# Myofascial Pain Dysfunction Syndrome

# 62

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## 62.1 Introduction

There is an accepted concept of triple complex involving both joints and intact dentition forming an integrated system which is carefully monitored by an arthrokinetic reflex muscular activity to ensure a controlled and stable pattern of painless mandibular movement. A disturbance in the coordinated activity of this musculature arising from malocclusion often accentuated by psychological factors inducing neuromuscular tension forms the basis for majority of problems involving temporomandibular joint (TMJ) dysfunction.

There is a large pool of evidence that clearly shows that mind and body are not independently functioning entities but closely interrelated in all aspects of pain direction, detection and perception. TMJ disorders is an umbrella term referring to a classification of musculoskeletal disorders impacting the masticatory muscles and/or the TMJ and is usually subdivided into three main categories. Box 62.1 enumerates the three categories of musculoskeletal disorders, often clubbed as TMJ disorders.

**Box 62.1 Subcategories of TMJ Disorders (TMDs)**

1. Myofascial pain disorder
2. TMJ disc interference disorders
3. TMJ degenerative diseases

It has always been a challenging job for the clinician to manage temporomandibular disorder (TMD) as it is a conundrum wrapped in enigma.

Management of TMD is controversial because science takes a back seat. We need scientific studies especially randomised clinical trials to overcome this problem. Matching the diagnosis to the treatment is still the most problematic aspect of TMD practice. The solution lies in making an accurate diagnosis to match an appropriate method of treatment.

## 62.2 Definitions

The definitions for TMJ pain are not universally used. Three currently accepted definitions of TMJ pain are:

1. Temporomandibular pain and dysfunction syndrome (International Association for the Study of Pain: Merskey and Bogduk [1])
   (a) Aching in the muscles of mastication often associated with restricted jaw movements and popping sounds
2. Oromandibular dysfunction [2] (International Headache Society: Oleson 1988)
   (a) Temporomandibular joint sounds on movement
   (b) Limited or jerky jaw movements
   (c) Pain during jaw function
   (d) Lock jaw on opening
   (e) Gnashing of teeth (bruxism)
   (f) Miscellaneous parafunction (tongue, lips or cheek biting)
3. Facial arthromyalgia [3]
   (a) Chronic or intermittent pain of TMJ and of its associated musculature

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### 62.2.1 Evolving Terminologies

Over many years, functional disorders of the masticatory system have been referred by many terms contributing to the confusion regarding aetiologic mechanisms and manifestations in this area.

In 1934 James Costen [4], an otolaryngologist, described a set of symptoms focused around the ear and temporomandibular joint (TMJ) leading to the earliest nomenclature of Costen syndrome. Costen believed these symptoms were due to the backward displacement of condyle after overclosure of the bite. Auriculotemporal nerve is found behind the tympanic bone which prevents nerve compression. Hence this theory was rejected.

Schwartz [5] (1959) described myofascial pain dysfunction syndrome (MPDS) characterised by clicking, muscle tenderness, pain in the TMJ region and restricted mouth opening. Following this, much later the term TMJ disturbances became popular, and then, in 1959, Shore [6] introduced the term TMJ dysfunction syndrome. Later Ramfjord and Ash [7] brought forth the term functional TMJ disturbances. To establish a connect with the aetiology, terms such as occluso-mandibular disturbance and myoarthropathy of the TMJ [8] were introduced. When pain and associated muscle involvement became the focus, terminologies such as pain-dysfunction syndrome [9], myofascial pain-dysfunction syndrome [10] and TM pain-dysfunction syndrome [11] arose.

Currently it has been established that these terms attempt to describe conditions with symptoms not always isolated to the TMJ, and for the need of a broader, umbrella term to classify these conditions, some authors believe that the title craniomandibular disorders [12] should be used. Finally, the term which has gained large-scale acceptance was suggested by Bell [13]—"temporomandibular joint disorders".

### 62.2.2 Current Definition

Myofascial pain dysfunction syndrome (MPDS) is a well-known term that is used in many other branches of medical science [14–16]. But in the last few decades, this term has been employed to describe orofacial chronic pain [17–19] often abbreviated in the literature as MPDS.

Presently, myofascial pain can be defined as "a regional myogenous pain condition characterised by local areas of firm, hypersensitive bands of muscle tissue known as trigger points" [20] alternatively called myofascial trigger point pain. The presence of central excitatory effects is a defining characteristic of this myalgic disorder. The presence of referred pain is common, often resembling a tension-type headache.

## 62.3 Etiopathogenesis and Proposed Mechanisms

A number of mechanisms have been put forth to explain myofascial pain, even though currently a holistic understanding of aetiologies remains elusive (Fig. 62.1):

1. Continuous source of input leading to deep pain [21, 22]
2. Heightened emotional stress [21, 23]
3. Sleep disturbances [21, 24]

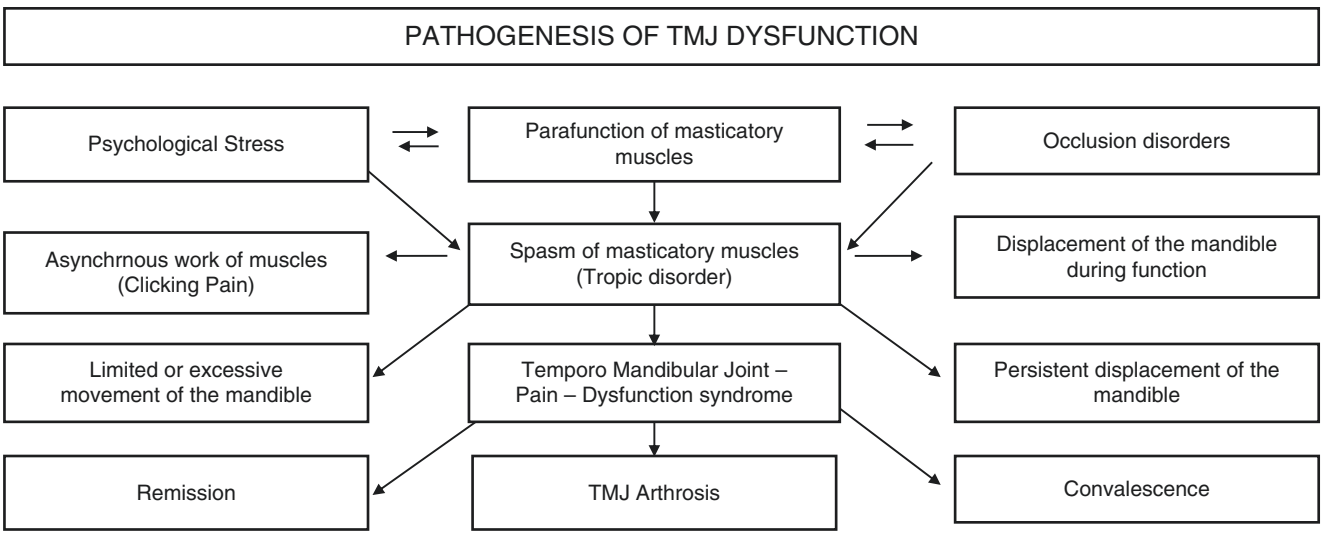



**Fig. 62.1** Pathogenesis of TMJ dysfunction

4. Local factors that govern muscle health, namely, habits, posture and muscle strains
5. Systemic factors like nutritional deficiencies [21], poor physical status, chronic fatigue and viral infections [21]

## 62.4 Patient History and Clinical Characteristics

The patient's main complaint is often directed towards the site of referred pain and rarely the exact source of pain (the trigger points). The clinician may accidentally direct treatment towards the secondary sites of pain resulting in failure to treat the actual cause of the pain, thereby leading to unsuccessful treatment. History taking must specifically include incidences of repetitive muscle trauma, improper postural habits, presence of occlusal parafunction and mental and emotional stress.

