Recovery of Post-Traumatic Temporomandibular Joint after Mandibular Fracture Immobilization: A Literature Review

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Abstract: Considered as one of the most common traumatic injuries of the maxillofacial region, mandibular fractures remain among the complex causes of temporomandibular joint disorders (TMDs). Due to the complexity of the temporomandibular joint, the management of TMDs represents a challenge in real-life practice; although many treatment modalities have already been proposed, ranging from conservative options to open surgical procedures, a consensus is still lacking in many aspects. Furthermore, despite continuous improvement of the management of mandible fractures, the duration of immobilization and temporary disability is not reduced, and the incidence of complications remains high. The aim of the present study is to (i) review anatomophysiological components of temporomandibular joint; (ii) review concepts of temporomandibular joint fractures; and (iii) describe methods of the recovery of the temporomandibular joint after mandibular fracture immobilization.

Keywords: mandibular fracture; temporomandibular joint disorders; management; physical therapy

1. Temporomandibular Joint—A Brief Review

As the most complex joint in the body, the temporomandibular joint (TMJ) is a bilateral diarthrosis that allows the complex movements necessary for eating, swallowing, talking, and yawning. The TMJ also is considered a ginglymus-arthrodial joint, ginglymus meaning a hinge joint that allows movement in one plane (only backward and forward motion) and arthrodial is a joint that allows sliding movements of the surfaces; it is formed by the articulation of the condyle of the mandible and the mandibular fossa of the zygomatic arch [1,2]. The components of TMJ are as follows: disk, articular surfaces (e.g., the mandibular condyle and the bony eminence on the temporal bone—the articular tubercle or the articular eminence of the temporal bone), fibrous capsule, synovial fluid, synovial membrane, and ligaments.

One of the most important TMJ components is the ovoid condylar process. The condyle head articulates with the glenoid fossa of the skull, via the meniscus A large variability was observed, between patients and age groups, regarding the form and volume of the condyle head [3]. The condyle may have several different normal shapes: convex, flat, angled, round. A flat condyle surface on one side may be pathologic if the contra-lateral side is angled. Condyles that are both angled or both flat may be normal contours [1]. The glenoid fossa, formed by the articular tubercle and by the post-glenoid tubercle, receives the mandibular condylar process. The TMJ surface, which contains the articular discs or meniscus, is smooth, oval, and deeply concave [4].

The articular eminence allows the condylar process to slide during mandibular movements. It is characterized by a great variability of the articular eminence and influences the...
path of the condylar movements and the rotation degree of the disc over the condyle. It has a convex shape in relation to the sagittal plane and a slightly concave shape in relation to the transverse plane [5,6].

TMJ capsule, a fibrous membrane, originates from the margins of the mandibular fossa, encloses the articular tubercle of the temporal bone, and inserts at the mandible neck. Synovial fluid has the role of lubricant and shock absorber and facilitates the smooth movements of jaws due to the friction decrease and cushioning of the articular cartilage in the TMJ. Three ligaments are associated with the TMJ: the temporomandibular ligament (major ligament; it prevents the mandible excessive retraction), the stylomandibular, and sphenomandibular ligaments (accessory ligaments; they are not directly attached to TMJ) [1,2,4,5].

The synovial membrane lines the fibrous capsule that encloses the TMJ. The synovial membrane is highly vascularized and is in contact with the capsule connective tissue. Each joint compartment is lined with its own synovial membrane [1]. Temporomandibular disorders (TMDs) comprise a broad group of musculoskeletal and neuromuscular conditions involving the TMJ, muscular, and osseous components. Anatomical, histological, and functional anomalies of the muscular and/or articular components of the system are accompanied by a large range of clinical signs and symptoms. TMDs symptoms are as follows: reduced mandibular range of motion, pain in the TMJ areas, pain in the masticatory muscles, generalized myofascial pain, and limitation or deviation of the jaw opening [7–9].

The TMDs etiology is multifactorial and includes biologic, environmental, social, psychological, and physical causes. Mandibular fractures are one of the etiological factors of TMJ disorders [10–13] and can produce mechanical changes within the TMJ such as: limitation or deviation of jaw opening, hemarthrosis, dislocation, fibrous adhesion, and ankylosis [14–16].

2. Mandibular Fractures—General Concepts

The mandibular fracture is one of the most common fractures of the face (70–80%) compared to any other bone of the cranium, and this is related mainly to the anatomical position of the mandible within the viscerocranium, the protruded position, mobility, as well as particular shape (v-shaped bone) and functions; it occurs as an effect of a strong blow to the lower jaw face (violence, traffic accidents, gunshot wounds, sports accidents, work accidents, and falls) [6,17–19].

