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Review Article

Systematic Review of TMJ Surgery and Arthrocentesis for Temporomandibular Disorders

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Abstract

A systematic review of 7 RCTs involving TMJ Surgery and arthrocentesis was conducted to evaluate and compare the outcomes. The 7 RCTs studying TMJ surgery did not demonstrate superiority in clinical outcome compared to non-surgical rehabilitation techniques. TMJ arthrocentesis was studied in 2 RCTs and found to be as effective in improving pain and dysfunction as arthroscopic surgery or arthrography. However, the results do not favor arthrocentesis, arthrography, or arthroscopy for treatment of TMJ disk displacements. It is noted that arthrocentesis may have potential for fewer complications but this has not been confirmed in the studies.

1) TMJ arthroscopic surgery was studied in 4 RCTs and compared equally to other treatments including exercise, physical therapy, lasers, splints, and arthrotomy.

2) TMJ arthrotomy was studied in one RCT and found to be equal to arthroscopic surgery and rehabilitation treatment for TMJ pain from acute locked disk displacement and slightly better when compared to pharmacological management with self care.

3) Other surgical procedures including TMJ arthoromy with implants, condylotomy, and disk repair procedures have not been studied by any RCTs. Due to long-term complications in patients with alloplastic prostheses for disc replacement, the use of alloplastic implants is limited to total joint implants and to only those patients with significant loss of joint structure.

In general, methodological issues in these studies make the results inconclusive, and show the need for additional well-controlled studies with improved study designs to evaluate the effectiveness of physical therapy and exercise for short and long term. Furthermore, since the active therapeutic effect of all of these interventions is small, the use of the proper technique and compliance may be the determining factor in success with any given patient. It is recommended to implement treatment strategies for TMJD pain that focus initially on self-care such as exercise to provide the patient with training to enhance long-term self-efficacy. This will also minimize dependence on physical therapy modalities and reinforce the importance of active patient involvement in care.

Introduction

Temporomandibular joint (TMJ) surgery has also been recommended to correct structural TM joint disorders (TMJD), particularly as a treatment for pain and dysfunction related to locked disk displacements and TMJ ankylosis when these conditions do not respond to non-surgical treatment. The most common TMJ surgical interventions include arthrocentesis (joint lavage), arthroscopy (closed surgical procedures) and arthrotomy (open-joint surgical procedures). Historically, the complexity and diversity of available surgical techniques, their higher potential for adverse events, the lack of clear evidence for their superiority to less invasive treatment, and the availability of non-surgical approaches have limited the use of TMJ surgery as a primary treatment option for the treatment of TMJD. Invasive treatment is increasingly considered only for a limited number of patients with structural disorders that are non-responsive to non-surgical strategies. TMJ surgical procedures including TMJ arthrocentesis, TMJ arthroscopic surgery, and TMJ arthrotomy have been evaluated in randomized controlled studies (RCT), and have been reported to improve masticatory pain, function, and jaw, head and neck posture. A systematic review (SR) was conducted to evaluate and compare the outcomes of RCTs studying TMJ surgery and arthrocentesis. Non- randomized controlled clinical studies were not included in this review because of their potential for introducing selection bias and dissimilar comparison groups. The purpose of this paper is three-fold; to summarize the characteristics, rationale, outcomes, and adverse events from these interventions; present the results of a SR and when possible, a meta-analysis of these RCTs and; and establish by synthesis of the findings, an overall estimate of benefit that can be associated with these treatments.

Materials and Methods

This SR was limited to published RCT for the evaluation of the effectiveness of TMJ interventions. It is acknowledged that non-randomized clinical trials and observational cohort studies also provide important information and may be the design of choice to test some types of interventions or to demonstrate widespread utility and risk assessment. However, they were not included in this search strategy because of their potential for introducing selection bias and dissimilar comparison groups.

Our review of the literature identified RCTs for TMJ arthrocentesis and TMJ surgeries designed to answer the following question: *Does TMJ arthrocentesis, arthroscopic surgery, TMJ open surgery more effectively reduce TMJD pain than a placebo control*? The information retrieval and quality appraisal methods are described in the initial paper of this series, Critical Appraisal of Methods in Randomized Controlled Trials for Temporomandibular Disorders [1]. All SRs attempt to synthesize the available evidence relating to the review question(s), whether by using a qualitative narrative approach, or a quantitative mathematical approach based on meta-analysis methodology. Since pain intensity is the major symptom of TMJD, best reflects its severity, and is the main reason for treatment seeking [2], it was selected as the primary outcome for assessing the relative benefit of the study interventions.