On clinical examination, the patient will display decreased range and speed of mandibular movement which usually correlates to the location and intensity of trigger point pain. The pain is commonly described as a dull ache or pressure which can be throbbing and severe. The masticatory muscles are tender on palpation with identifiable trigger points on palpation [25].

Trigger points are described as firm knots within muscles which are more tender on palpation than the surrounding muscle tissue. The pain that is generated is usually within and beyond the muscle and may occasionally elicit referred pain to a distant site and even an autonomic response.

Temporary inactivation can be tried through a trigger point anaesthetic injection, vapocoolant sprays, transcutaneous electrical nerve stimulation (TENS), etc. [26] which are used by certain practitioners to temporarily inactivate trigger points.

From a clinical standpoint, if the muscle is tender to palpation and none of the other masticatory muscle disorders better describe the patient's condition, the suggested diagnosis is myofascial pain.

## 62.5 Examination

- Questions concerning pain and restricted mandibular movements and TMJ sounds
  - Visual examination of the head and neck.
  - Palpation of the head and neck—This includes palpation of the individual masticatory muscles for tenderness (Figs. 62.2a, b and 62.3).
  - Listening to TMJ sounds and joint palpation (Fig. 62.4).

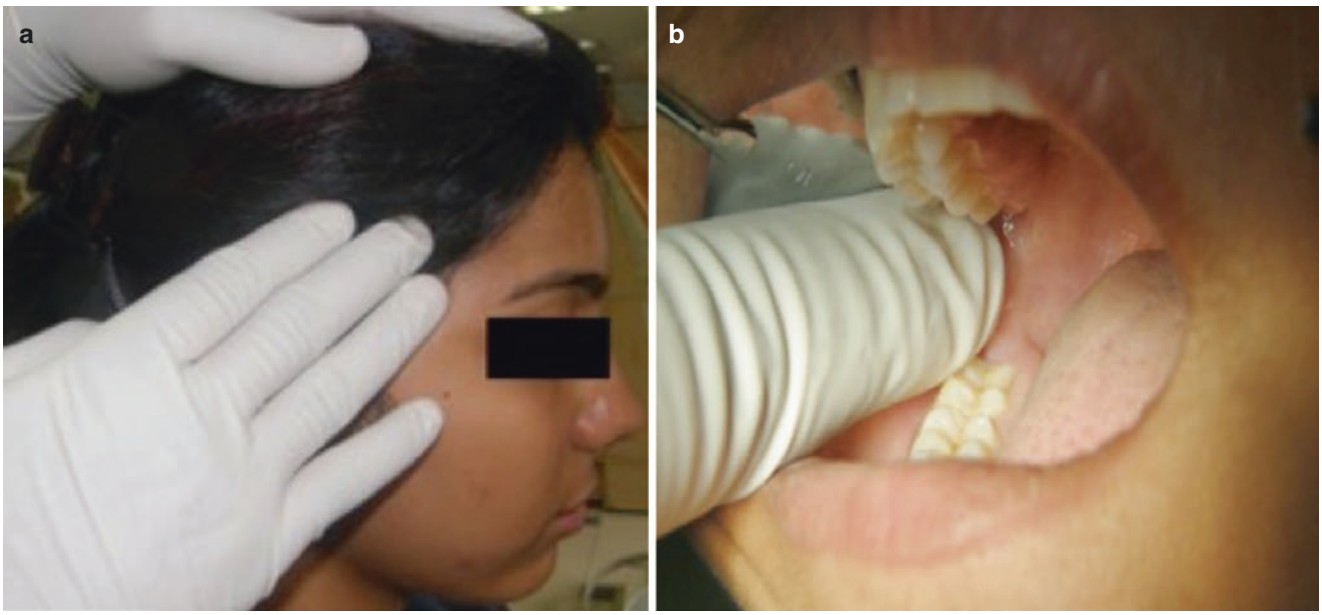




**Fig. 62.2** (**a**, **b**) Palpation of temporalis



**Fig. 62.3** Palpation of masseter



**Fig. 62.4** Palpation of temporomandibular joint

- Mandibular movements—For range of motion and deviation.
- Radiographs and other imaging techniques—An OPG (Fig. 62.5) may be easily available in most clinical set-ups. Dental cone beam CTs (Fig. 62.6) offer the advantage of lowered radiation dose with reasonable hard tissue detailing, articular surface erosions and joint space dimensions. MRIs are useful for imaging soft tissues such as the articular disc and joint ligaments (Fig. 62.7a, b).
- General oral examination.
- Occlusion.

### 62.5.1 Imaging Techniques

Pain in relation to the TM joint and masticatory muscles are among the commonest complaints of patients with TMD. MPDS is unique in that the contributing factors are neurogenic, psychogenic and musculoskeletal in nature. This greatly limits the role of conventional imaging modalities in clinching the diagnosis of MPDS.

OPG and CT are useful in imaging bony articular surfaces for erosions and changes in the joint spaces. MRI is excellent for imaging the disc, capsule and TM joint ligaments. However the usefulness of these imaging techniques appears restricted to ruling out other contributing factors to the patients' pain such as internal derangement and osteo-degenerative disorders. These features may often overlap with myofascial pain, often adding to confusion in diagnosis.

A thorough clinical examination is the most reliable way to arrive at a diagnosis of MPDS with imaging investigations assisting in ruling out other causative factors. Figures 62.5, 62.6 and 62.7 demonstrate some of the conventional methods of imaging the TM joint and associated structures with relevant findings.

## 62.6 Psychological Assessment

It is mandatory to do psychological assessment or screening of the patient for history of anxiety, depression and pain-related disability.

## 62.7 Pathophysiology of TMJ Pain

**Pain** An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage [27] (*International Association for the Study of Pain 1979*).

*Inflammatory Pain* Intra-articular tissue damage in association with disc displacement results in local TMJ pain. In addition, it can elicit reflex spasm of masticatory muscles resulting in pain from regions other than TMJ.

*Arthrogenous Pain* The patient can point to the worst spot with one finger in the TMJ region. The pain is relieved by giving auriculotemporal nerve (ATN) block.

*Myogenous Pain* Not relieved by block and diffuse in nature over the muscle.