Depending on the direction and force of the trauma, the most fractured areas of the mandible are as follows: the body (29%), followed by the condyle (26%), angle (25%), and symphysis (17%), the ramus (4%) and coronoid process (1%) and are often associated with other craniofacial, cervical, and systemic trauma [20,21].

In addition, the condylar process, coronoid, ramus, angle, body, symphysis, and alveolar processes are the area most prone to mandibular fractures [6,17]. Mandibular fractures are classified according to the etiological factors, location, severity, muscle action, type of fracture, reducibility degree, inter-fragmental situation, the dentate or edentate status of the fractured segments. Moreover, the mandibular fractures may be open, close, displaced, pathological, and comminuted [19].

Each anatomic-clinical subtype of mandibular fracture has a specific individualized management protocol, the choice of treatment method being conditioned by a series of factors such as the location of the traumatic lesion, existence of single/multiple fracture lines, associated jaw fractures, meaning and degree of bone fragment dislocation, the direction of the fracture line, the presence of teeth and the odonto-periodontal status, the shape of the teeth, the general condition as well as the age of the patient [18].

The primary objective of the treatment is to reconstruct the pre-injury dental occlusion, as well as the mandibular anatomy and jaw function. The therapeutic management consists of soft diet, closed reduction with intermaxillary fixation (bonded orthodontic brackets,
arch bars, direct wires, eyelet wires), and open reduction with internal fixation (wires, plates, hard wares placed directly across the fractured site) [19,22,23].

The multitude of potential clinical situations of mandibular fractures makes it difficult to choose the optimal treatment technique. The emergence of new methods of orthopedic and surgical treatment, of devices for fixing fragments, and the requirements of patients for early rehabilitation for faster integration into society, also place specialists in the field in a dilemma in choosing the optimal treatment methods that would correspond to contemporary principles [18].

Maxillofacial fracture surgery can be followed by immediate and delayed complications. Immediate complications are as follows: airway obstruction, bleeding, damage of teeth and/or bone, loss of teeth and/or bone. Delayed complications may include: infections (associated frequently with fractures are treated by open reduction), nonunion (osseous healing is lacking after 6 months in long bones and 12 weeks in the mandible, leading to fibrous union), malunion (incorrect position of the osseous union of the fractured segments), malocclusion, mandibular alveolar nerve damage (in mandibular fracture), temporomandibular disorders (TMDs) [19,24,25].

• Fractures of the mandibular condyle are directly related to the chronic TMDs due to progressive joint degeneration followed by articular disc dislocation, synovitis, and osteoarthritis.
• Condyle fractures represent 37% of the mandible fractures and can be extracapsular or intracapsular, undisplaced or displaced, deviated, or dislocated [10]. The effects of trauma in non-condylar mandibular fracture on the TMJ are yet poorly studied [10]. Two studies reported mandible trauma as a major factor of TMDs when adult patients with a non-condylar mandibular fracture were compared to healthy patients [10].
• Patients with condylar fracture associated with contralateral angle or body fracture have more TMDs signs than those with unilateral condyle fracture. [12].
• Patients with condylar fracture associated with a fracture of the angle or body will develop more extensive TMJ destructions on both sides. Condylar fracture on the same side can develop internal derangement due to delayed consequences of trauma [11].
• In addition, TMDs is a very common pathology in patients suffering from zygomatic complex fracture [26].

3. Rehabilitation of TMJ

The holistic management of a patient diagnosed with TMDs clearly depends on a specific diagnosis as well as the type and severity of TMJ damage [7]. Generally, a multifaceted and multidisciplinary approach involving multiple specialties such as general dentistry, oral medicine, orofacial pain, orthodontics, oral surgery, rheumatology, physical therapy, even psychiatry may be necessary to fully address the problem from all angles.

Major goals of TMDs treatment are intended (i) to decrease or eliminate joint pain and sounds; (ii) to improve joint function; (iii) to enhance the overall quality of life and (iv) to reduce disease-related morbidities [7,27,28].

The treatment of TMJ can be divided into two broad categories—noninvasive (non-surgical treatment) and invasive management (surgical treatment) [27].

3.1. Non-Surgical Treatment
3.1.1. Pharmacotherapy

The goal of pharmacotherapy is to relieve the symptoms and is a component of a comprehensive management program. The pharmacotherapy includes analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), anxiolytics, anti-depressants, and muscle relaxants [8,27–29].

