

The importance of pain description in temporomandibular joint internal derangements: A diagnostic tool in the clinical evaluation process?

Omar Franklin Molina¹ Bruno R Simião² Zeila C Santos¹ Maria A Sobreiro¹
Ricardo Marçal³ Karla R. Gama² Marcella S Carneiro⁴

¹Department of Orofacial Pain UNIRG University, Gurupi-TO, Brazil

²Department of Prosthodontics, UNIRG University, Gurupi-TO, Brazil

³Department of Restorative Dentistry, UNIRG University, Gurupi-TO, Brazil

⁴Department of Physical Therapy, UNIRG University, Gurupi-TO, Brazil

Corresponding author: Omar Franklin Molina

Abstract

Introduction: Some pain associated terms used by craniomandibular disorder patients during clinical evaluation may have clinical importance in the diagnosis of internal derangements of the temporomandibular joint.

Goals: Describe some terms which have enormous utility in the diagnosis of specific internal derangements of the temporomandibular joint.

Methods: Retrospective evaluation of clinical records of subjects with diagnosed bilateral capsulitis (n=30), bilateral retrodiscitis (n=30), bilateral disc-attachment pain (n=32), bilateral arthralgia (n=23) and bilateral osteoarthritis of the TMJ (n=20). Questionnaires, clinical examination, palpation of joint and muscles, evaluation of the chief complaint and biomechanical tests were used to evaluate types of internal derangement of the temporomandibular joint.

Results: Dull was the most common descriptor used by subjects in the bilateral capsulitis subgroup (29/30=96,7%), whereas dull (14/30=46,7%) and dull-aching (15/30=50%), were the most common descriptors used by the bilateral retrodiscitis subgroup. Most subjects in the bilateral disk-attachment pain subgroup (26/32=81,3%) described pain as dull, shooting and sharp. Six subjects=18,7% in the same subgroup described pain as dull, throbbing, shooting and sharp. As for subjects in the bilateral arthralgia subgroup, they used a complex combination of pain descriptors as follows: Burning (7/23=30,4%), dull, throbbing and burning (1/23=4,3%), dull, throbbing, sharp and burning (6/23=26,1%), dull and burning (5/23=21,8%), and dull, sharp and burning (4/23=17,4%). Regarding subjects in the bilateral osteoarthritis subgroup, (n=20), 17/20=85%, described pain as dull, 2/20=10% as dull and burning and 1/20=5% as dull, sharp and burning.

Conclusion: Dull and Dull + Aching constitute diagnostic terms characteristics of capsulitis/synovitis and retrodiscitis respectively. Sudden, sharp, shooting or stabbing terms constitute characteristic terms of disk-attachment pain. Burning is term used more frequently in advanced stages of TMJ-IDs, for instance, arthralgia. Patients with OA are more likely to use a variety of terms including sharp, dull, aching and sometimes burning to describe pain.

Keywords: Craniomandibular disorders. Capsulitis. Retrodiskal Pain. Disk-Attachment pain. Arthralgia. Osteoarthritis. Temporomandibular joint.

Date of Submission: 15-07-2020

Date of Acceptance: 31-07-2020

I. Introduction

Craniomandibular Disorders (CMDs) or temporomandibular disorders (TMDs) are collective terms used in Medicine and Dentistry to describe a set of pathological alterations that occur in the masticatory muscles, temporomandibular joints (TMJs) and adjacent anatomic structures usually of musculoskeletal origin^[1]. The clinical importance of CMDs has encouraged the dental and medical profession to study many disorders usually associated with pain and many signs and symptoms in the face, TMJs, head and neck. CMDs is a set of signs and symptoms that constitutes a sub-classification of musculoskeletal disorders being a common complaint in orofacial pain patients^[2]. Internal derangements of the TMJ (TMJ-IDs), constitute medical and dental terms used to describe a set of pathological alterations in shape and position of the joint disk in relation to the mandibular fossa, head of the mandible and articular eminence^[3]. Traditionally, TMJ-IDs

have been described as a progressive disorder with a natural history that may be classified into stages I, II, III and IV.^[4] TMJ-IDs constitute organic lesions that appear to be progressive in some individuals and probably have a traumatic origin^[5].

Chronic orofacial pain including CMDs, is defined as a very heterogeneous group of symptoms and many of them can result in pain and associated neuropathy that can be detected using information from clinical examination and/or neurophysiological testing^[6]. The diagnosis of the diversity of TMJs-IDs poses a challenge for the clinician and specialist as the clinical presentation of a specific disorder may be confusing^[6]. Pain in TMJs-IDs may be constant and dull, but sometimes may start suddenly, fluctuates in intensity with time and is often worse in the evening^[6]. Pain may also be moderate, severe or mild. There is enormous variability in the description or quality of pain when patients are evaluated in the clinical setting^[3]. This is true not only in the case of orofacial pain, but when we evaluate pain in individuals with TMJ-IDs. Pain in TMJ-IDs, may increase during jaw movements and/or be elicited during manual palpation of the TMJ and adjacent masticatory muscles. The diagnosis of TMJ-IDs is also difficult as adjacent masticatory muscles may produce referred pain to the TMJ described as dull, occasional, continuous and cyclic^[7].