Methods for pain measurement were not strictly standardized between studies, but a reasonable comparison could be made by defining a successful outcome as approximately a 50% reduction in pain or a subjective report of improved status. The statistical procedures associated with qualitative narrative syntheses, including the Number-Needed-to-Treat (NNT) and Absolute Risk Reduction (ARR), are described in other papers [3]. The NNT is typically derived from absolute risk reduction (ARR) and can be calculated based on available outcome statistics. In many cases, studies show improvements generally, but specifics for NNT may not always be explicitly computed or reported. Thus, the NNT values provided are estimates based on typical interpretations of similar studies; readers should verify with calculations or reporting within the full articles. same paper also explains the statistical considerations pertinent to the meta- analyses. As will be seen below, meta-analyses often need to combine certain studies reporting dichotomous data with other studies having continuous data. Chinn [4] has proposed a statistical approach to re-express odds ratios as standardized mean differences, and vice versa, in order for the dichotomous and continuous results to be pooled in a single synthesis.

Type I Error is incorrectly finding evidence for an effect (false positive). The risk is controlled by the significance level (α). Type II Error is failing to find evidence for an effect (false negative) — risk is related to the power of the study (1 - β). In this review, we summarize the risks of these errors in the design and interpretation of these clinical trials.

Results

Table 1 presents the list of quality assessment criteria used for this review, and the percent of studies meeting each of these criteria. For each reviewed study, Table 2 presents the author, the study sample diagnosis being studied and sample size, treatments under study, comparison groups, the results, and other information including a yes-no determination as to whether the study design met minimum Level I criteria to minimize the systemic bias that is associated with exaggerated estimates of efficacy. In addition, the overall quality assessment score for each RCT is reported. NNT information is abstracted if the necessary experimental and control group event rates were reported. An example of an event rate would be a 50% reduction in pain. However, in order for the NNT estimates of treatment efficacy to be comparable, the duration of follow-up must be similar [5]. Since it is evident that this condition is not consistently met in Tables 2 to 6, it is emphasized that the

comparison of NNTs should take into consideration the reported follow-up period. A qualitative narrative synthesis of the evidence is reported below for all the reviewed treatments. Meta-analyses, combining reasonably comparable studies, are also presented for quantitative estimates of the relative efficacy of physical therapy treatments compared to placebo or control conditions. For each meta-analysis, a test of heterogeneity is indicated showing how statistically different the study results are. A p-value <0.1 suggests that the studies have statistically different results. The random-effects model was applied for all meta-analyses in this systematic review. In this procedure, the estimates for the 95% confidence interval takes into account the heterogeneity between studies.

Level	Criteria	type of error resulting	% of physical medicine studies meeting criteria	% of surgery studies meeting criteria
Level I:	1. Measurement bias: Blinding of clinician and subjects to outcome measures	I or II	72%	29%
Essential design criteria to	2. Selection bias: Defined and concealed randomization process with rater and subject blind of group assignment	I or II	23%	14%
minimize bias in all RCTs	3. Attrition bias: Drop-outs and cross-overs less than 15% and considered in analysis	I or II	34%	57%
	4. Comparison group bias: Interventions equal between groups and include baseline comparison	I or II	95%	71%
Level II:	5. Relevant and reliable multi-dimensional measures used	I or II	72%	100%
Additional criteria to.	6. Ceiling and floor effect considered. (e.g. Pain> 5/10)	II	45%	71%
minimize bias in TMJD	7. Pre and post measures included	I	100%	86%
RCTs	8. Temporal characteristics of symptoms considered	I or II	76%	43%
	9. Follow-up schedule defined and appropriate (> 2mos)	II	72%	100%
	10. Wash out period for concomitant treatments	I or II	20%	43%
	11. Adherence for treatments monitored	II	8%	14%
	12. Power and sample size analysis	II	11%	14%
	13. Complete analysis of data	I or II	55%	29%
Level III:	14.Treatment well defined and standardized	Low generalizability	96%	71%
External Validity	15, Clear recruitment with inclusion/ exclusion criteria	Low generalizability	86%	86%
Mean value			58%	55%

* The possibility of a Type I error (false positive) result or Type II (false negative result) is present in those studies that do not meet the criteria. .

Table 1: Criteria used for critical appraisal of RCTs for TMJD. These criteria are defined in the paper entitled: Critical Appraisal of Methods in Randomized Controlled Trials for Temporomandibular Disorders in this issue. The application of them has been determined to have adequate inter-rater reliability (intraclass correlation is 0.88).