Non-Steroidal Anti-inflammatory Drugs. Non-steroidal anti-inflammatory drugs (NSAIDs) are medicines commonly prescribed for the treatment of minor-to-moderate pain, fever, and other inflammatory processes given their antipyretic, analgesic, and anti-inflammatory activities [30–34]. The key mechanism of action of NSAIDs remains the
inhibition of the enzyme cyclooxygenase (COX), particularly the COX-2 isoenzyme. In fact, there are two main COX isoforms with specific functions involved either in normal functioning and protection (COX-1) or in the generation of prostaglandins responsible for pain and inflammation (COX-2). Although typically found in all tissues and cell types, COX-1 isoenzyme is concentrated in several tissues and internal organs including stomach, kidney, endothelium, and platelets. 

COX-1 is a molecule that supports the synthesis of prostaglandins and is involved in platelet aggregation, the regulation of kidney and stomach blood flow, and the regulation of gastric acid secretion. The inhibition of COX-1 activity due to the effects of NSAIDs can induce gastrointestinal toxicity, cardiovascular and renal events, or delayed blood coagulation.

On the other hand, the COX-2 isoenzyme is widely induced by inflammatory triggers and/or trauma; it is located in macrophages, leukocytes, fibroblasts, and synovial cells. Considered an inducible isoenzyme, COX-2 plays a key role in pain and inflammatory processes [31–37], and by blocking COX-2, NSAIDs can exert their analgesic effects. However, there is a constitutive COX-2 involved in the physiology of pregnancy.

According to their selectivity for one or other of COX isoenzymes, NSAIDs are classified in (i) classical, non-selective NSAIDs, known to inhibit both COX-1 and COX-2 enzymes with the same potency and thought to have benefits in reducing pain and inflammation doubled by a typical side-effect profile; and (ii) coxibs or selective NSAIDs resulting only in COX-2 inhibition at therapeutical doses, with remarkable analgesic effects and also a favorable gastrointestinal profile with no impact on gastrointestinal safety.

Preferential COX-2 inhibitors represent an intermediate class of NSAIDs, quite recently described, that include NSAIDs which inhibit preferentially COX-2 at therapeutic doses and have potent analgesic and anti-inflammatory activity and only small negative influences on COX-1 enzyme; we discuss nimesulide, meloxicam, and nabumetone.

Specific COX-2 inhibitors or coxibs are represented by three main agents-celecoxib, etoricoxib and the intravenous parecoxib; the coxib on market, rofecoxib, was discontinued due to cardiovascular safety [30–33].

The usual doses of different NSAIDs are summarized in Table 1.

| NSAIDs (Non-Steroidal Anti-Inflammatory Drugs) | Dose and Frequency | Daily Limit |
|-----------------------------------------------|-------------------|-------------|
| 1. Conventional NSAIDs (non-selective COX inhibitors) | | |
| 1. Ibuprofen | 200 mg, 1 to 2 tablets every 4–6 h | 1200 mg |
| 2. Naproxen sodium | 220 mg, 1 to 2 tablets every 8–12 h | 660 mg |
| 3. Ketoprofen | 100 mg every 12 h | 200 mg |
| 4. Diclofenac | 75 mg once daily | 150 mg |
| 2. COX-2 selective inhibitors | | |
| 1. Aspirin regular strength | 325 mg tablets, 1 to 2 tablets every 4 h, or 3 tablets every 6 h | 4000 mg |
| 2. Celecoxib | 200 mg once daily | 400 mg |
| 3. Etoricoxib | 60, 90, 120 mg once daily | 120 mg |

There are several possible adverse effects of taking NSAIDs, especially with non-selective NSAIDs, which may occur at any time throughout the whole treatment period. The most commonly described are as follows: gastrointestinal, cardiovascular, complications, impaired renal function, clotting problems as well as respiratory disorders. Apart from an improved gastrointestinal safety, coxibs hold comparable side-effects profile with classical NSAIDs [30–33].

To achieve an anti-inflammatory effect in TMDs, these medications should be taken for a minimum of 2 weeks. Naproxen and ibuprofen are recommended first-line choices NSAIDs in patients with cardiovascular comorbidities, due to the lower risk of cardiovascular, while coxibs are preferred when gastrointestinal comorbidities [30–33].
**Analgesics-antipyretics.** Acetaminophen (a paraaminophenol) and pyrazolone derivatives such as metamizole and propyphenazone have mainly analgetic effects and are used as adjuvants, in association with NSAIDs or other classes of analgesics, to control different types of pain [30–33].