The description of the chief complaint (usually pain) in CMDs patients, is an important part of the diagnostic process. The diagnosis of a specific TMJ-ID may be difficult as patients use many terms to describe their pain. Such descriptors have paramount clinical usefulness but many times their meaning is unknown to the specialist in orofacial pain. According to Zakrzewska^[6], patients use a number of descriptors to describe their pain occurring in the region of the TMJs and adjacent anatomic structures. These descriptors include sharp, shooting, aching, throbbing, continuous, intermittent, mild, moderate or severe. During clinical examination of the TMJs, a clear description of the type of pain is necessary to facilitate the diagnostic process.^[8] Management of orofacial pain can only be effective if the correct diagnosis is reached and may involve referral to secondary or even to tertiary care specialists^[6]. It has been reported that misdiagnose rate in chronic pain patients ranges from 40% to 80% and that difficulties or failure to take a careful history, constitute major causes of misdiagnosis^[9]. Facial pain including TMJ pain is a common complaint. Yet this pain type can be difficult to diagnose due to the many complex anatomic structures involved, pain referral patterns from adjacent and distant skeletal muscles and insufficient diagnostic tools^[10]. Many practitioners view TMDs as a single disorder. However, careful observation and examination of patients reveal that patients have various TMJs-IDs sub-diagnosis^[11]. This is particularly true when pain descriptors are combined with some specific signs or symptoms, for instance, a description of sharp pain and periods of jaw locking. The observation of a combination of sign, symptoms, descriptors and patterns of jaw movements, constitute powerful elements in the diagnostic process.

Even though the medical and dental profession is aware of a wide range of descriptions in TMJs-IDs, there is little if any information about the diagnostic usefulness of terms used by patients to describe their pain. Further, there is paucity of studies in the field of diagnosis of TMJ-IDs and there is a trend to rely on information from clinical interview and MRI. Because the clinical description of TMJ-IDs is incomplete and description of pain is not used as a diagnostic tool in the orofacial pain field, this study was designed to:

1. Describe the clinical and diagnostic characteristics of some TMJ-IDs;
2. Evaluate frequency of some specific terms used by TMD-IDs patients to describe their pain and how they can be used to improve diagnosis of some TMJs-IDs.
3. Use the current literature to discuss a neurophysiologic explanation regarding the descriptions dull/aching and burning used more frequently by subjects presenting with retrodiscitis and arthralgia, respectively.

II. Methods

Sample

During a period of sixteen years, we clinically evaluated a large sample of subjects consecutively referred to UNIRG University School of Dentistry Division of Orofacial Pain, presenting with CMDs and bruxing behavior (BB). A standard examination protocol was used in all subjects who were evaluated by the same examiner (OFM): A comprehensive evaluation of the chief complaint including anatomic site, description of the pain including TMJ pain, head, facial and cervical pain, referral pain patterns, duration, location and chronicity of pain complaints was carried out. Gentle palpation of the masticator muscles and TMJs was carried out in order to determine the presence of trigger points and the type of TMJ-ID. Biomechanical tests were used to diagnose the type of TMJ-ID and a list of descriptors were used in order to correlate pain description with the diagnosis using biomechanical tests. Questionnaires were also used to evaluate pain in adjacent and distant areas from the masticatory system. BB was evaluated using a questionnaire, self-report and clinical examination of the oral structures in order to obtain information regarding signs and symptoms of BB. Well validated psychological tests were used to gather information about depression (BDI), anxiety (TMAS), somatization (Rief and Hiller questionnaire) and abuse (Sanders-Becker-Lausen instrument). The objective of using this comprehensive protocol was to gather accurate information to be used in future retrospective studies to explore

a variable of interest. Information about the reasons for using this protocol was given to all subjects. Hurt or damage was not induced during evaluation and subjects signed a formal consent allowing the researcher to use information for future research projects. The clinical records of all evaluated subjects were stored in a database for future research projects. During the months of January through May 2020, all clinical records were evaluated and all those subjects having complete information about CMDs, BB and TMJ-IDs were retrieved and analyzed aiming at determining frequent descriptors used by subjects with bilateral capsulitis (n=30), bilateral retrodiscitis (n=30), bilateral disk-attachment pain (n=32), bilateral arthralgia (n=23) and bilateral TMJ-osteoarthritis (n=20). A control group (n=60) of subjects referred in the same period of time with no CMDs was used as a comparison subgroup.

Inclusion criteria for CMDs: A complaint of pain in the masticatory muscles and/or TMJs, presence of joint noises, tenderness to palpation of the TMJs and/or masticatory muscles, restriction of jaw movements, pain during jaw movements, and headache referred from the masticatory system.

Inclusion criteria for internal derangements of the TMJs:

For capsulitis/synovitis (Bil CAP): Pain on gentle digital palpation of the joint capsule externally and anteriorly to the tragus during jaw opening and closing, pain on border jaw opening, pain that ceases immediately on closing the mouth and occluding the teeth, pain on moving the mandible laterally to the opposite side to stretch fibers of the joint capsule and induce pain, absence of more advanced TMJ-IDs, for instance, retrodiskal pain and/or disk-attachment pain.

For retrodiskal pain (Bil RP): Pain induced by clenching the teeth in the maximal intercuspal position, pain when manipulating the mandible in the centric relation position, pain when the patient is instructed to move the mandible to the affected side, pain induced by clenching the teeth in the intercuspal position ceases immediately when the patient is instructed to clench the teeth against cotton rolls placed over the posterior teeth, absence of a more advanced stage of TMJs-IDs, for instance, disk-attachment pain.

For disk-attachment pain (Bil DAP): Intermittent periods of locking, progressive decrease in jaw opening, presence of bilateral reciprocal clicking.

For arthralgia (Bil ART): A long history of TMJs-IDs, pain described as burning, joint noises (simple click, reciprocal click and/or ill defined crepitus), pain induced by a protrusive movement of the mandible as rubbing against inflamed and unprotected joint surfaces causes pain.

