Internal Derangements of the Temporomandibular Joint: The Role of Arthroscopic Surgery and Arthrocentesis

(Troubles intracapsulaires de l'articulation temporo-mandibulaire : le rôle de l'arthroscopie et de l'arthrocentèse)

· **Samuel Barkin**, DDS ·
· **Simon Weinberg**, DDS, FRCD(C) ·

Sommaire

La chirurgie arthroscopique semble être une méthode sûre, très peu invasive et efficace pour traiter les troubles intracapsulaires de l'articulation temporo-mandibulaire (ATM), réduire la douleur associée à ces troubles et accroître l'amplitude de mouvement chez 80 % des patients. Bien que ces résultats soient encourageants, ils sont fondés en grande partie sur des études rétrospectives de courte durée qui n'ont pas fait l'objet de contrôle. L'observation fondamentale de l'efficacité clinique de la lyse et du lavage, limités au compartiment supérieur de l'ATM et sans réduction discale, a amené les cliniciens à remettre en question l'importance de la position du ménisque articulaire comme facteur majeur de l'étiologie du dysfonctionnement douloureux de l'ATM. Bien qu'il existe des études prospectives randomisées de courte durée indiquant que l'arthrocentèse et la chirurgie arthroscopique présentent des taux de réussite comparables dans le traitement du blocage aigu en fermeture de l'ATM, il n'y a pas d'études similaires portant sur de longues périodes. Tant que de telles études n'auront pas été réalisées, le rôle de la chirurgie arthroscopique et de l'arthrocentèse dans le traitement des troubles intracapsulaires de l'ATM demeurera imprécis.

Mots clés MeSH : *arthroscopy/methods; temporomandibular joint disorders/surgery*

© J Can Dent Assoc 2000; 66:199-203
Cet article a fait l'objet d'une révision par des pairs.

Internal derangement of the temporomandibular joint (TMJ) may be defined as a disruption within the internal aspects of the TMJ in which there is a displacement of the disc from its normal functional relationship with the mandibular condyle and the articular portion of the temporal bone.[1] Farrar has estimated that up to 25% of the entire population has an internal derangement, which is usually treated with non-surgical methods initially.[2] Should these methods prove unsuccessful, they are often followed by surgical methods such as meniscectomy, disc repositioning procedures and condylotomy. More recently, studies utilizing magnetic resonance imaging suggest that the articular disc is displaced in 35% of asymptomatic volunteers.[3,4]

The recent development of TMJ arthroscopic surgery — a minimally invasive procedure — appears to have filled the clinical void between failed non-surgical treatment and open arthrotomy. In the past decade, arthroscopic surgery and, more recently, arthrocentesis have been used with increasing frequency to treat TMJ internal derangements that fail to improve following a reasonable course of non-surgical therapy.

Clinical Stages

Anatomical, epidemiological and clinical studies have shed some light upon the ultimate fate of the displaced disc.[5] Traditionally, internal derangement of the TMJ has been described as a progressive disorder with a natural history that may be classified into four consecutive clinical stages[1,5,6]: stage one has been described as disc displacement with reduction, stage two as disc displacement with reduction and intermittent locking, stage three as disc displacement without reduction (closed lock), and stage four as disc displacement without reduction and with perforation of the disc or posterior attachment tissue (degenerative joint disease).

Stage One

Stage one is characterized clinically by reciprocal clicking as a result of anterior disc displacement with reduction. Although it

has been stated that the later the opening click occurs, the more advanced the disc displacement, diagnostic assignment based on joint sounds has recently come under question.[7] The fifth World Congress on Pain determined that "Clinic cases cannot be distinguished from controls on the basis of clinically detectable joint sounds."[7] This concept is further emphasized by Rohlin and others, who showed in an arthrographic study that anterior displacement with reduction can exist without joint noises (i.e., false negative).[8]

The clinical hallmark of disc displacement with reduction is limited mouth opening, usually accompanied by deviation of the mandible to the involved side, until a pop or click (reduction) occurs. After the pop, the patient is able to open the mouth fully with a midline position of the mandible. Arthrograms show anterior disc displacement in centric occlusion, but the disc is normally located in the open-mouth position.

