

Stiesch-Scholz M, Kempert J, Wolter S, et al. Comparative prospective study on splint therapy of anterior disc displacement without reduction. J Oral Rehabilitation 2005; 32:474 -479. (29 refs.)

Purpose: To compare the treatment of painful disc displacement of the temporomandibular joint with two types of splints, pivot splint and the stabilization splint.

Materials and Methods: 40 patients (35 female, 5 male) with an age range of 18 to 64, presence of anterior disc displacement without reduction and a normal complement of teeth. Patients who have had prior surgery, presence of systemic underlying rheumatic disease, psychomatic illness, removable denture prosthesis and incomplete complement of teeth were excluded. Magnetic resonance imaging examination with open and closed mouth was done to confirm the clinical diagnosis. The patients were divided into two groups. Group I (18 female 2 male) received stabilization splint covering the whole upper dental arch, the occlusal contacts during static occlusion and canine guidance during dynamic occlusion were checked intra orally. Group II (17 female 3male) received pivot splint with a bilateral pivot in the region of second molar, and the contacts were checked intra orally. The patients were instructed to wear the splint day & night excluding meal time. All patients were examined before and 1, 2 and 3 months using craniomandibular system which examined the TMJ tenderness, and functional problems. Subjective evaluations of pain of the craniomandibular system with visual analogue scales (VAS) were recorded. Dental examination was also carried out to evaluate the side effects of the splint therapy such as tooth intrusion, tooth loosening or sensitivity on biting.

Findings: The maximal jaw opening was increased and significant pain reductions were seen in both groups. Active jaw openings increased by a mean of 8.05mm in the group I and 8.26mm in group II. There was subjective reduction of pain in both the groups, in group I was reduced by 30.54 scale units and in group II it was 39.36 scale units. The number of patients with tenderness to palpitation in the muscles or in the TMJ and the number of deviations in mouth opening also decreased. Side effects such as tooth intrusion, tooth loosening or sensitivity were not found in any of the patients.

Conclusion: It can be concluded that both types of splint provided effective therapy in patients with anterior disc displacement. It also indicates that the success of the therapy was less to do with the design and more with the basic decoupling of the established neuromuscular reflex mechanism and reduction of stress.

Dimitropulis G. The role of surgery in the management of disorders of the temporomandibular joint: a critical review of the literature Part I. Int J Oral Maxillofac Surg 2005;34: 107-13

Purpose: To review the evolution of Temporomandibular joint TMJ surgery together with the biological evidence for surgical disease

Materials and Methods: Literature review and author's opinion

Findings and Conclusions: the history of TMJ surgery in the first half of the 20th century was sporadic and reflected a poor understanding of TMJ pathology. By the second half of the 20th century the evolution of TMJ surgery improved by understanding of TMJ disorders as well as advances in diagnostic imaging. Such advances include the treatment of ankylosed joint which evolved from (1950) the simple division of fibrous band or ostectomy of fused joint with attempts to create a pseudoarthrosis close to the original joint, the latest technique (1960) included the use of interpositional graft materials as a barrier to prevent re-ankylosis. Dislocation procedures were described first in 1951 by Haug who introduced the eminectomy for the treatment of condilar dislocations and TMJ disfunctions. Later procedures involved capsulorrhaphies, lat pterigoid myotomis and ostectomy of the zygomatic arch and eminence to limit the condyle translation of the anterior synovial sulcus ablation using electrocautery and lasers via arthroscopy technique have been more recent development in the management of TMJ dislocation and hypermobility.