For osteoarthritis (Bil OA): Patient is in the fifth or sixth decade of life, bilateral crepitus, a long history of TMJs-IDs, patients' report of signs and symptoms indicating previous stages of TMJs-IDs, for instance a description of shooting, sharp, stabbing pain.

Inclusion criteria for the control subgroup: Absence of a CMD complaint.

Exclusion criteria for the control and experimental subgroups: Presence of cognitive difficulties or a severe psychological or psychiatric disorder, any type of epilepsy, for instance Parkinson's disease, patient's unwillingness to respond to questionnaires.

III. Statistical Analysis

Kruskal-Wallis' statistics followed by Dunn's test, were used to evaluate significance when comparing age in the subgroups. Fisher's exact test was used to analyze data when comparing frequency of certain pain descriptors in pairs of subgroups. Significance was accepted if $p < 0,05$.

IV. Outcome

This investigation retrospectively evaluated subgroups of TMJ-IDs subjects with bilateral capsulitis (Bil CAP, n=30), bilateral retrodiscitis (Bil RP, n=30), bilateral disk-attachment pain (Bil DAP, n=32), bilateral arthralgia (Bil ART, n=23), bilateral osteoarthritis (Bil OA, n=20) and a control group (n=60). There were 28 females (93,3%) and 2 males (6,7%) in the Bil CAP subgroup, 28 females (93,3%) and 2 males (6,7%) in the Bil RP subgroup, 32 females (100%) in the Bil DAP subgroup, 22 females (95,6%) and 1 male (4,4%) in the Bil ART subgroup, 20 females (100%) in the Bil OA subgroup and 46 females (76,7%) and 14 males (23,3%) in the Control subgroup. Mean age, standard deviation and range in these subgroups are described as follows: Bil CAP (30, 8,9, 17-47); Bil RP (33,4, 12,5, 11-60); Bil DAP (33,2, 10,5, 17-51); Bil ART (43, 10,5, 17-51); Bil OA (46,4, 9,3, 16-70); Controls (34,2, 15,0, 16-70). Kruskal-Wallis and Dunn' statistics ($p < 0,0001$): Bil CAP versus Bil ART ($p < 0,01$); Bil CAP versus Bil OA ($p < 0,001$); Bil RP versus Bil OA ($p < 0,01$); Bil DAP versus Bil ART ($p < 0,05$); Bil DAP versus Bil OA ($p < 0,01$); Bil OA versus Controls ($p < 0,01$). See Table 1 for further details.

Dull was the most common descriptor used by subjects (n=29/30=96,7%) in the Bil CAP subgroup whereas dull (14/30=46,7%) and dull aching (15/30=50%) were the most common descriptors in the Bil RP subgroup. This probably means that dull (Bil CAP) and dull + aching (Bil RP) are the most common descriptors used in the two early stages of TMJ-IDs. Most subjects (26/32=81,3%) used dull, shooting and sharp to describe pain in the Bil-DAP subgroup. Six subjects or 18,7% described pain as dull, throbbing, shooting and

sharp in such group. As for subjects in the subgroup with Bil ART (n=23), they presented a complex combination of descriptors as follows: Burning (7/23=30,4%), dull, throbbing, sharp and burning (6/23=26,1%), dull burning (5/23=21,8%), dull, sharp and burning (4/23=17,4%), and dull, throbbing and burning (1/23=4,3%). Regarding subjects in the Bil OA subgroup (n=20), 17/20=85%, described pain as dull, 2/20=10% as dull and burning and 1/20=5% as dull, sharp and burning. See Tale 2 for additional details.

Some descriptors were compared in pairs of subgroups to evaluate the significance of the difference using Fisher's exact test. Follows, pain description in pair of subgroups and significance: Frequency of **dull aching pain** in bilateral retrodiskal pain 15/30=50% versus bilateral disk-attachment pain 0/32=0%, (p<0,0001); in bilateral retrodiskal pain 15/30=50% versus bilateral arthralgia 0/23=0%, (p<0,0001); in bilateral retrodiskal pain 15/30=50% versus bilateral osteoarthritis 0/20=0%, (p<0,0001). Frequency of **dull, sharp and shooting pain** in bilateral disk-attachment pain 26/32=81,3% versus bilateral capsulitis 0/30=0%, (p<0,0001); in bilateral disk-attachment pain 26/32=81,3% as compared with bilateral retrodiskal pain 0/30=0%, (p<0,0001); in bilateral disk-attachment pain 26/32=81,3% versus bilateral arthralgia 7/23=30,4%, (p<0,0001). **Burning pain description** in bilateral arthralgia 7/23=30,4% versus bilateral capsulitis 0/30=0%, (p<0,001); in bilateral arthralgia 7/23=30,4% versus bilateral retrodiskal pain 0/30=0%, (p<0,001); in bilateral arthralgia 7/23=30,4% versus bilateral osteoarthritis 3/20=15%, (p=0,29); in bilateral arthralgia 7/23=30,4% versus bilateral disk-attachment pain 0/32=0%, (p<0,001). See Table 3 for additional details.

V. Discussion

1. Pain description in capsulitis and synovitis (B il CAP):

Pain in capsulitis and synovitis of the TMJ results from inflammation of the synovial membrane and fibrous capsule^[11] as anatomically, such structures are located very close to each other in such a way that certain types of trauma affect both structures which respond with the release of inflammatory mediators, leading to inflammation and pain. Inflammation of the joint capsule and synovial membrane is the result of both macro and micro-traumatic events^[12] which alters the physiology and histology of the local tissues. Inflammation of the capsular ligament may manifest as swelling and pain described as continuous and localized to the joint. Any movement that stretches the joint capsule may cause pain, discomfort and limitation of jaw movements^[13].