**Tricyclic antidepressants.** Different antidepressants are accepted for the management of chronic pain in TMDs, including amitriptyline, desipramine, doxepin, and nortriptyline. Additionally, benzodiazepines are used to help the patient to cope with stress by helping reduce their perception or reaction to stress [8].

3.1.2. Physical Therapy

Prolonged immobilization of the jaws during fracture can lead to serious complications as periodontal problems, facial pain, malocclusion, chin deviation, contracture of the mandible, hypomobility, or ankylosis of the temporomandibular joint [6,17,38]. The management is aimed to be holistic, most often difficult, long, requiring a lot of patience from both the doctor and the patient.

Specialized physical therapy options such as TENS (transcutaneous electrical nerve stimulation), ultrasound, iontophoresis, electrotherapy as well as low-level laser therapy have been used in the management of TMDs, despite the lack of evidence to support their use [8,9,28,39].

**Transcutaneous Electrical Nerve Stimulation (TENS)** TENS represents a non-invasive peripheral stimulation technique used to relieve both chronic and acute pain, but also to relax muscles and improve blood circulation. There are few side effects compared with drug therapy; allergic-type skin reaction is the most common complaint, and this is due to the material of the electrodes or the conductive gel.

Although TENS techniques include conventional TENS (low-intensity, high-frequency), acupuncture-like TENS (high-intensity, low-frequency), and intense TENS (high-intensity, high-frequency), conventional TENS is the most frequently used [6,39,40].

**Conventional TENS** parameters are as follows: high-frequency (50–100 Hz), low-intensity, small pulse width (50–200 µs). The goal of conventional TENS therapy is to stimulate large diameter, low threshold non-noxious afferents (A-beta) in dermatomes related to the pain. TENS can inhibit the activity in second-order nociceptive transmission neurons. Increased TENS pulse amplitude can induce a strong paraesthesia-like sensation. An adverse effect of conventional TENS therapy is high-threshold A-delta afferent activity and a painful paraesthesia beneath the electrodes [40]. Usually, the electrodes are placed bilaterally on the preauricular area and on the masseter muscle, one channel on the right-hand side and the other on the left-hand side [6,39,40].

**Low Level Laser Therapy (LLLT)**

Among various physical therapy modalities, low-level laser therapy (LLLT) has become a technique of interest due to several advantages: easy application, short treatment time, and minimum contraindications. LLLT is characterized by a wavelength ranging from 600–1100 nm, an output power of 1–500 mW, and an energy density of 0.04–50 J/cm² [28,41–43].

The main medical applications of LLLT are related to its capacity to reduce pain and inflammation and to accelerate tissue regeneration as LLLT is known to stimulate the proliferation of a variety of cells including fibroblasts, keratinocytes, endothelial cells, and lymphocytes.

Recently, LLLT proved efficaciously in dentistry, especially in the management of various soft tissue issues, dentinal hypersensitivity, bone regeneration, and musculoskeletal pain. Furthermore, it seems that LLLT is also considered for TMDs promoting the improvement of TMJ function and reducing signs and symptoms related to TMDs. However, the clinical efficacy of LLLT for the treatment of TMDs remains controversial. Indeed, there are reports of good results by LLLT application as compared to placebo control groups, while others found no significant differences among patients managed with LLLT [41–43].
No specific established protocol (energy intensity, power, exposure time, and number of applications) is currently recommended for TMDs. But, due to remarkable analgesic and anti-inflammatory properties, various types of lasers, such as helium-neon (HeNe) and arsenide-gallium-aluminum (GaAlAs), are efficient in patients with TMDs [41,42].

Ultrasound Therapy

Known as high-frequency sound waves, ultrasound therapy directed to the TMJ aims to reduce pain and inflammation, promote muscular relaxation, and increase blood flow. The analgesic effect is elicited by increasing the temperature in bone and tendons compared with surrounding tissue [44–46].

It is widely known that the biophysical effects of ultrasound are thermal and non-thermal. Thermal effects are the result of the absorption and attenuation of the sound waves in the tissue, promoting local heating (increased tissue temperature), amplified blood flow and enzymatic activity, improved collagen extensibility, decreased muscle guarding, decrease nerve conduction velocity, and, finally, increased pain threshold which is responsible for lessening of pain and muscle spasm. On the other hand, non-thermal effects are the result of cavitation, microstreaming, and acoustic streaming [41].

