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TMDS - From an Orthodontist's Perspective: An Overview

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Abstract

Temporomandibular disorders (TMDs) are multifactorial with a degree of psychogenic influence, causing discomfort of the temporomandibular joint (TMJ). A comprehension of the etiopathogenesis and full treatment of TMDs is far from being achieved, and clinicians must take into account this consideration when treating patients with temporomandibular disorders. Although numerous treatments have been advocated, the complex nature of TMDs requires a multidisciplinary team approach. TMDs cannot be treated fully but the adverse effect can be minimized.

Keywords: TMJ, TMDs

Introduction

Temporomandibular joint (TMJ) is a Compound, Synovial, Ginglimo-arthroidal, bicondylar, Epsoidal joint that allows complex movement in day to day life. TMJ is the joint between the condylar head of the mandible and the mandibular fossa of the Temporal bone. Any alteration in the TMJ have a strong impact on function, esthetic and structural balance of the dentition as well as the overall facial structures.

The temporomandibular disorders (TMDs), according to the American Academy of Orofacial Pain, is a collective

term for a group of musculoskeletal and neuromuscular conditions which include several clinical signs and symptoms involving the muscles of mastication, TMJ and associated structures.[1] Dr James Costen was the first to recognize signs and symptoms of temporomandibular disorders.[2]

The three main functions of TMJ[3]:

1. Its role in the act of mouth opening.
2. Its role in dental articulation or functional occlusion.
3. Its growth function and the effects of subsequent degeneration or breakdown that might occur under pathologic conditions.

Etiological factors of TMDs

The etiology of TMDs is usually considered multifactorial, so it manoeuvred by skilled dental personale (Figure 1) and the signs and symptoms of TMDs increase with age, particularly during adolescence.[4] Etiological factors[5-8] and Etiopathogesis[9] are shown (Table 1; Figure 2).

The prevalence of moderately severe to severe TMDs has been found to be about 20% to 30%, whereas the treatment need seems to be about 5%.[10,11] Egemark-Ericson, Carlson and Ingervall noted that the prevalence of symptoms increased from 30% to 60% between 7 and 15 years and symptoms tend to be more prevalent in females than in males.[12]

Various malocclusions have been associated with TMDs signs or symptoms[13-14] (eg class II and distal molar occlusions; anterior open bites and non-working side contacts; class III; crossbites; and deepbites). It is far more common in females to the point that only females are reported in some studies (Landi[15] Miller[16]).

The muscles that act on the TMJ are innervated by the mandibular nerve (Cranial Nerve V), the facial nerve (Cranial Nerve VII), C 1, C 2 and C 3.[17]

Diagnostic methods (Table 2)

The most common Biomarkers for TMDs are TNF and TNFR2.

Discussion

TMDs and Malocclusion: The cause effect relationship between TMDs and malocclusion is multifaceted, although the correlations that have been reported between TMDs and the various malocclusion types are quite low.

Malocclusion is one of the most common causes of craniomandibular disorders.[19] Dibbets et al. found that those teenagers who developed symptoms of TMDs had a different facial form or appearance to those who did not. They were having longer faces and were more skeletally class II.[20]

In contrast Schellhas and co-workers said that if orthodontics was undertaken for some Class II division 1 patients, the mechanics could exacerbate a pre-existing internal derangement by applying forces to the joint possibly causing condylar necrosis.[21] Deep bites tend to be more common among subjects without TMDs.[22]

TMDS and orthodontic treatment: The situation prior to 1988 as concluded by Gianelly, who suggested that the evidence indicating that orthodontics had caused long-term sequel of TMDs was based largely on anecdotal reports, but recently because of more severe criteria and better evidence the results become reliable.[23]

Sadovsky and Be Gola[24] couldn't find statistically significant difference between the treated and untreated subjects and they concluded that orthodontic treatment with fixed appliances in adolescence doesn't increase the risk of TMDs.

Henrikson and Nilner[25] compared 11-15 year old, treated and untreated female subjects with class II division 1 malocclusions, defined as having uni- or bilateral class II relations of at least half a cusp. They found that subjects with normal occlusions had the lowest prevalence of

TMDS signs when compared with those with treated or untreated class II division 1 malocclusions, who always had a higher prevalence of TMDs signs/symptoms. Treated class II division 1 patients had a lower prevalence of TMDs signs/symptoms than untreated subjects with a similar malocclusion.

