 21].



**Figure 10.** a side view showing the needle entrance into the TMJ superior joint space as heading to arthrocentesis. The picture shows the landmarks as well as the tragus canthal line.

On occasions, practitioners might not succeed to establish the circulatory flow, which might be caused due to loss of the joint distention, false location, numerous fibrous compartments, or internal pathology such as ankylosis. The practitioner can indicate true entrance if the needles do touch inside or if the needles showed movement while moving the mandible. Flushing the joint usually takes place using either normal saline or Ringer's lactate. Volumes ranging from 100 to 500 cc reported in the literature. It is necessary that caution be taken while flushing the fluid as reckless forceful flush might destroy the joint anatomy and push the fluids elsewhere (**Figures 10–14**). Violation of the surrounding structures is rarely reported (such as the external auditory canal, lateral pharyngeal space, superficial masseteric space, or medial pterygoid space). Injuring the surrounding vascular bundle is possible (such as the superficial temporal vessels, branches of the facial nerve, or less likely the masseteric vessels) [20, 21].

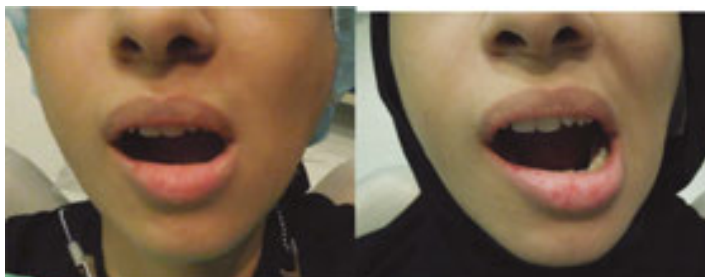




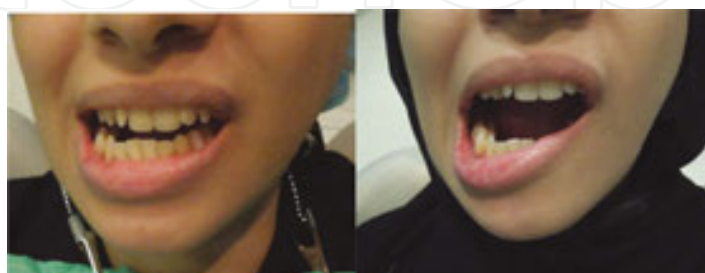
**Figure 11.** The left clinical picture showing a posterior open bite started immediately after prolonged dental care with a clinical diagnosis of acute disc displacement, and planned treatment with arthrocentesis under conscious sedation. The picture on the right showing the result illustrating the corrected occlusion position immediately after the procedure indicating replacing the acute disc displacement and allowing the condyle to move back in place.



**Figure 12.** The left clinical frontal view showing another example of a patient that presented with disc displacement leading to hypomobility of the mandible and minimal mouth opening. On the right, improved mouth opening is indicated.



**Figure 13.** The same patient in Figure 11, showing limited excursion preoperatively (left picture) and improved mandible excursion post arthrocentesis on the right.



**Figure 14.** Pre- and post-arthrocentesis show the patient in Figures 11 and 12 with improved excursions toward the contralateral side.



#### 6.4. TMJ surgical intervention

Surgical intervention is defined as surgical maneuvers used to open the joint, violate the capsule, or/and surrounding structures to expose a diseased site and surgically correct it with or without reconstruction. Although description and classification of internal derangements took a lot of discussion in the literature in addition to descriptive classifications such as Wilk's being implemented, still the joint status classification is very descriptive and is not a clear indicator of the surgical intervention needed [22]. Hence, careful clinico-radiographic correlation is needed to design the best intervention. As pain, function, and patient satisfaction usually dictate further steps of the treatment modalities.

TMJ surgical maneuvers range from exposing the external joint structure and reorienting the capsule only, violating the capsule and manipulate the disc, or resecting and reconstructing the deformed structures. Once the joint is exposed, careful evaluation of the internal components takes place and search for signs of abnormalities such decortication, osteophytes, fibrous adhesions, erythematous linings, or deformed articular eminence. Once identified, correction can take place by reorientation, resection, and/or reconstruction.

Managing deformed joints can be in the form of gap arthroplasty where the internal surface of the joint is being investigated, prepared, and assure functioning capability. All osteophytes should be shaved to assure a healthy and smooth condylar surface. The use of temporalis muscle flap is advisable when discectomy is performed in addition to poor synovial lining to reduce the chances of ankylosis and for better joint structure compensation postoperatively [22, 23].