**Fig. 62.5** OPG showing bony articular surfaces of TMJ



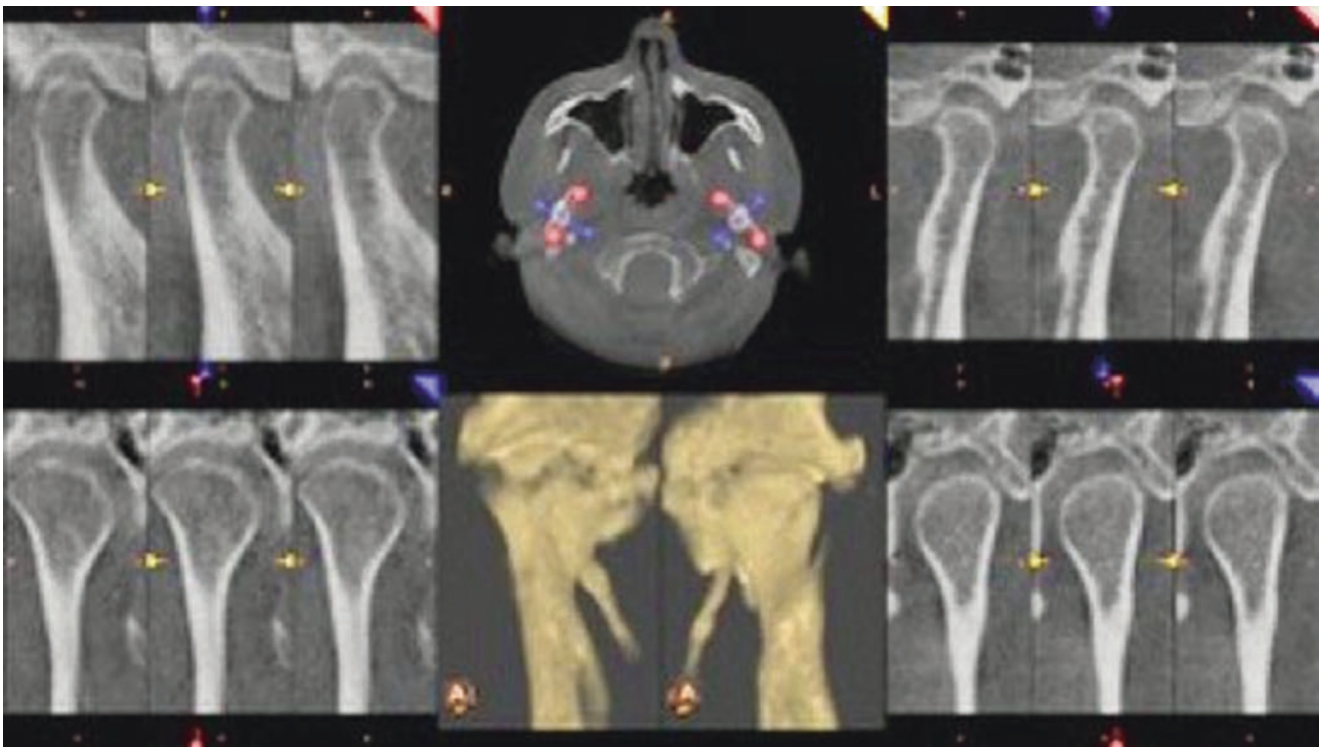



**Fig. 62.6** CBCT shows erosions and craters in the head of the condyle and increased joint space

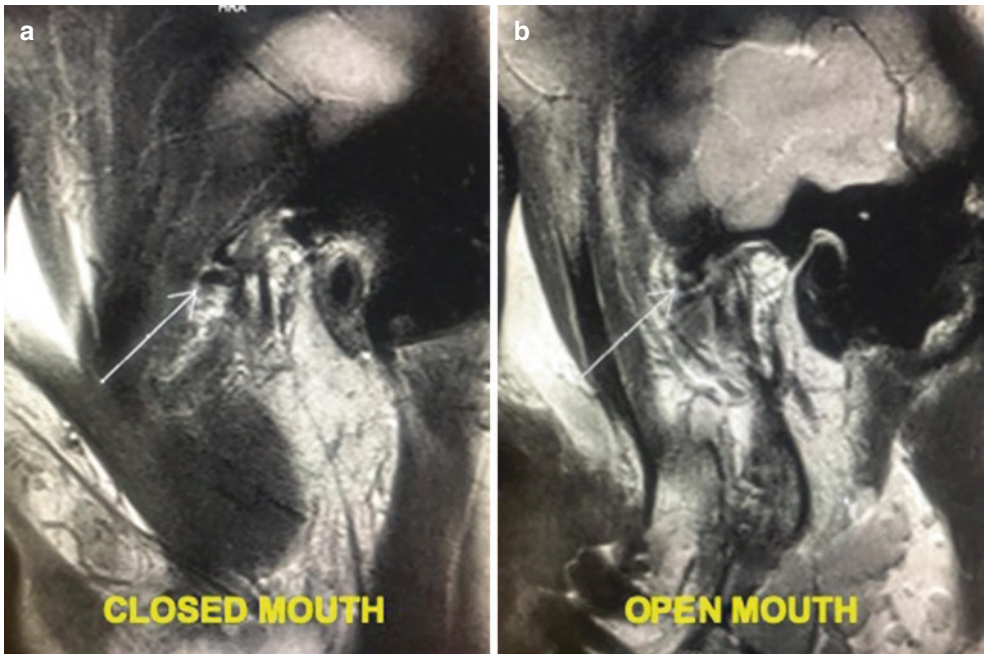


**Fig. 62.7** (**a**, **b**) MRI showing disc displacement without reduction in open and closed positions



## 62.8 Role of Parafunctional Habits

### 62.8.1 Bruxism

- Bruxism is defined as an oral habit of involuntary rhythmic non-functional gnashing or clenching of teeth outside of masticatory movements of the mandible [28]—"tooth grinding neurosis".
- Associated with REM, commonly seen in patients with high trait anxiety or increased depressive symptoms.
- This sustained muscle contraction leads to non-serous inflammatory reaction in masticatory muscles, subsequent fatigue and pain.
- Signs of bruxism: Fig. 62.8a–c
  - Attrition of teeth
  - Scalloping of the tongue
  - Cheek ridging—linea alba

A complete process of risk evaluation and assessment helps to highlight the problematic causative factors. These may include central and peripheral causes as shown in Table 62.1.

## 62.9 Clinical Signs of MPDS

- Pain in TMJ region
- Clicking/popping noise
- Restriction of mouth opening
- Deviation of mandibular midline to the affected side on mouth opening before clicking
- Restricted laterotrusive jaw movements to the contralateral side (Fig. 62.9a)
- Unrestricted laterotrusive jaw movements to the affected side (Fig. 62.9b, Table 62.2)

### 62.9.1 Clinical Test

To diagnose clicking caused by disc displacement with reduction:

- Patient is instructed to occlude the teeth firmly together.
- Patient is instructed to open the mouth until jaw clicking occurs indicating that the disc/condyle relationship is now reduced into normal position.
- No clicking sound is heard after placing the spacer (Fig. 62.10a, b).