TMJ internal derangement involving the disc can be traced back to a British surgeon Annandel who, in 1887, published an article describing two cases of discoplasty for the management of disc displacement in the TMJ. The first published case of discotomy for painful TMJ dysfunction was reported in the German literature by Lanz in 1909. From then until the 1950s discotomy remained the procedure of choice in the surgical treatment of painful TMJ dysfunction. The refinement of X-rays of the TMJ by the 1950s suggested that a reduction in joint space might well explain the painful TMJ dysfunction as a consequence of increased joint pressure. Pioneering surgeons such as Fred Henny, a pioneer of American Oral Surgery, advocated the technique of high condylectomy as a way of increasing the joint space. Critics of the technique were quick to argue that whatever space was created by the condylectomy would be immediately lost by the superior collapse of the ramus, for this reason, later works by Nickerson and Hall in 1980's utilized the direct intraoral approach for separating the condyle from the mandible. Later, Laskin emphasized the importance of psychological influence and parafunctional habits that largely obscured the joint as a source of pathology. Despite this, Laskin helped establish the important distinction between muscle and joint problems that had important implications in the diagnosis and management of TMD.

Proof for the role of the disc in TMJ pain and dysfunction was not available until 1970s when TMJ arthrography techniques were improved and refined. TMJ arthrography provided crucial evidence for the existence of intra-articular pathology such as disc displacement that could be clearly demonstrated in joints surgically undisturbed.

The 1970s proved to be a breaking point in the history of TMJ surgery. Largely as a result of the pioneering works of Wilkes, Farrar and McCarty, TMJ disc displacement was universally adopted as the mechanism which helped explain the pain, clicking and joint locking experienced in patients diagnosed with internal derang. It was not long before a new generation of surgeons turned their attention to the articular disc. As a result, TMJ surgery gathered importance in North America as various procedures were devised to reposition, repair or remove the diseased disc. Unfortunately, the early optimism of TMJ surgery was quickly followed by disasters in the form of alloplastic disc replacements that were implanted in thousands of patients between 1978 and 1986. As a result, the initial euphoria of TMJ surgery turned to desperation as surgeons were faced with a generation of patients who had multiply operated and painfully degenerated joints.

In 1975, Ohnishi adapted and miniaturized the orthopaedic arthroscope for use in the small dimensions of the TMJ. Sanderson and McCain published landmark papers on the therapeutic application of TMJ arthroscopy during the mid 1980's especially in the management of closed lock utilizing the simple technique of arthrolysis and lavage of the TMJ. TMJ arthroscopy and arthrocentesis also provided the opportunity for researchers to investigate and compare the synovial fluid of healthy and diseased joints. By the late 1980's and early 1990's TMJ surgery had undergone a new start with the adoption of minimally invasive surgery as the main surgical treatment modality of the TMJ. Today, the repercussions of early surgical disasters are still felt today as many patients with iatrogenic end stage joint disease are undergoing prosthetic joint replacements.

The new era of molecular biology in TMJ research by Milan and Schmitz proposed the molecular mechanisms of degenerative TMJ disease. , investigators have turned their attention to the molecular biology of articular health and disease in order to understand the factors that lead to, or result from, internal derangement and osteoarthritis of the TMJ. At the molecular level, the difference between adaptive changes and disease depends on the balance between anabolic (reparative) and catabolic (destructive) molecular events within the affected tissues. Therefore, the disease state is when tissue destruction outpaces tissue repair. The most significant finding in recent decades is the TMJ responds to a wide range of dynamic forces through its remarkable adaptive capacity. Changing load demands on the joint caused by clenching or bruxism leads to mechanical stress.

The adaptive capacity of the TMJ responds to mechanical stress by metabolic events that result in remodeling within the articular tissues. This may explain the structural variations found within asymptomatic joints not associated with active disease. This also explains why not all people who clench or brux go on to develop symptoms of TMJ disease.

In those who do develop TMJ symptoms, the joint may have a reduced adaptive potential and so responds to mechanical stress in a maladaptive way that results in disease. Increasing age is the most common factor which reduces the adaptive potential of articular tissues.