US is characterized by two main therapeutic parameters, as follows: (i) the intensity (0.1–3 Watts/cm²) considered the amount of energy emitted from the transducer divided by the effective radiating area of transducer head) at a penetration depth of up to 5 cm; and (i) the frequency range (1–3 MHz) which is measured in Hertz and represents the number of compression and rarefaction cycles per unit of time of the crystal found within the transducer. The frequency of the ultrasound is typically selected according to the target tissue; a low frequency of 1 MHz is usually used to treat deep lesions, while the 3 MHz frequency is ideal for treating superficial tissues [9,44–46].

The intensity required at the lesion can be determined from the tissue state: acute (0.1–0.25 W/cm²), subacute, chronic (>0.5 W/cm²). At an intensity of 1.25 W/cm², the sound waves are responsible for tissue vibration, controlling heat in the treatment field and a local intensification of blood flow and leading to increased tissue cell metabolism responsible for soft tissue healing. Moreover, higher intensities of ultrasound beams produce a significant frictional heat in the tissue [44,45]. It seems that 3 MHz at 1.5 W/cm² is appropriate to attain a 4 °C increase in local temperature at 4–5 min, while 1 MHz at 2 W/cm² is adequate to reach a 4 °C rise in local temperature at 10 min.

Kinetic/Exercise Therapy

Kinetic therapy aims to ameliorate pain, decrease high muscle activity, improve muscle coordination, and restore normal function.

Improvement of mouth opening as well as the range of motion in TMJ can be conducted either manually or with the help of various devices, but only after relaxing the hyperactive masticatory muscles. The patient is instructed to open their mouth until the pain is perceived and then to relax and maintain this position for a few seconds; it is mandatory to repeat the exercise several times a day.

Mechanotherapy is also performed with the help of devices that passively open the mouth; they are inserted between the dental arches and activated to mobilize the mandible. Patients can use wooden wedges, mandible retractors, or special devices (Heister, Darcisac, Lebedinsky device). Dilation is slow, progressive, and gentle, dosing the force very well and avoiding brutal maneuvers that could cause pain. The amplitude of dilation is increased by 1–2 mm per day and the exercises are continued for 30–40 days [6,45,47].

Active and passive joint exercises for increasing the range of motion of the TMJ remain a key component in the post-surgical management of such patients, while long-term follow-up is recommended [6,36,46].

a. The occlusal appliances which represent a noninvasive, conservative option with minimal risks is used to contain the obtained results [9,38,44].

Some of the characteristics of the stabilization gutters are significant: they are made of hard self-curing or thermo-polymerizable acrylate; cover all the teeth of an arch; (t
is usually made at the level of the maxillary arch); have a thickness of about 1.5 mm in the molar area; the occlusal surface is smooth and must make uniform contact with all antagonistic teeth [9,48].

b. Posture correction is related to head, neck, shoulder, and tongue position. The patient must perform exercises related to the improvement of coordination, stability, and jaw alignment [9].

3.2. Surgical Treatment

Primary treatment of TMDs is often non-surgical and includes physical therapy, medication (non-steroidal anti-inflammatory drugs), kinetic/exercise therapy, and occlusal appliances. However, in patients unresponsive to conservative therapies, minimally invasive options (intraarticular injections, arthroscopy, arthrocentesis) or surgical options should be considered.

a. Intraarticular Injections

Intraarticular injections represent another therapeutic option to control and treat TMJ derangement. Pain related to TMJ destructive processes can be reduced by intraarticular injections with different therapeutic solutions [28,34,35]. Two main types of drugs can be injected into TMJ, retard glucocorticoids and hyaluronic acid, aiming to improve pain, increase range of motion, and delay the progression of articular/cartilage damage.

Glucocorticoids/corticosteroids

Glucocorticoids/corticosteroids are powerful effective anti-inflammatory drugs, as they promote clinical manifestations of TMJ inflammatory processes. [17,35]. The most systemic effects of oral steroids can be avoided by intraarticular injections. Research regarding the efficacy of the intra-articular TMJ injections has shown improvement in some patients (lower TMJ pain, improved joint mobility). However, a few studies reported the progression of TMJ disorders.

Hyaluronic Acid (HA)

Hyaluronic acid is a polysaccharide derived from the synovial fluid and articular cartilage. It is used in intraarticular injections to restore the viscoelasticity of the synovial fluid. The benefits are as follows: lubrication, shock absorption, and TMJ protection effects [17,35–37].