## 62.10 Principles of Management

### 62.10.1 Role of Evidence-Based Management

The varying manifestation of myofascial pain (MFP) can range from single muscle involvement to complex cases involving multiple sites of pain and numerous contributing

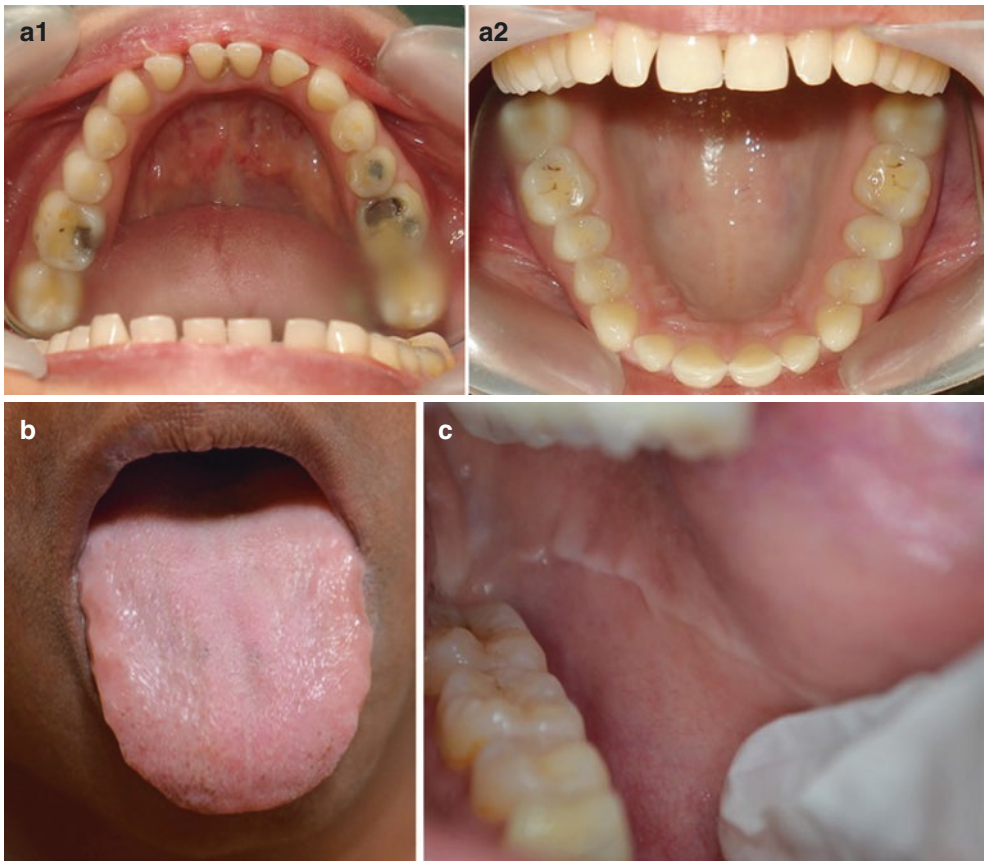



**Fig. 62.8** (**a**) Attrition of teeth from bruxism. (**b**) Scalloping of tongue margins (**c**) Linea alba

**Table 62.1** Central and peripheral causes of MPDS

| Central causes | Peripheral causes |
|---|---|
| Stress | Adverse postural issues |
| Anxiety | Repetitive localised strain in the form of occlusal parafunction |
| Depression | |

factors. The challenge in management consists of educating patients about the lifestyle factors that contribute to MFP, the persistence of which tends to result in treatment failure. Studies by Fricton and Aronoff [29, 30] et al. indicate that patients with MFP visit multiple practitioners in their quest for relief and are often treated with multiple modalities in a disorganised manner without experiencing improvement other than on a temporary basis.

### 62.10.2 Formulating a Comprehensive Problem List

Patient must be encouraged to adopt therapeutic lifestyle changes such as diet modification, exercise, proper sleep habits, social support and coping mechanisms which may contribute to more holistic and long-lasting positive outcomes.

### 62.10.3 Role of Interdisciplinary Management for the Complex Patient

Patients exhibiting multiple and often overlapping risk factors are best approached via an interdisciplinary involvement that uses a team of specialists to address the varied nuances

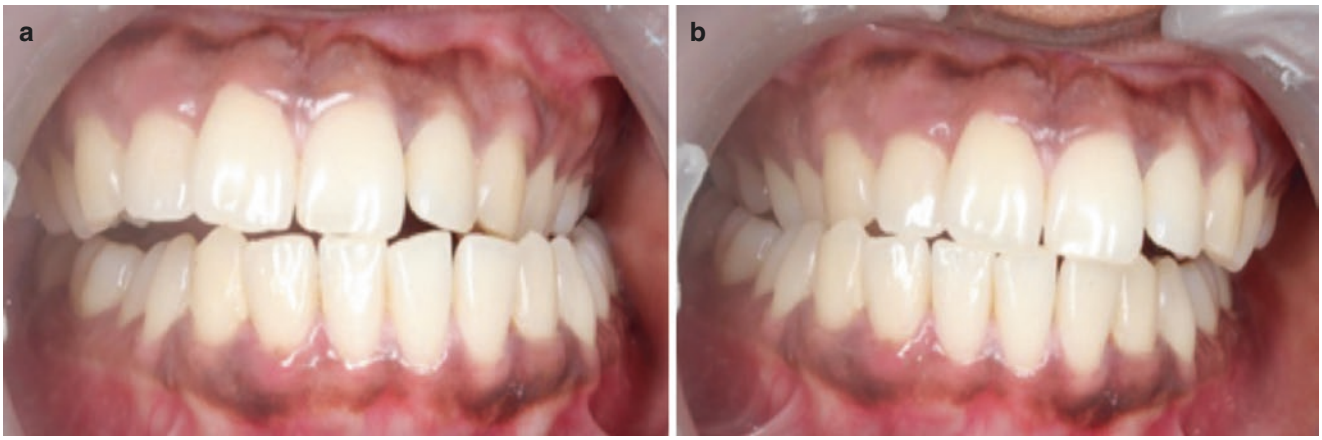




**Fig. 62.9** (**a**) Restricted laterotrusive jaw movements—contralateral side (**b**) Unrestricted laterotrusive jaw movements—affected side

**Table 62.2** Causes of clicking

| Causes of clicking |
|---|
| 1. Disc displacement with reduction |
| 2. Hypermobility of the condyle |
| 3. Loose intra-articular bodies like arthroliths, intra-articular fracture fragments of the articular surface [29] |
| 4. Thickening of the soft tissue on the slope of articular eminence |

of the problem in an organised manner. In both simple and complex cases, the clinician needs to isolate the individual problem area and arrive at a customised solution best suited to the patient.