In the current study most patients described joint pain from capsulitis/synovitis of the TMJ as continuous, mild, dull and aching, increasing in severity and/or elicited by jaw movements. Thus, this outcome is reinforced by one investigation^[11] and discussion of clinical cases demonstrating that capsulitis and synovitis of the TMJ are described as episodes of pain more or less continuous, steady, dull, aching and located in the preauricular area. Capsulitis and synovitis of the TMJ may also manifest as a restricted inflammatory process in the fibrous capsule and synovial membrane of the TMJ with minimal anatomical damage to those structures more frequently as a result of micro-trauma. One investigation^[9] contends that a dull aching pain usually indicates a chronic process in the TMJ. Pain at rest which increases during joint function or after loading the TMJ is one of the main symptoms of capsulitis and synovitis of the TMJ^[14]. TMJ pain from inflammation of the joint capsule and synovial membrane may be elicited and/or increases during jaw movements and is usually described as dull, occasional, continuous or cyclic^[15]. Inflammation of the joint capsule may manifest as local swelling and pain described as continuous, localized to the joint which increases in intensity with stronger jaw movements^[13].

Some researchers^[16] use different terms to describe pain in the TMD including dull, aching, throbbing and sharp. However, these different descriptors are used to describe the many types of pain which occur in the TMJs without specifying the type of TMJ-ID. Capsular inflammation may occur because of distraction of capsular ligaments. Capsulitis is characterized by inflammation of the adjacent synovial membrane. The pain is continuous, localized and there is tenderness to palpation of the joint capsule externally^[17].

2 Pain description in subjects presenting with diagnosed retrodiscitis pain

The retrodiskal tissue is constituted by all those anatomical structures located posteriorly in relation to the posterior band of the joint disc. These structures are richly innervated and endowed with abundant blood vessels. Further, nerve fibers or branches from the auriculotemporal nerve from the third division of the fifth cranial nerve can be found profusely posteriorly to the joint disc. Because occlusal interferences, micro-trauma from parafunctional behaviors and other etiological agents usually cause anterior displacement of the joint disk, pressure on the retrodiskal structures from a displaced condyle is a common mechanism responsible for retrodiskal pain. These assumptions are consonant with one study^[18] indicating that posterior displacement of the joint condyle causes excessive loading on the retrodiskal tissues resulting in injury, inflammation and joint pain reported by patients in the preauricular area. Constant or intermittent pressure by the head of the

condyle on the retrodiscal tissue endowed with abundant blood vessels and nerve endings can lead to inflammation and pain described as continuous^[14].

Most patients in the current study described pain as mild, intermittent, dull, and aching. A few patients reported that occasionally, the pain was shooting or sharp, lasting for a short period of time. Thus, data in the current study is in line with clinical studies^[11] reporting that pain in retrodiscitis of the TMJ is described as mild, intermittent, dull and aching. Retrodiscitis is inflammation and degeneration of the retrodiscal tissues following excessive force or pressure on well innervated and vascularized structures. Pain is described as dull and may be reproduced during clenching in the maximal intercuspal position^[17]. Further, in retrodiscitis, pain is described as continuous and increases in intensity when the jaw is moved to the affected side^[14].

2. In intermediate stages of TMJ-ID (disk-attachment pain), subjects described pain as shooting, sudden, stabbing, sharp and occasionally as dull aching.

All patients with disk-attachment pain in the current investigation described pain as intense, shooting, stabbing or sharp occurring mainly during function. Many patients also described pain as dull and aching. This is so as disk attachment-pain is a disorder that occurs associated with capsulitis/synovitis, retrodiscitis, disk displacement with reduction and reciprocal clicking. Thus, the description of disk - attachment pain in the current study is similar as compared with another investigation^[14] asserting that pain in the soft tissues of the non-inflammatory joint represent a sharp, sudden, intense pain that is closely related to joint movements (for instance, mouth opening). Disk-attachment pain occurs as a result of excessive pressure, tension, strain and inflammation on the attachments that hold the disk in position providing proper coordination during jaw movements. This is so as such TMJ pain may result from damage to the ligaments or disk-attachments of the joint between the skull (temporal bone) and the head of the mandible^[9]. The outcome in the current study is also in line with one investigation^[16] indicating that pain in patients with TMDs is described as aching, deep, sharp and variable in intensity^[16].

Because disk-attachment pain (DAP) is characterized by reciprocal clicking and more severe pain and the joint disk is usually displaced and deformed, displacement and deformation are more likely to facilitate physical contact with structures that usually are not involved in jaw movements (for instance, nerves and blood vessels). Thus, if contact or pressure against nerve endings occurs, one may expect a greater frequency of pain described as shooting, sharp, stabbing as a result of subtle damage from pressure on those structures. In other words, certain types of disk displacement are more likely to expose some branches of nervous structures to physical contact and or compression, more specifically during jaw movements. These assumptions are in line with other studies^[19] indicating that pain can be described in different words which have diagnostic implications in TMJ-IDs, for instance, sharp, shooting or stabbing which indicate nerve compression. Further, those researchers^[19] evaluated diverse types of orofacial pains and although they did not describe the mechanism implicated in the description of pain, they reported that TMJ pain is usually described as mild, moderate, severe, aching and sharp. TMJ-IDs patients with Bil-DAP frequently use the descriptions "severe, aching, sharp and shooting" to describe Bil-DAP. It may be that in TMJ-IDs when disk displacement progressed to disk-attachment pain, the anatomic incongruency between the joint condyle, disk and other structures is such that during certain jaw movement, there is anatomic contact with certain structures not adapted to withstand compression or repetitive touch. In this regard, one investigation^[15] indicates that the medially displaced disk may during jaw opening movement, directly damage the mandibular nerve or its branches at the oval foramen level by exerting intermittent compression, traction or friction. In this case, the nerve reaction may mimic neuropathic pain associated with the creation of false synapses.