Orthodontic treatment is often sought by patients to enhance the psychological and social well-being through improvement in the alignment of the dentition.[26] There seems to be always a significant degree of controversy regarding the relationship of TMDs and orthodontic treatment.[27-28]

The study by Minakuchi[29], whilst not utilising orthodontics as one of the treatment modalities, was noteworthy in terms of principle within the remit of TMDs treatment.

Egemark, Magnusson and Carlsson in their 20-year follow-up study found no statistically significant differences in the prevalence of TMDs signs and symptoms between subjects with or without previous experience of orthodontic treatment.[30]

There were studies[31-33] conducted which evaluated the effects of orthodontic treatment on TMDs, gave heterogeneous results but none of them concluded orthodontic treatment causes TMDs.

Luther et al. found that there is no evidence from trials to show that active orthodontic treatment can prevent or relieve TMDs adding support to teeth not being part of its cause.[34] Lapter concluded that there is no increased risk of TMDs associated with any particular type of orthodontic mechanics.[35]

Chen et al. suggest the use of fixed orthodontic appliances combined with TMJ splint for equilibration of the occlusion throughout the treatment of crossbite combined with significant deviation of the mandible from the rest position to the maximum intercuspation, when the patients present symptoms of TMJ. [36]

Tagkli et al. concluded that orthodontic therapy is not suggested as the initial and only treatment for patients suffering from TMDs although orthodontic treatment diminishes the occurrence of parafunctional activities and restricts the possibility of destroying the dental tissues through bruxism. The orthodontic treatment does not appear to be a notable resource for treating or preventing the onset of signs and symptoms of TMDs. Orthodontic treatment combined with orthognathic surgery affects positively on patients who show TMDs pre-operatively.[37]

The stability of occlusion depends on the position of the teeth, the premolars and their anatomical position, are essential for having efficient mastication as they support the occlusal balance and are central in keeping the vertical dimension of the face morphology.[38]

Sim et al[39] investigated the relationship between orthodontic treatment and TMDs in South Korean population and stated that TMJ pain and dysfunction was not associated with orthodontic treatment.

In patients with sleep bruxism, its etiology is fundamentally from central nervous system; therefore, the discharge splints do not cure it.[40] Splints are effective in preventing the damage that overload generates on the structures of the system, especially in terms of dental protection.[41]

Studies on the consequences of orthodontic treatment on TMDs have shown that such treatment neither increases nor decreases the risk of developing TMDs later in life, and some recent studies have found less prevalent TMDs signs and symptoms in subjects who have received orthodontic treatment, compared with orthodontically untreated subjects.[42]

There is little evidence that orthodontic treatment prevents TMDs, although the role of unilateral posterior

cross-bite correction in children may warrant further investigation. Signs and symptoms of TMDs increase with age, particularly during adolescence, until menopause, and therefore TMDs that originate during orthodontic treatment may not be related to the treatment.[35]

TMDS and extractions in orthodontics: Extraction has been a controversial subject for as long as the specialty of orthodontics has existed.

In a study by Artun J et al[43] on 29 female patients treated for Class II, Division 1 malocclusion it was observed that the mean condylar position was more posterior at right central and medial tomographic sections in patients treated with maxillary first premolar extraction.

In another study by Henrikson et al[44] which involved 65 females, it was concluded that the orthodontic treatment with or without tooth extractions did not increase the risk for TMDs or worsen pre-treatment signs of TMDs.

Management of TMDs in clinical setting[45-46]: (Figure 3; Table 3,4)

Tecco et al.[47] evaluated the use of a fixed orthodontic appliance in treatment of TMDs compared to the use of an intra-oral splint. They concluded that the use of a fixed orthodontic appliance seems to be as efficacious as the use of an AR maxillary splint in the treatment of joint pain and muscle pain, but not in the treatment of joint noise.

Management[48-50] of TMDs problems should emphasize conservative, reversible techniques including modest medication, Ergotherapeutic recommendations, counseling, exercises, physical therapy, Bio-mechanical therapy (Splint therapy) kinetherapy and occlusal splints.

If a patient develop symptoms during treatment the first rule in such case is to stop active orthodontic mechanics immediately; this is both a medico-legal and a practical matter at that point.[51]

Referral to an oral and maxillofacial surgeon should be recommended for patients in whom conservative therapy is ineffective and in those with functional jaw limitations or unexplained persistent pain.[52]

Conclusion

A practioner must always determine if any TMDs symptoms are present as part of the overall diagnostic process. Till now in accordance with the available evidence, the widely accepted conclusion is that orthodontic treatment neither causes nor cures TMDs.