The disc and attachments can be more complicated to manage as commonly the disc is displaced or deformed to certain limit, where the operator has to decide either to repair, reorient, partially resect the disc, or completely remove the deformed disc. Afterward, a decision to reconstruct takes place according to the status. Disc conservative maneuvers found to be beneficial if the gross bow-tie shape and size are maintained, while it is not recommended to keep the disc if major deformation is identified. If the bony surfaces are presented to be deformation free, then disk procedures might be all that is needed, although rare. Since arthroplasty is commonly needed concomitantly with diskoplasty. Arthroplasty should be performed with caution and as conservative as possible to avoid further articular damage, unfavorable healing, and ankylosis. Arthroplasty is performed if osteophytes, bony spurs, and abnormal irregularities are identified, which can be smoothened using fine hand instruments, for example, bone file, to avoid heat generation. In case of poor access, partial eminectomy can be performed to allow better evaluation of cephalic and medial surfaces of the joint so better intervention can be delivered [22–24].

In case of disc perforation, it should be evaluated regarding the size of the perforation, the location, the degree of disc displacement, and the internal status of the joint and bone surface. Accordingly, a decision can be made to perform selective perforation margin excision and suturing, or, transferring the case into partial discectomy. Disc reposition and arthroplasty are commonly associated with such surgical interventions. Partial discectomy usually involves resecting the deformed portion of the disc, which is usually toward the latero-posterior aspect,

in addition to repositioning it more posteriorly, commonly called a “disc reshaping” procedure [22–24].

In situations where major deformity does exist at the disc joint complex, total discectomy is performed. It used to be a common procedure that took place in the 1980s with very promising results. As pain significantly subsides, condyle mobility and the joint maturation improve [24]. Usually, disk replacement takes place immediately rather than delayed. A lot of techniques introduced for replacement, such as temporalis pedicle flap, has an advantage of being harvested along the same surgical site, as a regional flap reconstruction [23]. Dermal grafts, conchal cartilage grafts, and synthetic materials have been used as well. The advantage of disk replacement is minimizing the chances of joint crepitation in comparison with the non-replacement option. The option of condylotomy is still advocated in cases of refractory pain to non-surgical management of TMDs. It is thought that it will change the condyle fossa relation and hence redistribute the force in the joint that might reduce the pain source.

Total joint reconstruction is used when a major deformity affects most of the joint structure that needs total reconstruction. The options vary between autogenous components and synthetics. Autogenous are mainly used in young growing patients especially if systemic rheumatic disease is not a factor destroying the joint. While synthetics are used in non-growing patients, a history of more than previous TMJ surgeries, previous alloplastic reconstruction, systemic rheumatoid disease, previously failed autogenous options, or the existence of major deformity secondary to tumor, trauma, or congenital anomaly that destroyed the anatomical boundaries. The success rate of reconstructing the joint is over 90% over 5 years and pain reduction of 89% [22, 25]. The addition of fat graft at and around the reconstruction area has increased the success rate, reduced pain, heterotrophic bone formation, and fibrosis incidents necessary to re-intervene at the surgical site post-reconstruction.



**Figure 15.** A 35-year-old female patient presented with history of rheumatoid arthritis affecting the TMJ leading to hypomobility and mouth opening of 10–15 mm for the last 2 years. The option of total joint reconstruction was not feasible at the time and hence, an attempt of gap arthroplasty, discectomy, and temporalis muscle flap transfer was planned. The picture showing the preauricular approach to the TMJ with the temporal extension for temporalis flap management. The wound shows the joint region after opening the capsule and identifying the internal structures.

The major advantage of synthetic reconstruction is that it can be designed to custom fit the joint preoperatively, while the main disadvantages are the high cost of order and the possible prolonged delivery time (Figures 15–19).



**Figure 16.** A drain is placed at the surgical site to avoid hematoma or seroma collection that might disturb the healing, the occlusion, and lead to infection.



**Figure 17.** The coronoid process was removed bilaterally to facilitate better mandible mobility by removing the action of temporalis muscle.



**Figure 18.** The left picture is showing the significant increase in mouth opening immediately intraoperatively as well as stable occlusion is maintained as seen on the right. The patient continued physical therapy postoperatively and proper medical follow ups including pain management protocol.



**Figure 19.** A postoperative panoramic radiograph showing the bilateral TMJ status, occlusion, and arch bars in place to aid in maintaining the occlusion using intermaxillary light elastics to guide the muscles and joint into the newly set status.

## 7. Conclusion

It is of prime importance toward the healthcare system and public health to carefully examine those patients in order to guide them in the right path of management. It has been discussed that delaying treatment can harm the patients and change their pain threshold level. It is necessary as well to understand that treatment modalities do vary, and the management strategy is customized to each case in particular. Hence, an expertise consultation is usually necessary early enough to come up with the best management plan.

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