Stage Two

Stage two features all the aforementioned characteristics, plus additional episodes of limited mouth opening, which can last for various lengths of time. Patients may describe it as "hitting an obstruction" when opening is attempted. The "obstruction" may disappear spontaneously or the patient may be able to manipulate the mandible beyond the interference. Arthrographically, stage two is similar to stage one.

Stage Three

Closed lock (disc displacement without reduction) occurs when clicking noises disappear but limited opening persists. The patient complains of TMJ pain and chronic limited opening, with the opening usually less than 30 mm. Examination will reveal preauricular tenderness and deviation of the mandible to the affected side with mouth opening and protrusive movements. TMJ pain may accompany border movement. Interestingly, arthrocentesis and arthroscopic surgery have documented consistently high success rates in relieving this particular pattern of internal derangement.[9] Arthrographic examination and magnetic resonance imaging show anterior disc displacement in both centric occlusion and maximal mouth open positions. Limited condylar translation may also be evident.

In chronic closed lock episodes, if the condition progresses, the condyle may steadily push the disc forward to achieve almost normal ranges of mouth opening, in spite of the presence of a non-reducing disc.

Stage Four

With continued mandibular function, the stretched posterior attachment slowly loses its elasticity, and the patient begins to regain some of the lost range of motion. As retrodiscal tissue continues to be stretched and loaded, it becomes subject to thinning and perforation. Anatomic studies have shown that this tissue may remodel before it succumbs, ill-adapted to the functional load, and perforates.[10] In addition, arthrograms have shown joint crepitus to be highly suggestive of but clearly not pathognomic of disc perforation.

Although often classified as characteristic of a separate final stage, hard tissue remodelling probably occurs throughout all stages. Clinically, osteoarthrosis may be diagnosed because the remodelling often occurs unilaterally, the symptoms appear to worsen as the day goes on, crepitation as distinct from clicking is often present and radiographic evidence is frequent (e.g., flattening, sclerosis, osteophytes, erosion).[11]

The Progressive Nature of Internal Derangement

Although in many patients internal derangement undergoes the progressive changes just described, it is still not clear whether this progression happens in all cases. In fact, longitudinal epidemiological studies do not seem to support the idea of progression. For 10 years, Magnusson and others studied 293 subjects with clicking. At the five-year follow-up, clicking had not changed to locking in any of the subjects.[12] At the 10-year follow-up, only one of the 293 subjects reported intermittent locking.[13] Additionally, the authors reported that half the patients who exhibited clicking at age 15 no longer did so at age 20, and about half of those who did not exhibit clicking at age 15 went on to develop clicking. Thus, the probability that TMJ clicking would disappear in a symptomatic individual was equal to the probability of it appearing in an asymptomatic individual. This lack of progression of internal derangement from a reducing disc to a non-reducing disc condition was confirmed in studies by Greene and Laskin,[14] Laskin[15] and Lundh and others.[16]

Clinicians who justify aggressive treatment of asymptomatic TMJ clicking based on their belief in a high progression rate to a non-reducing state should instead exercise patience and clinical vigilance in their management of this condition.

Sato and others[17] studied the natural course of anterior disc displacement without reduction in 44 subjects who agreed to observation without treatment. The incidence of successful resolution of the condition was 68% at 18 months. This finding suggests that the signs and symptoms of anterior disc displacement without reduction tend to be alleviated during the natural course of the condition. The authors failed to mention what happened to the anteriorly displaced disc. They noted, however, that the maximal mouth opening increased from 29.7 mm to 38 mm and concluded that it was unlikely that the disc became self-reducing; rather, it was more plausible that there was some stretching and remodelling of the retrodiscal tissues, enabling the disc to be displaced more anteriorly by the translating condyle.

Thus, although clinical evidence does support progressive worsening of the condition in some patients, important clinical questions remain. It is not clear what the progression rate is, nor is it clear which patients have the greatest risk of progressing to more advanced stages. Consequently, clinicians who justify aggressive treatment of asymptomatic TMJ clicking based on their belief in a high progression rate to a non-reducing state should instead exercise patience and clinical vigilance in their management of this condition.