By orthodontic treatment the painful effect of TMDs as well as the worsening of TMJ can be minimized but cannot be fully cured.

As TMDs are a group of complex biopsychosocial chronic illnesses, which may exhibit high placebo response rates to therapy, therefore it is beneficial to consider interdisciplinary approach.

Orthodontic treatment with fixed appliance either with or without tooth extractions did not increase the prevalence of symptoms and signs, or worsen preexisting symptoms and signs of TMDs, but if the patient continues abnormal pressure habits that may lead to TMDs. Lack of evidence to the assumption that orthodontic treatment is associated with the occurrence of TMDS promotes the need for more longitudinal studies with broader aspects.

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Legends Figure and Table

Figure 1: Dental considerations in etiology of TMDs

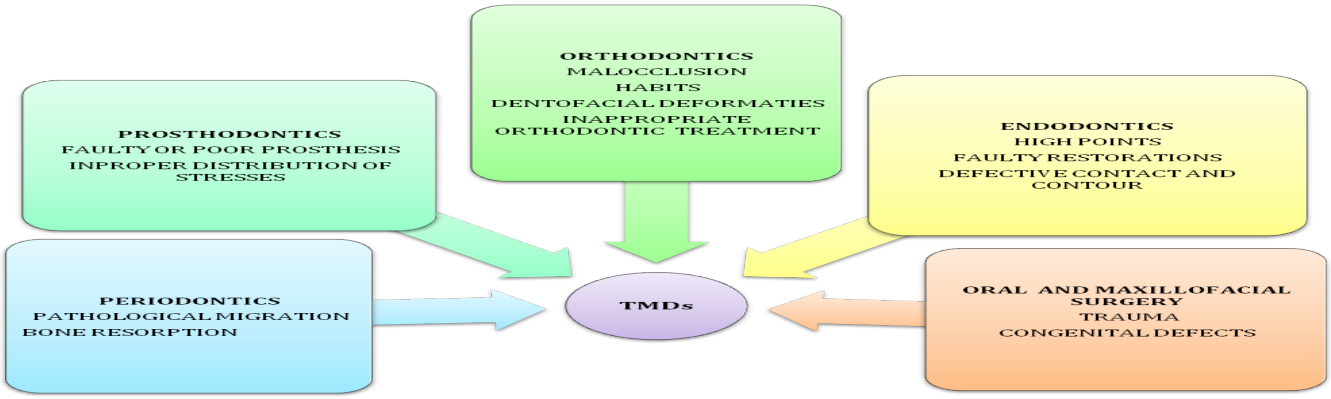

Table 1: Factors leading to TMDs

PREDISPOSING FACTORS	TRIGGERING FACTORS	PERPETUATING/ MAINTAINING FACTORS
•Genetics •Factors of structure (decrease in calibration, Discerosion or improper alignment, Patterns of occlusion and bruxism) •Tissue quality •Systemic diseases (such as rheumatoid arthritis, gout and fibromyalgia, facial typology) •Age	•Trauma: macro and micro level (e.g. injury to the jaw joint, osteoarthritis) •Habits (Bruxism as well as excess ability of articular tolerance)	•Underlying behavioral, social and emotional stresses •Acquired proprio deficiency •Primary or secondary hypersensitivity to pain