### 62.10.4 The Role of Occlusal Splint: Termination of the Cycle of Habitual Pain

Chronic pain is a learnt pattern that arises from repetition and is generated by the CNS. This habitual pattern must be arrested before attempting to treat MPDS. Treatment of MPDS is dependent on breaking the repetitive pattern generated by the central nervous system. Nociceptive responses are carried from peripheries into the central nervous system (CNS) through myelinated (type A-delta) or unmyelinated (type C) nerve fibres [31]. Dental malocclusion as a causative factor for MPDS has been found in literature since most treatment modalities hint at occlusal alteration one way or another. In a study by Laskin et al. [32], the authors remarked that many aspects of MPDS are yet to be explored; many have agreed that rapid improvement of symptoms is noticed with splint therapy. Splint therapy is an effective method of isolating occlusion as the causative factor as the interposition of a splint can immediately and dramatically break the pain pattern generated by the CNS. It is however necessary that splint therapy be initiated by skilled practitioners.

Soft splints are constructed of polyvinyl worn at night. It may act as a habit breaker.

The anterior bite plane or Lucia Jig is recommended for short-term use and is to be worn at night. Stabilisation splints help to disocclude the jaws, thereby restoring normal joint space with prolonged wear. These are also used to correct disc dislocations in internal derangement. The anterior repositioning splint allows the patient to close the mandible in a forward direction; however, this has not yielded successful results in many circumstances.

The gnathological splint was designed based on Roth's philosophy of correction of centric relation-centric occlusion discrepancies. It is a permissive type of hard splint made of heat cure clear acrylic fabricated using a semi-adjustable articulator (SAM 3, AD2, PANADENT articulators). It is usually worn full time in maxillary or mandibular arch. The splint is designed on the concepts of gnathology to correct the centric relation-centric occlusion (CR-CO) discrepancies, which are a sequence of progressive disc derangements.

A few important factors to be considered prior to splint fabrication include diagnosis and institution of therapy by skilled clinicians, and alteration of occlusion results in

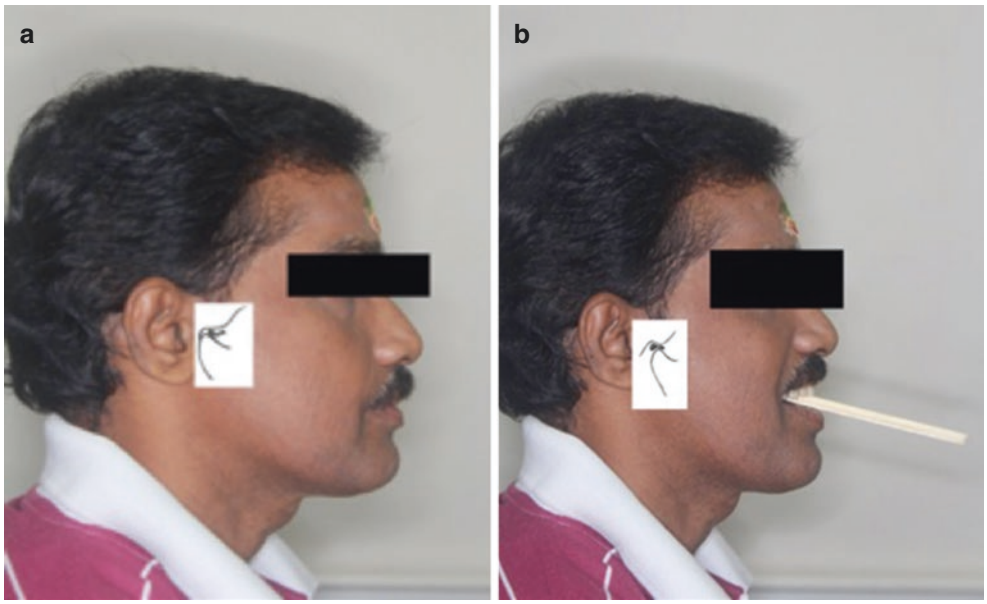


**Fig. 62.10** Diagnosis of clicking sound in the TMJ. (**a**) Patient in closed mouth position, with anterior disc displacement (shown by TMJ superimposition) and (**b**) Condyle translating over the displaced disc (TMJ superimposition), to produce clicking sound



changes in masticatory behaviour which in turn alters neuromuscular activity and learnt patterns of pain generation. Regular follow-up is essential after splint usage. This helps to identify any complications as a result of splint therapy which might mandate stoppage of splint therapy altogether [33, 34]. The specific type of splint and duration of treatment must be carefully titrated for individual patients. Overuse of the right splint can also result in worsening of the condition by creating open bites, intrusion of teeth and loss of occlusal contact and worsening of MPDS symptoms [35–37].

### 62.10.5 Occlusal Adjustments

Wang et al. advocated elimination of premature contacts using occlusal adjustment as one of the most crucial methods for breaking the neuromuscular cycle in MPDS [38]. A thorough occlusal analysis has consistently been an instrumental diagnostic criterion to resolve MPDS symptoms.

## 62.11 Modalities of Management of MPDS

Because of the prolonged and occasionally varied treatment phases in the management of myofascial pain, the healthcare provider must develop a long-term association with the patient and direct the goals towards fostering a positive attitude towards therapy and commitment to long-term change [39, 40].

### 62.11.1 Muscle Exercises

Muscle exercises are the most effective for muscle rehabilitation. Active muscle stretching combined with passive exercises diminishes the sensitivity of trigger points. Postural exercises reduce trigger point reactivation, while strengthening exercises serve to enhance circulation and suppleness of the muscles. Determination of the muscular range of motion is the preliminary requirement prior to prescribing physiotherapy.

Postural exercises function to teach the patient to adopt a more neutral and relaxed body position, thereby ameliorating fatigue from undue stress on a set of muscles. Interincisal mouth opening is an effective indicator of muscle range of motion, and limited mouth opening is indicative of tender points in the masticatory muscles. Adverse postures such as jaw thrust and forward head position must also be discouraged.

Correctional exercises include:

1. Placement of the tip of the tongue on the roof of the mouth with the teeth parted.
2. Instruction in proper posture for daily activities like sitting, standing and lifting of objects.
3. Encourage sleeping on the side or back. This is effective for patients who complain of muscle stiffness upon awakening.
4. Incorporate a form of aerobic exercise into the daily routine to improve mood, circulation, strength and muscle endurance [41].

### 62.11.2 Muscle Treatments

*There are various techniques for muscle stimulation.*

*Non-invasive methods of trigger point (TrPs) inactivation include*

- massages,
- acupressure therapy
- and ultrasound application which act as non-invasive mechanisms of disruption.

*Relaxation measures include*

- moist heat applications,
- ice packs,
- Fluori-Methane sprays
- and diathermy which alter muscle and skin temperature.

*Electrical current stimulation through*

- transcutaneous electrical nerve stimulation (TENS),
- electro-acupuncture
- and direct current application stimulates the muscles and TrPs.

*Methods of chemical and mechanical alteration of TrPs are achieved by*:

- acupuncture and
- TrP injections with local anaesthetic,
- saline
- and corticosteroids.