Even though Ivkovic and Racic^[14] did not relate pain description with a specific TMJ-ID stage, their study indicates that joint pain from the soft-tissue structures, disc ligaments, retrodiscal tissue and joint capsule, may be described as sharp, sudden and intense usually related with jaw movements. This pain type only occurs when there is compression or anatomic contact with nociceptors and may be considered as a less intense neuropathic pain because it correlates with the presence of damage in the peripheral branches^[15] of the third division of the trigeminal nerve, most likely, from the auriculotemporal nerve which sends branches to the posterior and medial regions of the TMJ. Further, "in many patients with TMJ-IDs, and neuropathic pain, the medially displaced disk during jaw-opening movement may directly damage the mandibular nerve or its branches at the oval foramen level by exerting intermittent compression, traction or friction"^[15]. Some researchers defend the notion that pain in the TMJ may be described as dull, aching, throbbing, sharp, continuous, intermittent, mild or moderate. However, in this case, such descriptors constitute terms used by patients to describe most types of TMJ-IDs, rather than a specific TMJ-ID stage, for instance burning in the case of TMJ arthralgia or shooting in the case of disk-attachment pain (DAP). Pain from the soft tissue structures of the non-inflammatory joint represents a sharp, sudden and intense pain that is closely related to joint movements during function^[14], for instance, speech, chewing, jaw movements during BB and so on.

Sharp, shooting, intense and sudden pain in disk-attachment pain closely resembles pain associated with neuropathic disorders. Any pain described as sharp, shooting usually indicates nerve compression.^[9]

3. Arthralgia patients described pain as burning, dull, aching, occasionally shooting.

In the current study all subjects diagnosed with arthralgia, used burning and other burning associated terms to describe pain.. Thus, burning is a descriptor used by patients with arthralgia or by those in early stages of TMJ-OA. In the current study, the burning description was also used to differentiate Bil arthralgia subjects from those with OA, DAP and even disk displacement without reduction. Findings in the current study are in line with one investigation^[20] about TMDs, asserting that TMD pain is usually described as aching, sharp, jabbing and sometimes burning. Additionally, Wright and North^[21] reviewed management and treatment of TMDs and asserted that the quality of TMJ pain is generally an ache, pressure or dull pain but sometimes may be described as a burning sensation. The low frequency of a burning description used by patients with TMJ-IDs is the result of a low frequency of both, TMJ-arthralgia and TMJ--OA.

The frequency of arthralgia of the TMJ is relatively low probably in the range of 10%-15% according to previous studies on the frequency of TMJ - IDs^[3]. Thus, in TMJs-IDs subjects we must expect a low frequency of pain described as burning as such description is used only by subjects presenting with arthralgia pain and probably by some with early osteoarthritis of the TMJ. Congruent with these assumptions, one investigation^[11] evaluated the relationship between tinnitus and TMDs. Researchers assessed a group of 164 patients with TMDs reporting that only 16% of the TMDs sample described pain as burning. The outcome in the current investigation is also in line with the study carried out by Molina and coworkers^[3]. These researchers evaluated a subgroup of TMD patients and reported that 100% of the sample they evaluated described pain as burning and 80% as severe. Further, and consonant with the outcome in the current investigation, one study^[11] asserted that pain in arthralgia is the result of "traumatic proliferation of synovial membrane with inflammation onto the articular surfaces and degeneration of avascular fibrous tissue from the articular surfaces which are no longer protective with the subsequent exposition of underlying innervated and vascular osseous tissue". Pain in these conditions is described as dull, aching and sometimes as a persistent burning sensation^[11]. TMJ arthralgia may be due to inflammation and/or degeneration of the joint structures^[22]. The pain may be elicited by chewing food, jaw movements that press upon, irritate or rub the inflamed articular tissues^[11].

It may be that the description of burning in TMJ arthralgia indicates selective neuroanatomical destruction of some micro-areas within the TMJ associated with a specific TMJ-ID. This assumption is echoed by the investigation carried out by Hendler^[9]. This researcher evaluated differential diagnosis of facial pain from various sources and reported that description of pain is of great importance in the differential diagnosis. Further, he asserted that some patients describe their pain as burning which indicates damage to small unmyelinated C fibers which are susceptible to compression, infection or chemical irritation. C fibers are mostly found in superficial organs, such as the skin and in other somatic structures including muscles and joints. Stimulation of C- fibers usually lead to a poor localized, dull pain sensation. Both mechanical and biochemical factors are involved in the mechanisms of peripheral nerve compression. Pain sensations arise from the peripheral nervous system as a result of structural damage to the nerve and also from sensitization^[23]. Prolonged inflammation (as is the case in TMJ arthralgia) that lasts beyond the expected period of healing, is typically mediated by C-fibers^[24]. C fibers can be found in the skin, muscles and joints and when stimulated result in poor pain localization and dull pain sensation^[24]

4. Subjects with TMJ-OA described their pain more frequently as dull

In the current investigation, some patients with TMJ-OA described pain as mild, moderate and severe, dull, aching, sometimes sharp and rarely burning. This varied description probably represents different sub-stages or populations with the disorder at the time of examination. In this regard, it has been reported that TMJ-OA is characterized by the presence of at least 3 different populations^[25] and this may be associated with different pain descriptions. Partially supporting the outcome in the current study, one investigation^[26] about rheumatoid arthritis with TMJ involvement, describes a clinical case in which during clinical examination the patient described a dull preauricular pain occurring more frequently during function. OA pain is described as very intense especially during function, constant and well localized. OA pain is related to the secondary inflammation of the synovial joint membrane^[14].