Along with glucocorticoids, the intra-articular injection of the viscoelastic hyaluronic acid solution has proven useful in the treatment of certain degenerative arthritic conditions, leading to significant improvement in both pain and function.

Comparative benefits, efficacy data, and adverse events of glucocorticoids and hyaluronic acid injected in affected TMJ are summarized in Table 2.

b. Arthrocentesis and Arthroscopy

Arthrocentesis is a minimally invasive procedure, defined as the lavage of the TMJ without viewing the joint space. Arthrocentesis uses sterile needles and irrigants. To avoid patients’ discomfort, arthrocentesis must be performed under local anesthesia or intravenous conscious sedation. [6,8,27,28,36].

Arthrocentesis aims to reduce the pain by removing inflammatory mediators and to ensure mandibular mobility by removing intra-articular adhesions factors [6,8].

The classical technique of TMJ arthrocentesis uses double access to the joint cavity by two needles, one for injecting and the other for aspirating the solution. A variant of arthrocentesis uses a single-needle technique to provide the underpressure fluid injection that will allow a volume increase in the joint cavity and breakage of the joint adherences that reduces transulatory movement of the condyle. [6,8].

Arthroscopy is a technique widely used in the diagnostic and treatment of TMDs. Arthroscopy is performed either under local or general anesthesia [6,8].
Table 2. Intraarticular injections: doses, benefits, and side effects.

| Drug                                      | Doses                                      | Benefits                                                                                           | Local Side Effects                      |
|-------------------------------------------|--------------------------------------------|----------------------------------------------------------------------------------------------------|----------------------------------------|
| Intraarticular administration of Hyaluronic Acid (HA) (viscosupplementation) | Single dose, with second injection in two weeks | Restore the rheological properties of the synovial fluid and block articular damage. Decrease in pain levels since HA regulates various inflammatory mediators. Promotion of the release of the surfaces between the articular disc and the mandibular fossa; increasing of TMJ mobility; improvement of the synovial fluid circulation. | Mild pain and swelling at injection site |
| Glucocorticoids                           | An interval of at least 4 weeks between glucocorticosteroid injections and a maximum number of three injections in each joint have been recommended | Reduction of inflammatory processes; decrease of the immune system activity. Decreasing of TMJ pain. Increasing of range of jaw motion. | Destruction of articular cartilage; bone resorption, infection |

c. Open Joint Surgery

Open surgical treatment TMDs is used in specific clinical situations: TMJ ankylosis (fibrous or bony) and synovial chondromatosis. The goal is to limit the condylar movement beyond the articular eminence, by creating a mechanical obstruction beyond the condylar pathway. Surgical interventions address capsular plication, reduction or augmentation of the articular eminence, osteophyte and pathological tissues removal, TMJ biopsy, lateral pterygoid myotomy, and condylectomy [6,8,27,28].

4. Conclusions

The mandibular fractures are among the most frequent traumatic injuries in the maxillofacial region with a negative impact both on esthetics and functions of the stomatognathic system.

Trauma in the maxillofacial area can induce many complications related to soft tissues, TMJ, nerves, bones, osteonecrosis, malocclusions, malunion, nonunion, and infections. Incorrect reduction in the mandible and incorrect position of the mandibular condyle has a direct effect on the TMJ and will result in TMJ disorders.

The therapeutic management of TMDs associated with the mandible fractures implies long-term rehabilitation procedures performed in a multidisciplinary approach that includes specialists from oral surgery, prosthetics, orthodontics, physiotherapy, otorhinolaryngology, ophthalmology, and even neurology.

The main objectives of the treatment of temporomandibular disorders are both to reduce or eliminate the pain and/or joint noises, and to restore normal mandibular functioning.

The treatment approach in the early stages of TMDs should involve simple, reversible, nonsurgical modalities, that can be associated with minimal invasive or surgical procedures when the evolution of TMDs will impose such approaches.

Non-invasive recovery of the post-traumatic temporomandibular joints implies a large range of approaches from pharmacotherapy (non-steroidal anti-inflammatory drugs, analgesics, glucocorticoids/corticosteroids, hyaluronic acid) to physical therapy (transcutaneous electric nerve stimulation, low-level laser therapy, ultrasounds therapy, kinetic therapy, occlusal appliances).
Accurate diagnosis and proper case selection will ensure the success of TMJ surgical management. However, the use of the surgical approach in TMDs is irreversible and should be avoided where possible.

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