*Spray and stretch technique*: Local muscle vapocoolant spray application alongside passive stretching renders instant pain relief [21, 42]. Failure of this technique has been attributed to:

(a) Inadequate achievement of full muscle dimension due to bone or joint abnormalities, muscular contractures or the patient's inability to voluntarily relax
(b) Incorrect technique of spraying
(c) Failure to attenuate causative factors

### 62.11.3 Trigger Point (TrP) Injections

Pain reduction, improvement in range of motion, better exercise tolerance and generalised enhancement of circulation in muscles are some of the positive effects of trigger point injections as documented by Cifala et al. [43] and Jaeger and colleagues [44].

Trigger point injections act by physical disruption of the trigger point from needle entry, and the pain relief may be seen to last from the anaesthetic duration to several months. Saline injections and "dry needling" have also been reported with varying degrees of success. Dry needling, frequently known as myofascial trigger point dry needling, is an alternative medicine practice comparable to acupuncture. It is carried out by physical therapists where permissible by state laws. The use of a combination of sub-anaesthetic doses of local anaesthetic agents has also been found to be successful. The results of a double-blind controlled trial by Simons et al. [45] suggested 3% chloroprocaine and 5% procaine (without vasoconstrictors) to be effective.

Corticosteroid in combination with a local anaesthetic administered as a local intramuscular injection was first practised in the early 1950s. Though there haven't been randomised trials to prove the efficacy of the same, Gray and colleagues suggested that locally delivered corticosteroids mitigate pain and improve function in patients with MPDS [46].

### 62.11.4 Trigger Points

These are areas of taut, inflamed muscle bands that elicit pain on palpation. Pain of this origin is usually referred to other sites in the local region. Figure 62.11a–e demonstrates the various muscles of the head and neck and the related trigger points elicited in MPDS.

### 62.11.5 Bite Adjustment

Despite many MPDS cases being treated from an occlusion-related standpoint, literature has shown dental occlusion or partial and total edentulism to be weakly correlated as causative or maintenance factors of TMPDS [47, 48].

Therapies ranging from occlusal adjustments on natural teeth to extensive prosthetic dental rehabilitation have been reported. Other treatments include oral appliances and orthodontics. Marbach [49] et al. demonstrated that missing teeth, malocclusion and night-time bruxism in control group patients did not correlate with facial pain and vice versa.

## 62.12 Intraoral Appliance Therapy *(Refer to suggested reading at the end of the chapter)*

Stabilisation appliances are well accepted, but the clinician must ensure that they are not ill-fitting, bulky, etc., so it is imperative to adjust them for patient comfort and better compliance. Regular reviews and inspection for soft tissue ulceration, dental pain, oral malodours, speech impairment, caries, tooth mobility and occlusal alterations must be carried out.

Splints: Box 62.2 enumerates the broad classification of splints conventionally used in the management of MPDS.

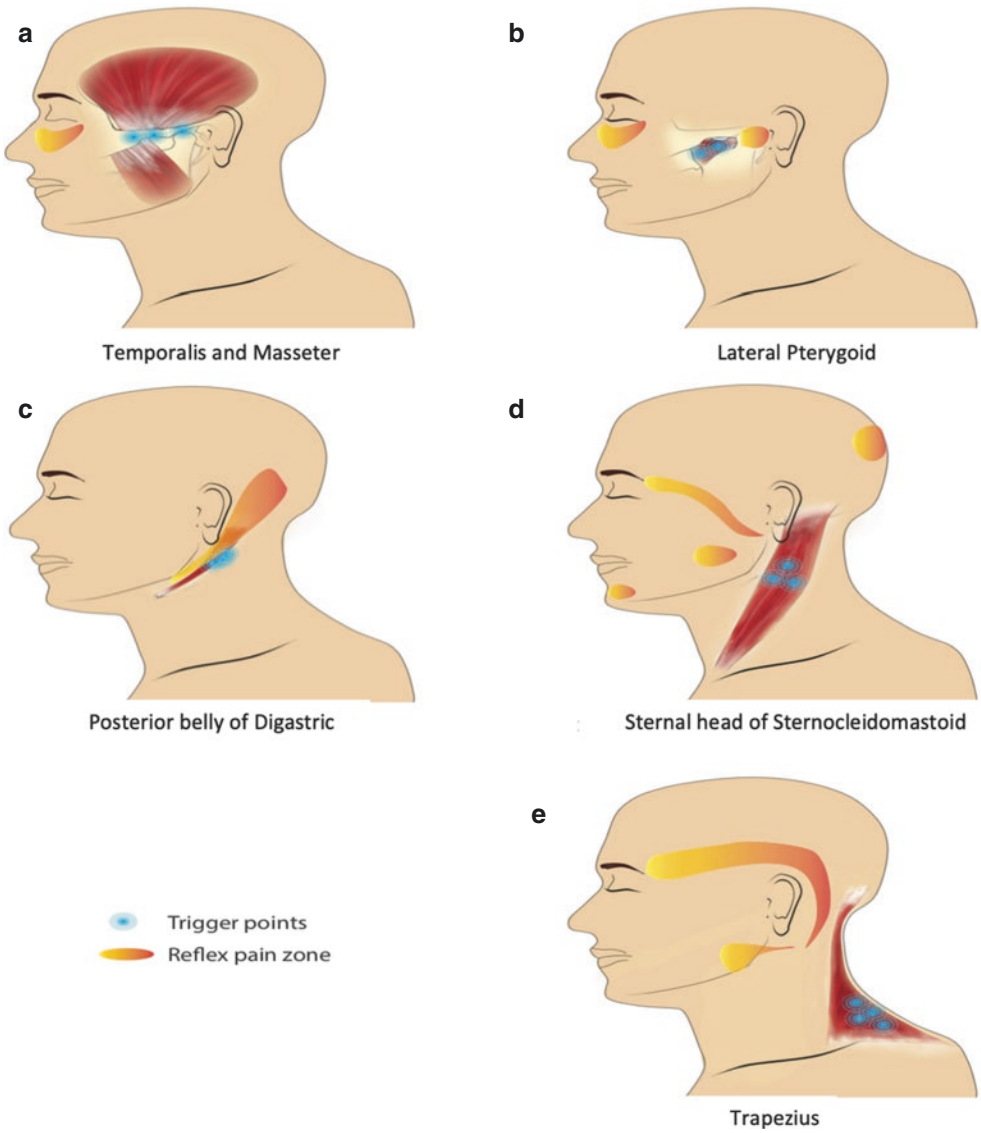




**Fig. 62.11** Trigger points (blue) in chewing muscles, neck muscles and reflex pain zone (yellow-orange): (**a**) Masseter and temporalis. (**b**) Lateral pterygoid. (**c**) Posterior belly of digastric. (**d**) Sternocleidomastoid (**e**) Trapezius

Soft Bite Guard: Splint is constructed of polyvinyl worn at night. It may act as a habit breaker and also serves to protect the occlusal surfaces of the teeth (Fig. 62.12).

The Anterior Bite Plane or Lucia Jig (Fig. 62.13): For short-term use to be worn at night.