TMJ-OA patients complain of dull, deep, constant, mild, moderate or severe pain in the preauricular area which increases during jaw function^[3]. They usually describe pain as dull aching, but their pain may have a occasional sharp component during jaw movements^[26]. This varied description is probably related to the presence of capsulitis/synovitis (dull, aching) and pressure on nervous fibers as a result of disk displacement and anatomic incongruity between the head of the mandible and the displaced and deformed disk. In some OA patients, pain may be the result of inflammation in the joint capsule and synovial membrane, deterioration of the cartilage and bone and sometimes from pressure on nervous branches of the

auriculotemporal nerve. This most likely occurs in transitional stages of TMJ-OA. These assumptions are partially supported by one study^[17] indicating that TMJ-OA is sometimes associated with a secondary inflammation, for instance, capsulitis and synovitis. Ruparella and associates^[26] in their case report of a patient with OA and rheumatoid arthritis describe patient's pain using the descriptors continuous, very intense, and dull occurring in the preauricular pain during function.

Because bilateral OA patients in the current study described pain as dull (85%) and some as burning (10%), data in the current study contradict information from one investigation^[27] asserting that more intense, sharp, stabbing pain and less intense dull aching pain, occur following injury to the cartilage in OA of the TMJ. This duality of data may be clarified as follows: if we include arthralgia as one sub-stage of OA rather than as an independent stage, the description of pain according with our data would be: dull, burning, dull and sharp and dull and burning. Bell's studies^[11], for instance, consider arthralgia of the TMJ as an early stage of OA rather than as an independent one as we did in the current investigation.

5. In early stages of TMJ-IDs pain was described as dull or dull aching, in intermediate stage of TMJ-IDs pain was described more frequently as sudden, shooting, sharp or stabbing whereas in a late stage of TMJ-IDs (bilateral arthralgia=Bil ART), burning was the most common descriptor used by subjects in such subgroup. It is very likely that this change in description from one stage to another, represents correlates of neuroanatomical and biomechanical transitions representing disk derangements associated with **abnormal position**, displacement, and **neuroanatomical damage to nerve terminals** that process peripheral information about pain in the TMJ. Of particular interest is the "sharp, shooting, sudden and stabbing" description which was reported by all subjects with Bil DAP and by some subjects diagnosed with Bil ART, probably pointing to a more defined neuropathic component of pain in those TMJ-IDs. Thus, if we accept that sharp, shooting or stabbing pain indicates a nerve behavior signaling biomechanical damage to the nerve, then we have to accept that the transition from disk-attachment pain to arthralgia in TMD-IDs is one characterized by significant damage to the nerve and a differential neuroanatomical nerve response in the form of "sharp, shooting or stabbing pain".

Deformation, changes in velocity of displacement, pressure distention and distortion occur in some anatomic areas of the TMJ in subjects with TMJ-IDs. These phenomena stimulate proprioceptive and nociceptive adaptation by joint receptors which transmit nociceptive and proprioceptive information. The larger myelinated A-delta fibers are primarily specialized in the detection and signaling of nociceptive information such as pressure and mechanical distortion whereas the smallest and unmyelinated C fibers are involved in detecting and signaling noxious heat, mechanical and chemical stimuli^[27]. It is known that the skeleton is innervated by a set of nociceptors and that many skeletal pains including those in the joints have a nociceptive and a neuropathic component. Regarding the TMJ, there is scarcity of studies about a neuropathic response in those neurons that innervate such structure.

In a very restricted anatomical space such as that in the TMJ, any damage to the joint disk causes displacement, movement distortion and deformation, leading to inflammation and pain. In this regard^[27], A-delta and C fibers function as mechanotransducers which constitute ion channels that detect mechanical stimuli such as stretching and pressure. Significant movement or deformation of the joint disk is very likely to stimulate A-delta and C fibers which process a nociceptive response translated in higher center as "sharp, shooting or stabbing pain". On the other hand, dull aching pain following injury (as that present in retrodiskal TMJ pain) is probably processed by unmyelinated C-fibers^[28]. In line with this set of considerations, one investigation^[29] indicates that in some cases of TMJ disk displacement, mechanical irritation of branches of the mandibular nerve innervating the TMJ may cause compression and irritation which could explain the sharp, shooting, stabbing pain felt locally in the affected TMJ. Regarding C nociceptive fibers, there is evidence that neuropathy in these fibers manifest in a variety of diseases and often results in symptoms of burning pain, shooting pain and allodynia^[30]. To conclude, the dull and dull aching pain which was described by subjects in early stages of TMJ-IDs is processed by the small unmyelinated C afferent fibers whereas the pain described as sharp, shooting, intense and stabbing (as in the case of Bil DAP) is transmitted by the larger myelinated A delta fibers.

Disk attachment pain is related to intense pain, disk displacement, deformation, pressure and distortion, factors which may contribute to disabling pain. Mechanical distortion during jaw movements may activate mechanotransducers leading to sharp, shooting and stabbing pain which is processed by myelinated A-delta fibers^[27].