Figure 2: Etiopathogenesis

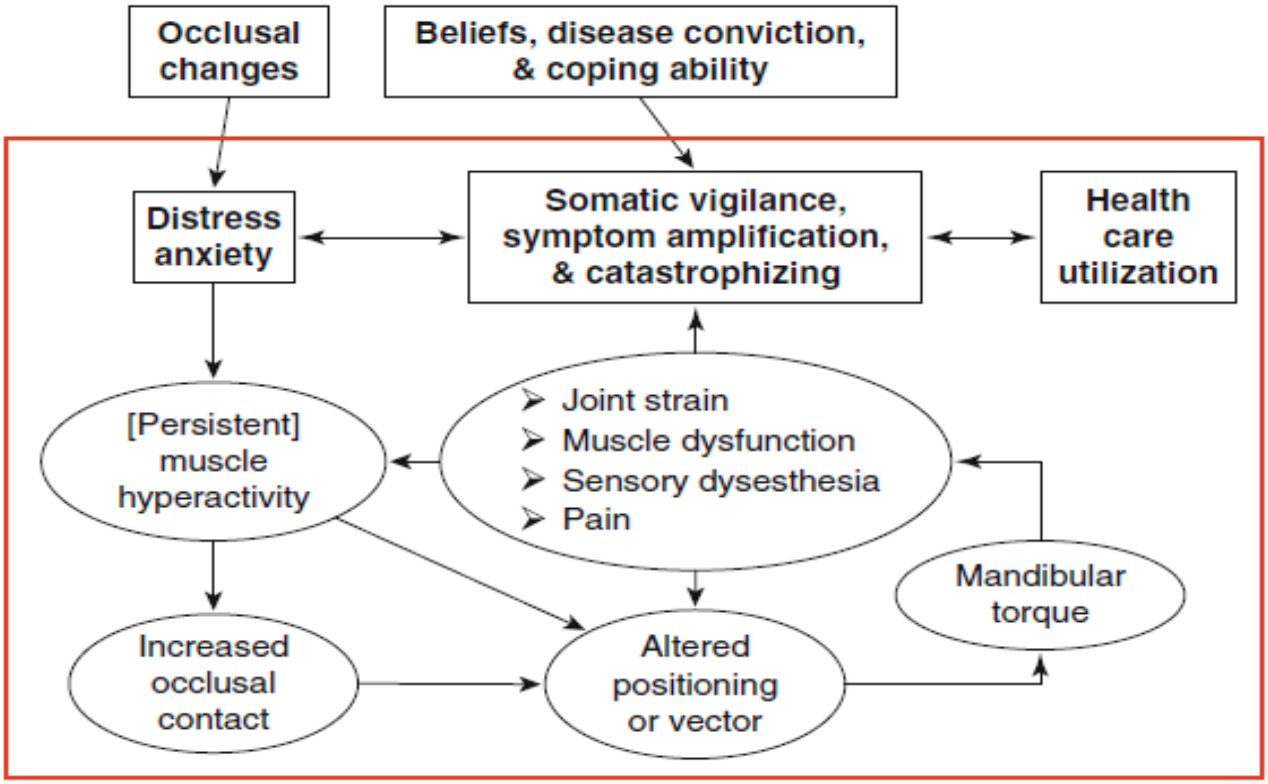

Table 2: Various TMJ imaging methods.

TWO DIMENSIONAL METHODS	THREE DIMENSIONAL METHODS
•PANORAMIC RADIOGRAPH	•COMPUTED TOMOGRAPHY
•TRANSCRANIAL VIEW	•MAGNETIC RESONANCE IMAGING
•TRANSPHARYNGEAL VIEW	•NEW TOM SCANNER
•TRANSORBITAL VIEW	•3-D ULTRASONOGRAPHY
•REVERSE TOWNE'S VIEW	•RADIONUCLIDE IMAGING
•SUBMENTO-VERTEX VIEW	•3D-ISOTROPIC MR ARTHROGRAPHY
•CONVENTIONAL TOMOGRAPHY	•T SCAN SYSTEM
•2D-CONVENTIONAL MR ARTHROGRAPHY	

Table 3: Classification of TMDs[18]

Table 3: CLASSIFICATION OF TMD
➢ Articular disorders (intra-articular) ➢ Congenital or developmental disorders; Condylar hyperplasia; First and second branchial arch disorders; Idiopathic condylar resorption ➢ Degenerative joint disorders ➢ Inflammatory (Capsulitis, polyarthritides, Rheumatoid arthritis, Gout, Ankylosing spondylitis); non-inflammatory (Osteoarthritis) ➢ Disk derangement disorders ➢ Displacement with reduction; Displacement without reduction (closed lock); Perforation ➢ Infection ➢ Neoplasia ➢ Temporomandibular hypermobility ➢ Dislocation; Joint laxity; Subluxation ➢ Temporomandibular hypomobility ➢ Ankylosis: true ankylosis (bony or fibrous) or pseudoankylosis; Postradiation fibrosis; Trismus ➢ Trauma ➢ Contusion; Fracture; Intracapsular hemorrhage ➢ Masticatory muscle disorders (extra-articular) ➢ Local myalgia, Myofascial pain disorde, Myositis, Myofibrotic contracture, Myospasm, Neoplasia

Figure 3: Clinical approach for diagnosing TMDs[45-46]