Female hormones such as oestrogen and prolactin are also thought to adversely affect the adaptive capacity of the TMJ by tipping the balance of molecular events in favor of catabolic or destructive tissue degradation. Degenerative changes within joint tissues are also promoted by factors which enhance sympathetic tone such as nicotine ingestion or psychological stress resulting from chronic pain and anxiety.

Based on the data derived from clinical and animal research, Milan and Smichtz proposed three mechanisms of injury to explain degenerative TMJ disorders. These are: direct mechanical injury, hypoxia-reperfusion injury and neurogenic inflammation. This theory proposes that excessive mechanical loading of the joint disturbs the delivery of vital nutrients to the cells within the joint and disrupts the elimination of harmful metabolic waste products. Further damage is done when the mechanical load on the joint results in intra-capsular pressure that exceeds the end capillary-perfusion pressure which disrupts the blood flow to the joint and leads to tissue hypoxia. When the pressure is released, the resultant reperfusion of the joint in the form of a sudden surge in blood flow may result in oxygen being converted to damaging free radicals. Finally, the release of pro-inflammatory neuropeptides from mechanically stressed or irritated nerve terminals in retrodiscal tissues, especially in cases of disc displacement, can invoke an inflammatory response in surrounding tissues causing pain and swelling (dysfunction).

According to Milan, mechanical stresses to the joint lead to the accumulation of damaging free radicals which, under normal conditions, are neutralized by enzymes, antioxidants and some hormones (melatonin). A disease state can occur in susceptible individuals who are unable to respond to the accumulation of free radicals within the TMJ because of the intrinsic deficiency of their free radical searching f or repair mechanisms. Milan refers to this as 'oxidative stress' which triggers further molecular events that amplify the destruction of articular tissues and result in

degenerative disease in the TMJ. Nitzan, suggested the theory of uncontrolled free radicals further by speculating that oxidative stress may also damage the lubrication system that allows the smooth translation of the disc during function of the TMJ. The phospholipids and hyaluronic acid, which are essential in an efficient system of joint lubrication, are attacked and broken down by excess free radicals. This results in damage to the joint lubrication system which leads to increase friction between the articular disc and the surrounding articular surfaces.

Research in molecular biology may one day result in a test that will help identify those patients most susceptible to TMJ disorders. Improvements in diagnostic and therapeutic approaches to TMJ disease are what researchers in molecular biology are attempting to achieve. With the help of molecular biology, the future of TMD management may comprise more carefully targeted and less radical treatment modalities.

Treatments such as TMJ arthrocentesis using different agents such as specific enzymes or antioxidants may well obviate the need for more radical open surgical intervention. More research and development of new techniques are still needed.

Katzberg R, Tallents R. Normal and abnormal Temporomandibular Joint disc and posterior attachment as depicted by magnetic resonance imaging in symptomatic and asymptomatic subjects. J Oral Maxillofac Surg 2005;63:1155-61.

Purpose: To provide a detailed assessment of morphologic and signal intensity changes of the disc and to characterize the posterior attachment morphology and signal intensities in symptomatic versus asymptomatic subjects and in joints with and without disc displacement.

Materials and Methods: 61 asymptomatic patients 26 males and 35 females with a mean age of 27.3, with a range of 19 to 49 years 58 symptomatic patients 6 males and 52 females with a mean age of 29.2, with a range of 10 to 66 years. A detailed MRI assessment of each pair of TMJ's in all subjects was performed with a 1.5 tesla MRI system with the jaw first in the closed, rest position and then at the maximal open position, these images were acquired to protocol bilateral orthogonal sagittal planes of both TMJs in the closed jaw position. These were followed by bilateral sagittal plane open-jaw images, the final imaging sequence was with the jaw closed and acquired coronal images of both TMJs. Normal discs position was defined as posterior band of the disc being located at the superior or 12 o'clock position relative to the condyle, disc configuration was classified as biconcave, bipanar (flat), biconvex or deformed and thickened.