VI. Conclusion

Based on the retrospective review of clinical records allocated by the type of TMJ-ID and backed by the current literature on the subject, it is concluded that:

1. Most subjects with TMDs-ID diagnosed with capsulitis/synovitis and retrodiscitis of the TMJ described pain as continuous (capsulitis/synovitis), intermittent, mild or moderate, and dull, aching (retrodiscitis) located in the preauricular area which increases in severity and is elicited by jaw movements. In transitional stages from retrodiscitis to disk-attachment pain some patients may describe TMJ pain as shooting or sharp.

2. Disk-attachment pain subjects describe TMJ pain as sudden, more intense, sharp, shooting or stabbing. This type of pain correlates well with the presence of reciprocal clicking and progressive decrease in jaw opening;

3. Description of TMJ pain based on literature review in the current study usually report terms more likely to describe different stages of TMJ-IDs rather than a specific stage of TMJ-IDs.

4. Pain in TMJ arthralgia is described as burning, a term which is used in differential diagnosis. Other used terms include aching, sharp and jabbing because of the influence of previous stages of TMJ-IDs.

5. Subjects with TMJ- OA describe pain as mild, moderate or severe, dull, aching, sometimes sharp and rarely burning.

6. Regarding use of these terms for diagnostic purposes, even though dull, aching are used in many stages of TMJ-IDs, they are used more frequently in early stages.

7. A description of sharp, shooting or stabbing and sudden, are characteristics of disk--attachment pain whereas burning is a typical description of arthralgia or of an early stage of TMJ-OA. Because TMJ-OA includes some sub-stages, there is a richness of descriptors in this disorder including dull, aching, mild, moderate or severe, sharp and sometimes burning.

New studies on this field are welcome and would be extremely useful to better define the descriptive characteristics of TMJ-IDs.

8. Because the terms dull, dull and aching, sharp, shooting or jabbing, burning, dull and other descriptors were used more frequently by the subgroups presenting with Bil CAP, Bil RP, Bil DAP, Bil ART and Bil OA, respectively, there is no doubt that there is a correlation between these descriptors, disk displacement, inflammation and degeneration. Thus, to a certain extent, pain descriptors are the counterpart of TMJ disc pathology including displacement, compression, injury and damage to such a structure.

References

- [1]. Wright EF, Bifao SL. The relationship between tinnitus and temporomandibular disorders (TMDs) therapy. *Int Tinnitus J*. 1997; 3: 55-61.
- [2]. Romero NM, Uyanik JM. Orofacial pain management, current perspectives. *J Pain Res* 2014; 7: 99-115.
- [3]. Molina OF, Aquilino RN, César EW, Cury SE, Marçal RL, de Miranda M. TMJ Arthralgia: a rarely described internal joint derangement and characterization regarding factors of age, pain description and prevalence in craniomandibular disorders individuals (CMDs). *Cadernos UNIFOA* 2010; 14:71-81.
- [4]. Barkin S, Weinberg S. Internal derangements of the temporomandibular joint. The role of arthroscopic surgery and arthrocentesis. *J Association Dentaire Canadienne*. 2000; 66: 199-203.
- [5]. Wilkes C. Internal derangements of the temporomandibular joint. Pathological variations. *Arch Otolaryngol Head Neck Surg* 1989; 115; 469-77.
- [6]. Zakrzewska JM. Multidimensionality of chronic pain of the oral cavity and face. *J Headache Pain* 2013; 14: 37-47.
- [7]. Young AL. Internal derangements of the TMJ: a review of the anatomy diagnosis, management. *J Indian Prosth Soc* 2015; 15: 21.
- [8]. Shaffer SM, Sizr PF, Brismée JM, Courtney CA. Temporomandibular Disorders, Part 1: Anatomy, examination, and diagnosis. *J Manual Manip Ther* 2014; 22: 2-12. Hendler N. Facial pain from various source - diagnoses and differential diagnoses. *Oral Craniofac Res* 2017; 3: 1-5.
- [9]. Ghazal F, Ahmad M, Elrawy H, Said T. Zeroing in on the cause of your patient's facial pain. *J Fam Pract* 2015; 64: 524-31.
- [10]. Bell WE. Orofacial Pains: Classification, diagnosis, management. Year Book Medical Publishers, Chicago, Fourth Edition, p. 1-448.
- [11]. Laplanche O, Ehrmann E, Pedeutour P., Duminil G. TMD clinical diagnostic classification (Temporomandibular Disorders). *Dentofac Anorm Orthodont* 2012; 15: 1-
- [12]. Herb K, Cho S, Stiles MA. Temporomandibular joint pain and dysfunction. *Curr Pain Headache Rep* 2006; 10: 408-14.
- [13]. Ivkovic N, Racic M. Structural and functional disorders of the temporomandibular joint. *Intechopen* 2018; 2018: 1-26.
- [14]. Pedulláh E, Cascone P, Garufi A, Mandalá ML, Blandino A, Cascone P. Neuropathic pain in temporomandibular joint disorders: Case control analysis by MRI. *Am J Neuroradiol* 2009.; 30: 1414-18.
- [15]. Zakrzewska JM. Differential diagnosis of facial pain and guidelines for management. *Brit J Anaesthesia* 2013; 11: 95-104.
- [16]. Morazavi SH, Motamedi M, Navi F, Pourshahab M, Bayanzadh S, Isapour . Outcome of management of early temporomandibular disorders. *Natl J Maxillofac Surg* 2010; 1: 108-11.
- [17]. Gustin S, Peck CC, Cheney LB, Macey FM, Murray G, Henderson LA. Pain and plasticity: Is chronic pain always associated with somatosensory cortex activity and reorganization. *J Neurosci* 2012; 32: 14874-884.
- [18]. Tait RC, Ferguson M, Herndon CM. Chronic orofacial pain: Burning mouth syndrome and other neuropathic disorders. *J Pain Management Med* 2017; 3: 1-14.
- [19]. Nelson D, Landau WM. Jaws: Diversities of gnathological history and temporomandibular joint enterprise. *J Neurol Neurosurg Psychiatry* 1999; 67: 141-47.
- [20]. Wright E, North S. Management and treatment of TMDs: A clinical perspective. *J Manip Ther* 2009 17: 247-54.
- [21]. Harrison AL, Thorp JN, Ritzline P. A proposed diagnostic classification of patients with temporomandibular disorders: Implications for physical therapy. *J Orthop Sports Phys Ther* 2014; 44: 181-96.