Arthroscopic Surgery

Most patients with articular disc displacements either improve spontaneously or can be managed efficiently with appropriate non-surgical therapy. Some patients, however, may become refractory to conservative treatment and require surgical intervention to relieve the troublesome TMJ symptoms. Failed non-surgical therapies accompanying persistently high levels of pain and dysfunction that interfere with the activities of daily living are the primary indications for surgical intervention. Traditionally, various forms of open-joint procedures (arthrotomy) were employed. More recently, TMJ arthroscopy has increased in popularity, because it is less invasive than open surgery, is associated with few complications and requires a shorter hospital stay.

In a position paper on TMJ arthroscopic surgery, the American Association of Oral and Maxillofacial Surgeons outlined the indications for surgical (operative) arthroscopy.[18] Operative arthroscopy was indicated for selected joint conditions that constituted a disability for the patient, that were refractory to medical treatment and that required internal structural modifications. Israel has established further indications[19]: (1) The patient has significant pain or dysfunction, producing a disability and poor quality of life. (2) Appropriate non-surgical treatment over a reasonable length of time has failed. (3) TMJ is the origin of the pain or dysfunction. (4) There may be possible therapeutic benefit in arthroscopic surgery as a diagnostic modality prior to open joint surgery. (5) Any additional myofascial pain symptoms should be under successful management.

There are four subclassifications of TMJ arthropathy that are amenable to treatment with arthroscopic surgery[20]: (1) hypomobility secondary to anteriorly displaced discs with or without reduction (adhesions), (2) hypermobility, (3) degenerative joint disease (osteoarthritis) and (4) synovitis.

Operative Arthroscopy and Arthrocentesis

Lysis of adhesions and joint lavage are the most commonly performed TMJ arthroscopic surgical procedures to relieve painful hypomobility. The objectives of these techniques are to eliminate restrictions on the disc and lateral capsule, to wash out microscopic debris resulting from the breakdown of the articular surfaces, to irrigate the joint of enzymes and prostaglandins and to stimulate the normal lubricating properties of the synovial membrane.[21] In addition, the presence of fibrous adhesions in the superior joint space limits normal translatory function of the disc–condyle complex. Although the pathogenesis of adhesions remains unclear, it is suspected that a macro- or micro-traumatic episode induces hemorrhage; in the presence of limited joint mobility, the blood clot that forms organizes into a fibrous adhesion.[22] Generally, a blunt trocar or blunt probe is utilized in a sweeping fashion between the disc and temporal bone to accomplish lysis of adhesions.

When diagnostic arthroscopy has demonstrated that the disc is displaced anteriorly, some surgeons have attempted to reposition the ectopic disc; however, whether the disc remains reduced is questionable.[23,24] Israel has advocated procedures that induce scarring in the posterior attachment tissue through the injection of sclerosing solutions.[19]

More advanced disc-stabilizing techniques have been strongly advocated by other clinicians.[25,26] McCain and others[25] and Tarro[26] have developed arthroscopic protocols for repositioning and suturing the disc. Tarro believes that the effectiveness of these procedures is directly related to disc mobility, and he supports the creation of a relaxing incision anterior to the disc (an anterior muscle or band release).[26] However, as Sanders points out, "No evidence has been shown to prove that these techniques are any more successful (or even as successful) as arthroscopic lysis and lavage."[27]

With the recent introduction of arthrocentesis, joint lavage has become the simplest form of TMJ surgical intervention. Arthrocentesis is commonly defined as a lavage of the joint and is traditionally accomplished without viewing the joint space. It may be completed under local anesthesia as an office procedure, with or without the addition of sedation, and its primary purpose is to clear the joint of tissue debris, blood and pain mediators that are believed to be byproducts of intra-articular inflammation. Although arthrocentesis is being used for the treatment of a variety of TMJ disorders (acute capsulitis or traumatic synovitis), published data on long-term outcomes are available only for its use in the treatment of closed lock.[21]

Nitzan has noted the results obtained at three centres (in Japan, Israel and the United States) to determine the efficacy of arthrocentesis in the management of closed lock.[21] Lactated Ringer's solution or normal saline was injected into the upper joint space to increase intra-articular pressure and lavage the joint. The results in 68 patients presenting with symptoms of severe closed lock included a maximal-mouth-opening increase from an average of 25.29 mm to 43.6 mm. Overall, arthrocentesis was successful in 94.1% of patients. The follow-up times ranged from 2 to 36 months, with no reports of relapse.