Stabilisation Splint: It is a hard splint made of acrylic for the restoration of occlusion (Fig. 62.14). It minimises abnormal muscle activity and restores neuromuscular balance.

Gnathological Splint: A specialised splint based on Roth's philosophy: To correct centric occlusal-centric relation discrepancies (Fig. 62.15a, b).

### 62.12.1 Pharmacotherapy

Multiple different pharmacologic therapies have found application in MPDS.

#### 62.12.1.1 Non-steroidal Anti-inflammatory Drugs (NSAIDs)

In the case of TMPDS, few controlled trials exist that indicate daily use of NSAIDs offers little benefit when compared to the well-known occurrence of side effects as reported by Dionne et al. [50]. Singer and colleagues concluded that a 4-week trial of ibuprofen 1500 mg per day was no more effective than a placebo [51]. Patients report short-term relief with high doses of NSAIDs; however, long-term therapy with NSAIDs is not encouraged.

**Box 62.2 Splints Used in the Management of MPDS (Refer to suggested reading at the end of the chapter)**

Types of splint:

1. Permissive/muscle deprogrammers, e.g. stabilization splints, gnathological splint—Roth philosophy
2. Non-permissive/directive, e.g. anterior repositioning splint

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**Fig. 62.12** Soft splint

#### 62.12.1.2 Opioids and Narcotic Analgesics

With the use of opioid and narcotic analgesics comes the problems of physical dependence, addiction and drug tolerance. There is a lack of controlled studies in literature to guide the clinician regarding the same which restricts the use of these drugs specifically to recalcitrant cases. Patient selection is critical when instituting opioid therapy, and success of therapy is usually measured by reports of reduction in pain intensity, return to quality of life and achievement of a stable dose.

Oral opioids are, namely, sustained release morphine, meperidine and butalbital in combination with aspirin and caffeine. Transdermal fentanyl is effective in some cases.

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**Fig. 62.13** Anterior bite plane or Lucia Jig

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**Fig. 62.14** Stabilisation splints (hard split)

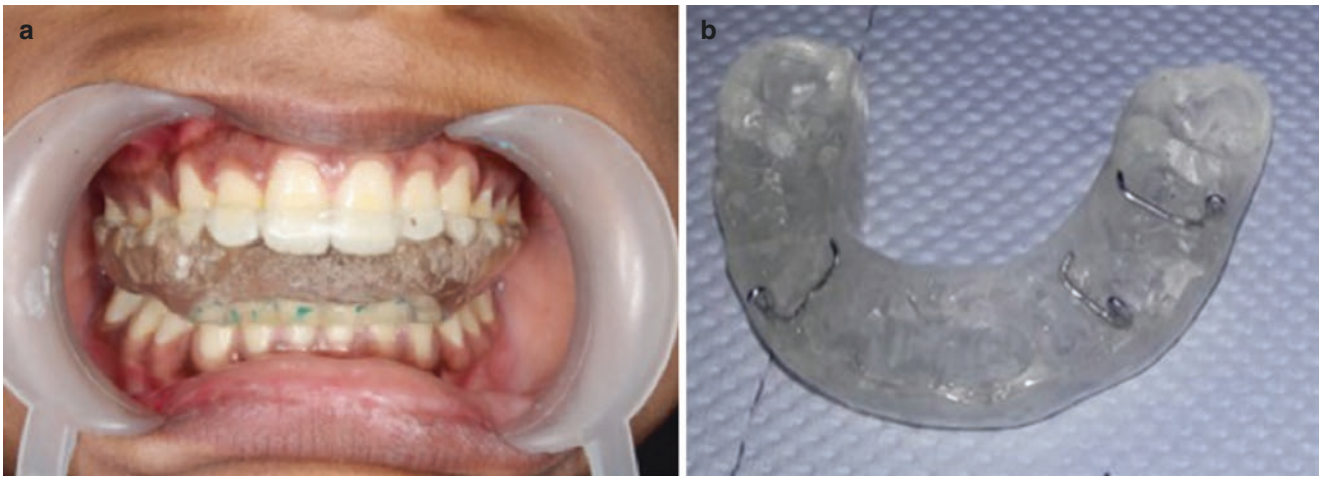




**Fig. 62.15** (**a**) Gnathological splint (intraoral) (**b**) Gnathological splint (in vitro)

#### 62.12.1.3 Antidepressants

Antidepressant drugs are frequently used in the management of a number of pain conditions, including MPDS. Studies indicate that these drugs behave independent to their role as antidepressants since they are effective at low doses (on average 23.6 mg for pain relief as opposed to a mean of 129 mg for depression) [52].

Amitriptyline and imipramine have been widely researched for their antidepressant and pain control properties. Dosage is initiated at 10 mg during bedtime and, if needed, is raised in 10 mg increments up to 30–40 mg. Analgesic effects are noted to occur within a few days. Side effects include sedation, constipation and dry mouth. TMPDS case reports have shown anecdotal evidence suggestive of agitation arising from selective serotonin reuptake inhibitors. Citalopram, a Selective Serotonin Reuptake Inhibitor (SSRI), had comparable effects to a placebo in the treatment of fibromyalgia [53]. Earlier sources of literature have also highlighted the efficacy of monoamine oxidase inhibitor drugs (phenelzine, tranylcypromine) in the treatment of orofacial pain conditions [54].

#### 62.12.1.4 Muscle Relaxants

In the short term, diazepam and related muscle relaxants bring about relief from painful muscle spasms but are effective only for a short-term basis.

Benzodiazepines are associated with development of tolerance when used for a long period of time among other side effects. Varying degrees of relief have been reported with relatively low (diazepam, 5 mg bid; clonazepam, 0.5 mg bid or tid) doses, and usually an increase in dosage is not mandated.

### 62.12.2 Supportive Therapy

#### 62.12.2.1 Ultrasound and Electrogalvanic Stimulation

Painful trigger points have been demonstrated to be managed effectively with therapeutic modalities such as ultrasound application and electrogalvanic stimulation (EG) [55]. Ultrasound causes localised muscle relaxation by producing heat deep within the fibres corresponding to the trigger points [56]. Low-voltage EG stimulation is used to stimulate muscles in a phased and rhythmic manner. This results in muscle relaxation and reduced muscle hyperactivity [57, 58]. These techniques are generally considered conservative and are extremely useful in mild to moderate cases of MPDS.

Box 62.3 outlines the prognosis and some of the important pearls to be borne in mind by the clinician attempting to treat MPDS.

**Box 62.3 Clinical Pearls for Successful Outcomes and Prognosis of MPDS**

Successful outcomes and prognosis of MPDS are dependent on the following factors:

- Accurate diagnosis—It is essential to isolate MPDS from a host of conditions that may mimic symptoms such as internal derangement, migraines and cluster headaches.
- Appropriate case selection—This necessitates the correct identification of the disease phase and institution of appropriate treatment measures.
- Clinician factors—Experience and patient rapport.
- Patient factors—Compliance, understanding, expectations.
- Multidisciplinary team approach—Effective communication between maxillofacial, orthodontic, orthopaedic and physiotherapy colleagues can ensure holistic management of the patient's condition.