[22]. Boulu P, Benoist M. Recent data on the pathophysiology of nerve root compression and pain. Rev Rheum Engl Ed 1996; 63: 358-63.

[23]. Yam MF, Loh YC, Tan CS, Ada SK, Manan NA, Basir R General pathways of pain sensation and the major neurotransmitter involved in pain regulation. Int J Mol Sci 2018; 19: 1-23.

[24]. Pullinger G, Seligman DA. TMJ osteoarthritis: A differentiation of diagnostic subgroups by symptom history and demographics. J Craniomand Dis Facial Oral Pain 1987; 1: 251-56.

[25]. Ruparelia PB, Shah DS, Ruparelia K, Sutaria SP, Pathak D. Bilateral TMJ involvement in reumatoid arthritis. Hindawi Publishing Corporation 2014; 2014 : 1-5.

[26]. Mantyh PW. The neurobiology of skeletal pain. Eur J Neurosci 2014; 39: 508-19.

[27]. Martin CD, Jiménez-Andrade JM, Ghilardi JR, Mantyh PW. Organization of an unique net-like meshwork of CGRP + sensory fibers in the mouse periosteum. Neurosci Lett 2007; 427: 148-52.

[28]. Johansson AS, Isberg A, Isacsson G. A radiographic and histological study of the topographic relation in the temporomandibular joint region: Implications for a nerve entrapment mechanism. J Oral Maxillofac Surg 1990; 48: 953-61.

[29]. Hovaguimian A, Gibbons CH. Diagnosis and treatment of pain in small fiber neuropathy. Curr Pain Headache Rep 2011; 15: 193-200

Table 1: Social and demographic data in subgroups of TMDs subjects presenting with bilateral capsulitis (Bil CAP), bilateral retrodiskal pain (Bil RP), bilateral disk-attachment pain (Bil DAP), bilateral arthralgia (Bil ART), bilateral osteoarthritis (Bil OA) and controls with no TMDs (Controls).

	Bil CAP n=30		Bil RP n=30		Bil DAP n=32		Bil ART n=23		Bil OA n=20		Controls n=60	
GENRE	n	%	n	%	n	%	n	%	n	%	n	%
Females	28	93,3	28	93,3	32	100	22	95,6	20	100	46	76,7
Males	2	6,7	2	6,7	0	0	1	4,4	0	0	14	23,3
Totals	30	100	30	100	32	100	23	100	20	100	60	100
AGE												
Mean	30		33,4		33,2		43		46,4		34,2*	
SD	8,9		12,5		10,5		10,5		9,3		15,0	
Range	17-47		11-60		17-51		17-51		16-70		16-70	

* Kruskal-Wallis and Dunn' statistics (p<0,0001): Bil CAP versus Bil ART (p<0,01); Bil CAP versus Bil OA (p<0,001); Bil RP versus Bil OA (p<0,01); Bil DAP versus Bil ART (p<0,05); Bil DAP versus Bil OA (p<0,01); Bil OA versus Controls (p<0,01).

Table 2: Different descriptors used by five subgroups of TMDs subjects with different TMJ-IDs.

	Bil CAP n=30		Bil RP n=30		Bil DAP n=32		Bil ART n=23		Bil OA n=20		Controls n=60	
Frequently used descriptors	n	%	n	%	n	%	n	%	n	%	n	%
Dull	29	96,7	14	46,7					17	85	0	0
Dull throbbing	1	3,3									0	0
Dull aching			15	50							0	0
Dull boring			1	3,3							0	0
Dull shooting sharp					26	81,3					0	0
Dull throbbing shooting sharp					6	18,7					0	0
Burning							7	30,4			0	0
Dull throbbing burning							1	4,3			0	0
Dull throbbing sharp burning							6	26,1			0	0
Dull burning							5	21,8	2	10	0	0
Dull sharp burning							4	17,4	1	5	0	0

Table 3: Comparison of frequencies of certain pain descriptors in different pairs of subgroups and level of significance.

DESCRIPTORS PAIR OF SUBGROUPS FREQUENCIES P-VALUE SIGNIFICANT?
TMD-IDs stages p-value Significant?
(Fisher's exact test)

Dull aching	Bil RP 15/30	Bil DAP 0/32	0,0001	Yes
	Bil RP 15/30	Bil ART 0/23	0,0001	Yes
	Bil RP 15/30	Bil OA 0/20	0,0001	Yes
Dull, sharp, shooting	Bil DAP 26/32	Bil CAP 0/30	0,0001	Yes
	Bil DAP 26/32	Bil RP 0/30	0,0001	Yes
	Bil DAP 26/32	Bil ART 6/23	0,0001	Yes
Burning	Bil ART 7/23	Bil CAP 0/30	0,001	Yes

The importance of pain description in temporomandibular joint internal derangements: A ..

	Bil ART 7/23	Bil RP 0/30	0,001	Yes
	Bil ART 7/23	Bil OA 3/20	0,29	No
	Bil ART 7/23	Bil DAP 0/32	0,001	Yes