Because the success rates with arthrocentesis are similar to those of arthroscopic lysis or lavage, Nitzan believes that a major part of the success of surgical arthroscopy in the treatment of severe closed lock is attributable to the lavage rather than to the surgical instrumentation.[21] Sanders, however, maintains that in cases of chronic closed lock, intracapsular lysis using probes between the disc and fossa is necessary to release superior compartment adhesions.[28]

More recently, Fridrich and others[29] and Murakami and others[30] have reported results in prospective comparisons of surgical arthroscopy and arthrocentesis for the treatment of TMJ disorders. Fridrich and others[29] studied 19 patients randomized into one of two groups: arthroscopic lysis and lavage under general anesthesia, or arthrocentesis, hydraulic distention and lavage under intravenous sedation. Objective and subjective data were collected, and patients were followed 26 months postoperatively. There were no statistically significant differences in outcome between the two groups for any of the parameters evaluated. The overall success rates were 82% for arthroscopy and 75% for arthrocentesis. Therapeutic success rates were not significantly different for arthroscopy and arthrocentesis; both modalities were useful for decreasing TMJ pain while increasing functional range of mandibular motion.[29]

In their assessment of 108 patients, Murakami and others confirmed the findings of Fridrich and others and found the treatment efficacy of arthroscopic surgery and arthrocentesis to be comparable. Their study compared the results of arthrocentesis with results of non-surgical treatments and arthroscopic surgery for the management of closed lock. They concluded that arthrocentesis was indicated for the patient with acute TMJ closed

lock who was refractory to medication and mandibular manipulation.[30]

Recently, Bertolami and others reported the results of treating TMJ disorder patients with intra-articular injections of sodium hyaluronate. They randomized 120 patients in a placebo-controlled study. Subjects received unilateral upper joint space injections of either 1% sodium hyaluronate or physiologic saline. No differences were detected for patients suffering from degenerative joint disease or non-reducing displaced discs; however, patients with reducing displaced discs showed statistical within-group and between-group differences in levels of TMJ dysfunction as measured by the Helkimo indices. Twice as many patients treated with hyaluronate (90%) showed improvement compared to patients who received the placebo injection.[31]

Disc Position and Surgical Outcomes

Although the surgical treatment of disorders of the TMJ has traditionally been directed at the restoration of normal anatomic form and function, many studies have shown that clinically successful results are attained regardless of the postsurgical position of the disc.[23,24] These crucial observations have led investigators to question the role of disc position in the etiology of TMJ pain dysfunction.

Gabler and others used magnetic resonance imaging to assess disc–condyle relationships before and after arthroscopic surgery for symptomatic TMJ disorders associated with disc displacement.[23] Disc positions relative to condyles were found to be generally unchanged. Nevertheless, 11 of 12 patients (92%) were judged to have had successful outcomes based on criteria that included presence of pain, interincisal opening, protrusive and excursive mandibular movements and masticatory function. These observations, together with the magnetic resonance imaging findings, strongly suggest that repositioning or reduction of displaced discs is not a prerequisite for clinical success in symptomatic patients. This conclusion was also emphasized in the clinical studies by Montgomery and others[24] and Moses and others.[32]

In 1992, McCain and others reported the largest multicentre retrospective study on TMJ arthroscopy.[33] In total, 4,831 joints were evaluated, 32% of which had follow-up lengths of greater than two years. All of the 12 participating centres reported that range of motion and diet consistency markedly improved and joint pain and sense of disability markedly decreased after arthroscopic surgery. The authors concluded that arthroscopy was a highly effective, minimally invasive, safe surgical technique for the diagnosis and treatment of intra-articular TMJ pathology.

Le Dr Barkin est résident spécialiste en chirurgie buccale et maxillo-faciale à l'Hôpital de Toronto et à la Faculté de médecine dentaire de l'Université de Toronto.

Le Dr Weinberg est professeur au Département de chirurgie buccale et maxillo-faciale de la Faculté de médecine dentaire de l'Université de Toronto et membre du personnel actif de la Division de chirurgie buccale et maxillo-faciale de l'Hôpital de Toronto (Réseau hospitalier universitaire).

