

Open versus arthroscopic surgery for the management of internal derangement of the temporomandibular joint: a meta-analysis of the literature

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Abstract. The objective of this study was to assess the clinical outcomes of the following three surgical methods for the management of internal derangement (ID) of the temporomandibular joint (TMJ): arthroscopic lysis and lavage (ALL), arthroscopic surgery (AS), and open surgery (OS). A systematic and electronic search of several databases with specific key words was performed from their inception through November 2014. Clinical human studies, including randomized controlled trials (RCTs), controlled clinical trials (CCTs), and retrospective studies, with the aim of comparing the three surgical methods for the management of ID of the TMJ were included. Seven publications were identified: three RCTs, two CCTs, and two retrospective studies. A significant difference was found between OS and AS in pain reduction ($P = 0.05$), but no significant difference with regard to maximal inter-incisal opening (MIO > 35 mm), mandibular function impairment, and clinical findings (clicking, joint tenderness, and crepitation) ($P = 0.52$, $P = 0.34$, and $P = 0.19$, respectively). The results of the meta-analysis showed that the use of OS is superior to AS in pain reduction, with comparable MIO, jaw function, and clinical findings. In addition, the results of the present study showed that ALL provides greater improvement in MIO and comparable pain reduction when compared to AS.

Key words: open-joint surgery; arthroscopic surgery; arthroscopic lysis and lavage; internal derangement; chronic closed lock; discectomy; meta-analysis.

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Internal derangement (ID) of the temporomandibular joint (TMJ) is defined as an abnormal relationship between the temporomandibular disc with respect to the

mandibular condyle, the temporal fossa, and the temporal eminence of the TMJ.¹ ID of the TMJ includes conditions such as anchored disc phenomenon, disc

displacement with reduction, painful click, and closed lock. Patients with ID of the TMJ often complain of pain, joint sounds, and a limitation in mouth opening.²

More than 80% of patients with ID of the TMJ can be treated successfully with non-surgical therapy.^{3,4} Non-surgical therapies include pharmacotherapy, TMJ splints, and physical therapy.² Patients who do not respond to non-surgical therapy may require more invasive procedures, such as arthrocentesis and arthroscopy, or various surgical modalities such as disc repositioning by excision of retrodiscal tissue⁴ and intra-articular suturing and disc repair,⁵ discectomy,⁵ or discectomy and replacement^{6,7} (e.g., by auricular cartilage).

Arthroscopy of the TMJ was first introduced by Ohnishi.⁸ Lysis of adhesions and joint lavage, described by Sanders in 1986, are the most commonly performed TMJ arthroscopic surgical procedures.⁹ Many articles have reported success rates for this simple procedure to be good and in the range of 70% to 96%, which is comparable to the results of open surgery procedures.^{2,10-20} TMJ arthroscopy has recently increased in popularity, because it is less invasive than the open surgery, is associated with few complications, and requires a shorter hospital stay.²¹ However, Moses and Poker²² and Murakami et al.²³ reported that improvements in maximum inter-incisal opening (MIO) were significantly better when extensive techniques involving anterior release of the disc and lateral capsular release were used than when only conventional lysis and lavage was used.

There is no consensus on the choice of the surgical procedure – open surgery or arthroscopic lysis and lavage – for the management of ID of TMJ disorders.²⁴ In addition, no systematic review and meta-analysis has correlated these with different Wilkes stages,^{25,26} therefore the present systematic review with meta-analysis was designed and implemented to assess the clinical outcomes of the following three surgical methods for the management of ID of the TMJ: arthroscopic lysis and lavage (ALL), arthroscopic surgery (AS), and open-joint surgery (OS).

Methods

Search strategy

An electronic search of the PubMed, Ovid MEDLINE, and Cochrane CENTRAL online databases was conducted from their respective dates of inception to August 2014. This systematic review and meta-analysis was conducted according to the PRISMA Equity 2012 checklist.²⁷

Search terms

Free text words and medical subject heading (MeSH) terms were used. The heading

sequence was (open versus arthroscopic surgery in internal derangement of TMJ) AND (operative versus arthroscopic lysis and lavage in TMJ closed lock) AND high condylectomy. The low yield led to the use of another search term, omitting reference to piezoelectric surgery versus rotary bur: 'high condylectomy', 'discectomy', 'arthroplasty', 'operative versus simple arthroscopic surgery', 'Wilkes stage classification', 'maximal inter-incisal opening, TMJ pain', 'chronic closed lock' AND 'internal derangement AND TMJ', 'maximal mouth opening' AND 'pain' AND 'anterior disc displacement with/out reduction' AND 'chronic TMJ pain' AND 'open surgery' OR 'arthroscopic surgery'.

The abstracts of the resulting publications were reviewed and the full text obtained for those with apparent relevance. The references of identified papers were cross-checked for unidentified articles, and the individual databases of key subject journals were searched using the same terms as above. These journals were the *Journal of Oral and Maxillofacial Surgery*, *International Journal of Oral and Maxillofacial Surgery*, *Journal of Oral Surgery*, and *British Journal of Oral and Maxillofacial Surgery*. The searches were limited to articles published in the English language. An attempt was made to identify unpublished material or to contact authors of published studies for further information. To complete the search, the references of each selected publication on open versus arthroscopic surgery in ID of the TMJ were searched by hand. The study screening process was performed by the author.

Selection criteria

The following inclusion criteria were adopted in accordance with the PICOS criteria: (P) Patients: those patients with ID-like anchored disc phenomenon, disc displacement with or without reduction, painful click, and closed lock. (I) Intervention: open surgery such as discectomy, meniscoplasty, local repair of perforation, high condylectomy, disc repositioning, and arthroplasty were the intervention in the OS versus AS comparison; electrocautery of the pterygoid ligament, myotomy of the lateral pterygoid muscle (or both), motor debridement, and disc suturing were the interventions in the ALL versus AS comparison. (C) Comparator: this was arthroscopic surgery in the OS versus AS comparison and arthroscopic lysis and lavage in the ALL versus AS comparison. (O) Outcomes: pain by visual analogue scale (VAS), MIO, mandibular function

impairment, and postoperative clinical findings (clicking, joint tenderness, and crepitation). (S) Study design: human studies published in English, including randomized or quasi-randomized controlled clinical trials (RCTs), controlled clinical trials (CCTs), and retrospective studies whose aim was to compare open surgery to arthroscopic surgery for the management of ID of the TMJ.

Exclusion criteria

The following were excluded: case reports, technical reports, animal or in vitro studies, review papers, and non-controlled clinical studies.

Data collection process

The author carefully assessed the eligibility of all studies retrieved from the databases. The following data were extracted from the studies included in the final analysis: authors, year of publication, study design, number of patients, gender (male/female), mean age in years, follow-up period, type of open TMJ surgery, duration of the problem, and diagnostic problem subgroups.

Risk of bias in individual studies

A methodological quality rating was performed by combining the proposed criteria of the Meta-Analysis of Observational Studies in Epidemiology (MOOSE) statement,²⁸ the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement,²⁹ and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)³⁰ statement to verify the strength of scientific evidence in clinical decision-making. The classification of the risk of bias potential for each study was based on the following five criteria: (1) random selection in the population, (2) definition of inclusion and exclusion criteria, (3) report of losses to follow-up, (4) validated measurements, and (5) statistical analysis. A study that included all the criteria mentioned above was classified as having a low risk of bias and a study that did not include one of these criteria was classified as having a moderate risk of bias. When two or more criteria were missing, the study was considered to have a high risk of bias.

Summary measures

The mean change from preoperative to postoperative MIO/pain for both comparisons was either directly reported in the

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