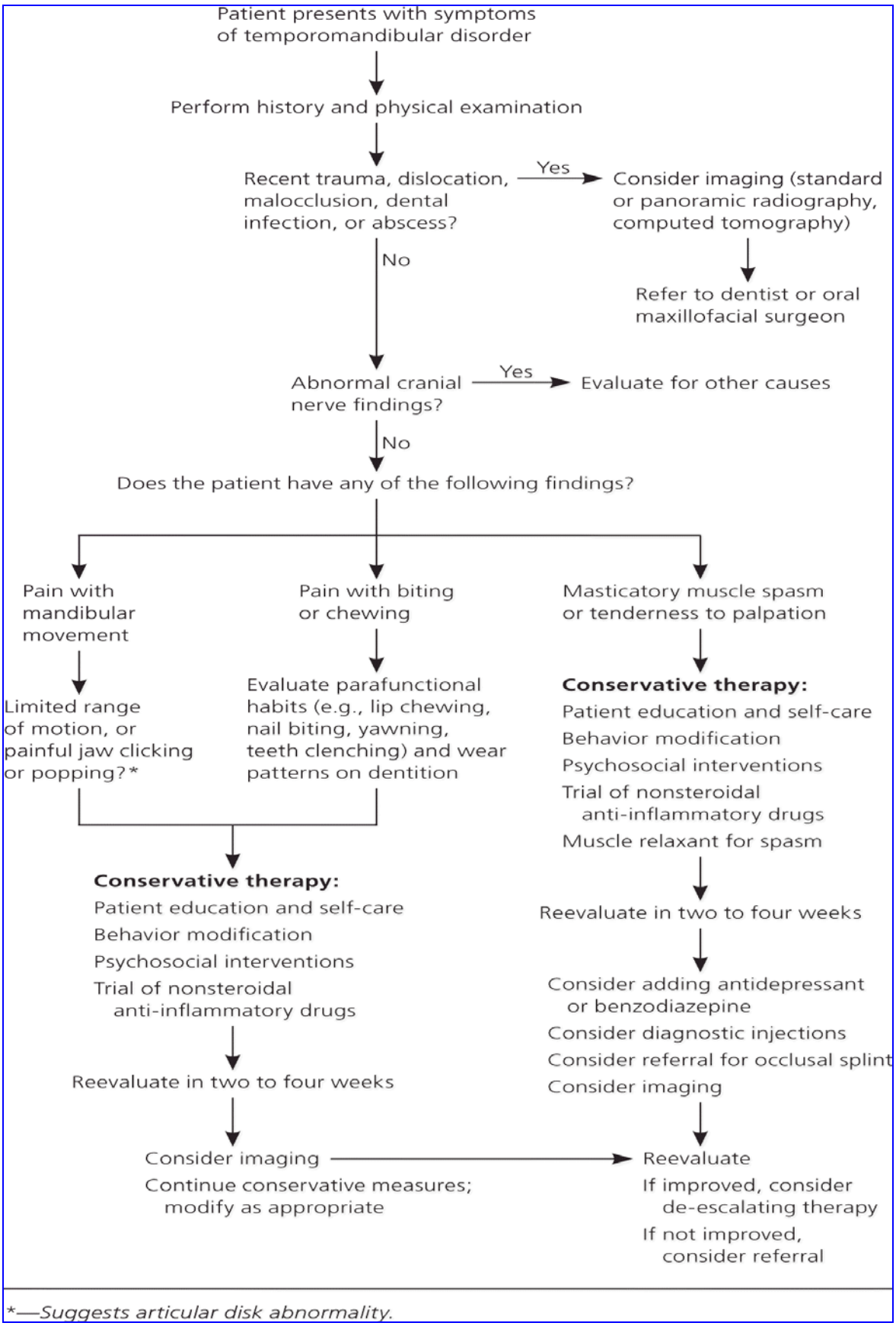

Table 4: Instructions for TMDs

Conservative Treatment Instructions	➢ Eating soft foods ➢ Applying ice packs ➢ Avoiding extreme jaw movements ➢ Learning techniques of relaxing and reducing stress or anxiety.

Table 5: Therapies for TMDs symptoms

Medicative approach	➢ Prescribing NSAIDs and /or Steroids
Passive approach	➢ Physiotherapy (Electrotherapy, Heat/cold therapy, ultrasound, ionophores)
Active approach	➢ Exercises(Head and neck improvement, jaw stretching) ➢ Education and self management in physical therapy ➢ Dry needling and accupuncture
Indirect approach	➢ Performing cervical therapies (manual techniques, neuromuscular reeducation, etc.)
Intra oral orthopedic devices	➢ Occlusal orthotic devices (specially during day for habit breaking and awareness), ➢ Splint therapy (Stabilization splints, Michigan splints, Discharge splints)
Surgical procedures	Arthroscopy, Arthrocentesis, Discectomy, Disc replacement, Tissue engineering(replacing diseased, displaced, or degenerated tissues)