## 62.13 Treatment Summary

The management of MPDS can be summarised as follows (Table 62.3). (Refer also to Chap. 63 - Internal Derangements of the Temporomandibular Joint)

**Table 62.3** Summary of MPDS stages and authors' recommendation for management

| Phase | Treatment approach |
|---|---|
| I (Fatigue and spasm causing pain and dysfunction) | • Avoidance of clenching and grinding<br>• Soft diet<br>• NSAIDs and muscle relaxants—ibuprofen, Valium |
| II (Unsuccessful phase I) | • Medications are continued<br>• Splints (bite appliances) are introduced to prevent muscle overuse, including bruxism<br>• Encourage to wear night and day<br>• Medications discontinued if relief is obtained |
| III (Unsuccessful phase II) | • Physical therapy of muscles<br>• Ultrasound |
| IV (Unsuccessful phase III) | • Psychological counselling<br>• Referral to multidisciplinary centres<br>• Surgery for recalcitrant cases |

## 62.14 Recent Advances

Newer management methods that have emerged in the recent years for treatment of MPDS include botulinum toxin injections as well as cold and soft laser therapy.

### 62.14.1 Botulinum Toxin Injections

Botulinum toxin injection enhances vascularity by augmenting the blood flow to the affected muscles and releases the taut muscle fibres caused by abnormally contracting muscles [59]. It has also been reported to increase endogenous endorphin secretion by way of needle insertion into trigger points [60, 61]. However, studies reveal that 3–10% of patients develop neutralising antibodies with long-term adverse effects that include muscular atrophy [62].

The injection solution is prepared by dissolving 100 IU of botulinum toxin into 1.0 mL of sterile saline solution (0.9%) at room temperature to be done immediately before injection. An insulin syringe with a hypodermic needle may be used for administering the injection. Small increments of this solution may be injected into trigger points in different muscles. (refer Chap. 33 for more details)

### 62.14.2 Cold and Soft Lasers

Cold laser therapy or low-level laser therapy (LLLT) has been shown to play a substantial role in the treatment of generalised musculofascial disorders and facial pain relief [63–66]. After a thorough clinical examination of the patient that must reveal clearly the affected muscles, a treatment cycle is formulated which usually consists of low-level laser application like Ga-Al-As (Endolaser) of wavelength 780 mm for 4–6 weeks.

Theories put forth to explain pain reduction via low-level laser therapy include hyperpolarisation of neuronal cell membranes and resultant elevation of pain threshold alongside an increase in the secretion of morphine-like substances such as encephalin and endorphin which have an analgesic and anti-inflammatory effect [11].

Since trigger points are known to be of inflammatory nature [6], it can be concluded that laser application alleviates oedema, inflammation and pain by inhibiting inflammatory components such as prostaglandin (PGE2), prostacyclins, histamine and kinin.

## 62.15 Summary and Conclusion

It would be appropriate to conclude that successful outcomes and prognosis of MPDS are dependent on accurate diagnosis, appropriate case selection and above all an interdisciplinary involvement that uses a team of specialists to address the various nuances of the problems in an organised manner.

The clinician needs to isolate the individual problem area and arrive at a customised solution best suited for the patient.

The following salient points must be borne in mind by the reader on completion of the chapter on MPDS as shown in Box 62.4.

**Box 62.4 Summary of Important Points**

- Myofascial pain dysfunction syndrome is mainly a pain disorder related to muscles and fasciae, distinct from TMJ disc interference disorders and temporomandibular degenerative diseases.
- Myofascial pain can be defined as "A myogenous pain condition characterised by Local areas of firm, hypersensitive bands of muscle tissue known as trigger points".
- Bruxism and other parafunctional habits lead to sustained muscle contraction and eventually non-serous inflammatory reaction in masticatory muscles, muscle fatigue and pain.
- Splint therapy as interposition can dramatically break the pain pattern. "Lucia Jig" or anterior bite plane recommended for short-term use helps to disocclude the posterior teeth, thereby relieving muscle fatigue and pain caused by sustained muscle contraction due to clenching.
- Non-invasive method of muscle treatment includes inactivation massage, ice packs and Fluori-Methane sprays.
- Trigger point (TrP) injections with local anaesthetic, saline and steroids mitigate pain and improve function.
- Anti-depressants like amitriptyline in small doses (10 mg) at bedtime along with "Lucia Jig" for short-term use give good pain control results.

## 62.16 Case Scenarios

**Case 1:** (Fig. 62.16a–c)

A 29-year-old female patient complained of pain in the head and jaw for the past 2 years and underwent medical treatment for the same with little relief. On examination, muscles of mastication were sore and there was difficulty in manipulation of the jaw, and the patient showed a deep bite (Fig. 62.16a). CBCT showed increased joint space and MRI showed normal imaging. Having diagnosed with MPDS, the patient was advised gnathological splint (Fig. 62.16b) for full-time wear. The symptoms improved over 6–8 months. Post splint therapy, the bite was considerably opened (Fig. 62.16c), relieving pressure on the joint structures, and the patient was forwarded for orthodontic settling.

**Case 2:** (Fig. 62.17a–c)

A 48-year-old female patient complained of pain in the head and neck for the past 1 year. All the symptoms started with dental procedures which lasted long. On examination there was severe muscle spasm with tenderness in muscles of mastication and difficulty in opening mouth due to muscle spasm, and deviation on mouth opening was also seen. Intraorally, she had a deep anterior bite which was almost closed in relation to 11, 21, 31, 41 (Fig. 62.17a). CBCT and MRI showed normal imaging, and hence she was advised a gnathological splint (Fig. 62.17b) for her myofascial pain and to open the bite. The symptoms improved over 3–5 months of full-time wear, the bite was significantly opened and the patient was referred for orthodontic settling of the bite.

**Case 3:** (Fig. 62.18a–c)

A 21-year-old female patient who was a dental student reported with clicking sounds and pain on both sides of the lower jaw and severe teeth grinding at night for the past 6




**Fig. 62.16** (**a**) Anterior deep bite with spacing in the lower anteriors. (**b**) Gnathological splint in place. (**c**) Post splint therapy correction of deep bite prior to orthodontic settling




**Fig. 62.17** (**a**) Pretreatment occlusion showing anterior deep bite. (**b**) Gnathological splint in place. (**c**) Post splint therapy

**Fig. 62.18** (**a**) Palpation of tender points on the temporalis and masseter muscles. (**b**) The Lucia Jig. (**c**) Patient wearing the Lucia Jig

months. The patient was clinically examined, severe tenderness was elicited on palpating the masseters and temporalis bilaterally (Fig. 62.18a), and intraoral signs of enamel wear from attrition were apparent. Imaging of the TMJ via MRI showed a normal study. She was advised to wear a Lucia Jig (Fig. 62.18b, c) for 3 months in order to disocclude the posterior teeth. In addition, she was prescribed amitriptyline (10 mg) once a day at night which she took for the same period. On follow-up after 3 months, she had complete relief from the pain and reported complete cessation of the parafunctional habit.

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