The PA was divided into 3 parts: the temporal posterior attachment (TPA), the intermediate part of the PA (IPA), and the condylar posterior attachment (CPA). Statistical assessment was made comparing configuration and signal intensity changes between: 1-symptomatic versus asymptomatic subjects, and joints with or without internal derangement.

Findings and Conclusions: 20 of 61 (32.8%) of volunteers and 45 of 58 (77.6%) of patients had at least 1 abnormal TMJ, deformity of the disc was noted in 34 of 116 (29.3%) joints in patients and 5 of 122 joints (4%), there was a large region of increased signal intensity in the posterior band of the disc on T1 weighted images in 13 of 116 (11.2%), T2 weighted images in 9 of 116 joints (7.8%) of patients versus 0 of 122 joints (0%) of asymptomatic volunteers. In all joints, the TPA was visualized in 73.6% in the closed position and 44.7% in the open jaw position. In all joints with disc displacement without reduction, the TPA was visualized in 41.2% in the closed jaw position and in 17.6% in the open jaw position. There was no consistent structure visualized in the posterior attachment that could be definitively characterized as CPA in any joints. Magnetic resonance is a reliable and accurate source of fine details of the TMJ, separating normal from internal disorders in the temporomandibular joints.

Dimitroulis G. The role of surgery in the management of disorders of the temporomandibular joint: A critical review of the literature Part 2. Int J Oral Maxillofac Surg 2005;34:231-7. (106 refs.)

Purpose: To review the clinical controversies of TMJ surgery over the past two decades.

Materials and Methods: Review and opinion article.

Findings:

- Absolute indications for TMJ surgery include tumors, growth anomalies, and ankylosis. Relative indications for TMJ surgery include TMJ internal derangement involving disc position and integrity and osteoarthritis.
- The primary indication for TMJ surgery in the literature is the failure of non-surgical therapy. This is controversial because this may be the result of misdiagnosis or incomplete diagnosis, people who fail to respond to non-surgical therapy may also fail to respond to surgical therapies, and sometimes surgical intervention maybe a better first option compared to non-surgical therapy (closed lock of the TMJ).
- Clinical features of surgical candidates include symptoms of pain and dysfunction well localized to the TMJ. Radiological evidence of disease in bone (tomograms or CT-scans) or soft tissues (MRI) provides essential diagnostics in making the case for surgical intervention. Decision for surgical intervention should be based on clinical findings and the radiologic findings should only play a supportive role.
- Internal derangement of the TMJ which presents as closed lock (disc displacement without reduction) has been shown to be effectively managed by TMJ arthrocentesis (acute onset closed lock) and TMJ arthroscopy (long standing or chronic closed lock). Painful TMJ derangement where there is little or no restriction of mandibular function (i.e., reducing disc displacement) appears to respond to condylotomy procedures where condylar sag results in increased joint space and relief of intra-articular pressure. Arthrotomy of the TMJ is reserved for advanced stages of TMJ internal derangement and osteoarthritis.
- A meta analysis by Reston and Turkelson suggested that TMJ arthrocentesis and arthroscopy are effective in the management of patients with TMJ disc displacement without reduction.
- Multiple studies have reported 80-90% success rate with minimally invasive procedures like TMJ arthroscopy for the management of patients with painful limitation of mouth opening resulting from closed lock of the TMD as well as reduced morbidity compared to other surgical procedures. There is not enough literature to prove this.
- The controversies with regard to open TMJ surgeries include: Role of disc repositioning surgery in light of the results of TMJ arthroscopy and arthrocentesis, whether disc replacement is at all necessary following discectomy procedures, and the use of alloplastic or prosthetic devices in the management of end-stage TMJ disease.

Conclusions: More research is required to justify the surgical treatment of common disorders such as TMJ internal derangement and osteoarthritis, but are difficult to perform due to ethical reasons. The treatment of TMD should be tailored to diagnosis and not be restricted by the belief that minimal intervention is best.