Écrire au : Dr Samuel Barkin, Département de chirurgie buccale et maxillo-faciale, Hôpital de Toronto, 200, rue Elizabeth, Toronto, ON M5G 2C4

Les auteurs n'ont pas d'intérêt financier déclaré.

Références

1. Dolwick MF, Katzberg RW, Helms CA. Internal derangements of the temporomandibular joint: fact or fiction? *J Prosthet Dent* 1983; 49:415-8.

2. Farrar WB. Myofascial pain dysfunction syndrome [letter]. *J Am Dent Assoc* 1981; 102:10-1.

3. Katzberg RW, Westesson PL, Tallents RH, Drake CM. Anatomic disorders of the temporomandibular joint disc in asymptomatic subjects. *J Oral Maxillofac Surg* 1996; 54:147-53.

4. Ribeiro RF, Tallents RH, Katzberg RW, Murphy WC, Moss ME, Magalhaes AC and other. The prevalence of disc displacement in symptomatic and asymptomatic volunteers aged 6 to 25 years. *J Orofac Pain* 1997; 11:37-47.

5. Kaplan A. Natural history of internal derangement of the temporomandibular joint. In: Thomas M, Bronstein S, editors. *Arthroscopy of the temporomandibular joint*. Philadelphia: WB Saunders; 1991. p. 70-4.

6. Heffez L. Surgery for internal derangement of the temporomandibular joint. In: Peters L, Indresano T, Marciani R, Roser S, editors. *Principles of oral and maxillofacial surgery*. Philadelphia: J.B. Lippincott; 1992. p. 1933-5.

7. Stohler C. Disk-interference disorders. In: Zarb G, Carlsson G, Sessle B, Mohl N, editors. *Temporomandibular joint and masticatory muscle disorders*. Copenhagen: Munksgaard; 1992. p. 271-6.

8. Rohlin M, Westesson PL, Eriksson L. The corrolation of temporomandibular joint sounds with joint morphology in fifty-five autopsy specimens. *J Oral Maxillofac Surg* 1985; 43:194-200.

9. Sanders B. Arthroscopic surgery of the temporomandibular joint: treatment of internal derangement with persistent closed lock. *Oral Surg Oral Med Oral Pathol* 1986; 62:361-72.

10. Heffez L, Blaustein D. Pathologic anatomy of internal derangements. In: Heffez L, Blaustein D, editors. *Arthroscopic atlas of the temporomandibular joint*. Philadelphia: Lea & Febiger, 1990.

11. Zarb GA, Carlsson GE. Osteoarthrosis/Osteoarthritis. In: Zarb G, Carlsson G, Sessle B, Mohl N, editors. *Temporomandibular joint and masticatory muscle disorders*. Copenhagen: Munksgard, 1994. p. 298-314.

12. Magnusson T, Egermark-Eriksson I, Carlsson GE. Five-year longitudinal study of signs and symptoms of mandibular dysfunction in adolescents. *J Craniomandib Pract* 1986; 4:338-44.

13. Magnusson T, Carlsson GE, Egermark I. Changes in subjective symptoms of craniomandibular disorders in children and adolescents during a 10-year period. *J Orofac Pain* 1993; 7:76-82.

14. Greene CS, Laskin DM. Long-term status of TMJ clicking in patients with myofascial pain and dysfunction [published erratum appears in *JADA* 1988; 117:558]. *JADA* 1988; 117:461-5.

15. Laskin DM. Etiology and pathogenesis of internal derangements of the temporomandibular joint. *Oral Maxillofac Surg Clin North Am* 1994; 6:217-22.

16. Lundh H. Westesson PL. Koop S. A three-year follow-up of patients with reciprocal temporomandibular joint clicking. *Oral Surg Oral Med Oral Pathol* 1987; 63:530-3.

17. Sato S, Takahashi K, Kawamura H, Motegi K. The natural course of nonreducing disc displacement of the temporomandibular joint: changes in condylar mobility and radiographic alterations at one-year follow-up. *Int J Oral Maxillofac Surg* 1998; 27:173-7.

18. American Association of Oral and Maxillofacial Surgeons: position paper on TMJ arthroscopy 1988. In: Thomas M, Bronstein S, editors. *Arthroscopy of the temporomandibular joint*. Philadelphia: WB Sauders, 1991. p. 347-50.

19. Israel H. Arthroscopy of the temporomandibular joint. In: Peterson L, Indresano T, Marciani R, Roser S, editors. *Principles of oral and maxillofacial surgery*. Philadelphia: J.B. Lippincott, 1992. p. 2015-40.

20. Sanders B, Buconcristiani RD. Surgical arthroscopy. In: Sanders B, Murakami K, Clark GT, editors. *Diagnostic and surgical arthroscopy of the temporomandibular joint*. Philadelphia: WB Saunders, 1989.

21. Nitzan DW. Arthrocentesis for management of severe closed lock of the temporomandibular joint. *Oral Maxillofac Surg Clin North Am* 1994; 6:245-7.

22. Kaminishi R, Davis C. *Soft tissue pathology-intracapsular fibrosis of the superior compartment of the temporomandibular joint.* Philadelphia: WB Saunders, 1991. p. 235-47.

23. Gabler MJ, Greene CS, Palacios E, Perry HT. Effect of arthroscopic temporomandibular joint surgery on articular disk position. *J Craniomandib Disord* 1989; 3:191-202.

24. Montgomery MT, Van Sickels JE, Harms SE, Thrash WJ. Arthroscopic TMJ surgery: effects on signs, symptoms, and disc position. *J Oral Maxillofac Surg* 1989; 47:1263-71.

25. McCain JP, Podrasky AE, Zabiegalski NA. Arthroscopic disc repositioning and suturing: a preliminary report. *J Oral Maxillofac Surg* 1992; 50:568-79.

26. Tarro A. Disc-stabilizing techniques. In: Thomas M, Bronstein S, editors. *Arthroscopy of the temporomandibular joint.* Philadephia: WB Saunders, 1991. p. 206-12.

27. Sanders B. Efficacy of temporomandibular joint arthroscopy: a retrospective study [Discussion]. *J Oral Maxillofac Surg* 1993; 51:17-21.

28. Sanders B. Arthroscopic management of internal derangements of the temporomandibular joint. *Oral Maxillofac Surg Clin North Am* 1994; 6:259-69.

29. Fridrich KL, Wise JM, Zeitler DD. Prospective comparison of arthroscopy and arthrocentesis for temporomandibular joint disorders. *J Oral Maxillofac Surg* 1996; 54:816-20.

30. Murakami K, Hosaka H, Moriya Y, Segami N, Iizuka T. Short-term treatment outcome study for the management of temporomandibular joint closed lock. A comparison of arthrocentesis to nonsurgical therapy and arthroscopic lysis and lavage. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1995; 80:253-7.

31. Bertolami CN, Gay T, Clark GT, Rendell J, Shetty V, Liu C and others. Use of sodium hyaluronate in treating temporomandibular joint disorders: a randomized, double-blind, placebo-controlled clinical trial. *J Oral Maxillofac Surg* 1993; 51:232-42.

32. Moses J, Sartosis D, Glass R, Tanaka T, Poker I. The effect of arthroscopic surgical lysis and lavage of the superior joint space on TMJ disc position and mobility. *J Oral Maxillofac Surg* 1989; 47:674-8.

33. McCain JP, Sanders B, Koslin MG, Quinn JH, Peters PB, Indresano TT. Temporomandibular joint arthroscopy: a 6-year multicenter retrospective study of 4,831 joints [published erratum appears in *J Oral Maxillofac Surg* 50:1349]. *J Oral Maxillofac Surg* 1992; 50:926-30.

LE CENTRE DE DOCUMENTATION DE L'ADC

Pour en savoir plus sur le traitement des problèmes temporo-mandibulaires, communiquez avec le Centre de documentation de l'ADC. Le personnel peut effectuer des recherches documentaires et fournir des articles ou manuels sur demande. Pour plus d'information sur les frais et services, communiquez avec le Centre de documentation par téléphone au **1-800-267-635**4, poste 2223 ou au **(613) 523-1770**, poste 2223, par télécopieur au (613) **523-6574** ou par courriel à **info@cda-adc.ca**.