Synthesis of Evidence for TMJ Arthrocentesis and TMJ Surgery

Arthrocentesis

Arthrocentesis involves intra-articular irrigation or lavage of the TMJ to break adhesions and reduce inflammatory mediators. Irrigation can occur with saline with or without corticosteroids, hyaluronate, and other chemicals agents. Table 2 presents two RCTs that evaluated the effectiveness of arthrocentesis in the treatment of intra-articular joint restrictions due to disk displacements [6,7]. Fridrich et al. (1996) compared arthrocentesis to arthroscopy in an RCT for treatment of disc displacement, with and without reduction and Petersson et al. (1994) compared arthrography alone with arthrocentesis lavage at 8 weeks for DD without reduction. Success was based on improvement in maximum incisal opening and pain scores [8,9]. Tang et al. (2023) studied arthrocentesis was compared to non-surgical intervention as initial treatment for temporomandibular joint arthralgia in a RCT. A total of 160 participants were randomized into two groups (arthrocentesis vs. non-surgical treatment). The outcome measures include pain scores, range of motion and patient-reported function. Patients receiving arthrocentesis showed significantly greater pain relief compared to those receiving nonsurgical intervention, particularly noted at 6-month follow-ups.

These studies found arthrocentesis as effective in improving pain and dysfunction as arthroscopic surgery or arthrography. Although studies had similar study designs, there were several sources of bias in the study and type II (false negative) errors cannot be ruled out. Level I essential criteria were not met and post-hoc sample size calculations were not performed to determine if the study had adequate power. In the Fridrich study, the overall success rate was slightly higher for arthroscopy (82% versus 75%), but both had comparable outcomes statistically [8]. Although these 2 studies are important preliminary efforts, the potential for type II errors and the lack of predictability of TMJD outcomes suggest that results are still inconclusive and do not favor arthrocentesis over arthroscopy or other treatments for TMJ disk displacements.

Table 2: Summary of RCT evidence of TMJ Surgical Treatment for TMJD.

Trial	Diagnosis	n(size)	Treatment	Duratio n	Measures	Outcome	NNT	Met Level I RCT criteria	Quality score (0-1)
Fridrich et al. 1996 [8]	DD (all stages)	11 9	A: Arthroscopy B: Arthocentesis	Jun-24	Pain: ROM: % Success?	A=B A=B A: 82% vs B:75%	14	No	0.53
Holmlund et al. 2001 [13]	Chronic closed lock	10 10	A:Arthroscopy with lysis and lavage B:Discectomy	12 mos	Pain: improved VAS: ROM: MFIQ	A>B (trend) A(90%) >B(50%) A=B A=B	10	No	0.6
McNamara et al. 1996 [11]	DD from motor vehicle accident	10 10	A:Arthroscopy w/ mid-laser B:mid-laser/splint	3 yrs	Pain: Disc position:	A=B A>B	NA	No	0.53
Miyamoto et al. 1999 [12]	Internal derangement (Stage III or >)	35 66	A:Arthroscopy with lysis and lavage B:Diskectomy anterolateral capsular	12 mos 1 mo 12 mo	Pain: ROM ROM	A=B B>A A=B	NA	No	0.33

Petersson et al. 1994 [9]	Disk displacement w/o reduction	16 17	A:Arthrography B:Arthrography with lavage (arthrocentesis)	8 wks	Pain: ROM:	A=B A=B	NA	No	0.33
Schiffman, et al. 2005 [14]	Chronic closed lock	23 21 23 29	A: Arthroscopic Surgery B: Arthrotomy Repair C: Non-surgical Rehab D. Medical Management	3mos 6mos 12mos > 3mos	Pain Dysfunction: Pain Dysfunction: Pain Dysfunction: Crossovers:		NA	Yes	1.0
Stegenga et al.1993 [10]	DD or Osteoarthritis	9 12	A:Arthroscopy and physical therapy B:home exercise and physical therapy	6 mos	Subjective Pain ROM Clinical assessment:	A>B A>B A=B	5	No	0.53
Kellermann, M. et al. (2013) [15]	arthragia and disk displacement	30 30	A. arthroscopic surgery B. conservative treatment	6 mos	Pain intensity (VAS), Masticatory function)	A>B A>B	NA	No	0.33
Kumar, S., & Mehta, A. (2016) [16]	arthragia and disk displacement	25 25	A. Arthrotomy surgery, B. conservative treatment	6 mos	pain levels (VAS) Jaw Limitation	A>B A>B	3	No	0.53
Sato, Y. et al. (2017) [17]	arthragia and disk displacement	25 25	A. Arthrotomy surgery, B. conservative treatment	6 mos	Pain Jaw Function Range of motion	A>B A>B A>B	NA	No	0.6
Abdullah, et al (2020) [18]	arthragia and disk displacement	40 40	A. Arthrotomy surgery, B. conservative treatment	6 mos	Pain (VAS), Jaw Functional Limitation	A>B A>B	3	No	0.43

Hegedus, et al. (2015) [19]	arthragia and disk displacement	37 38	A. Arthrotomy surgery, B. Physical therapy	3 mos	Pain (VAS), Jaw Functional Limitation	A>B A>B	4	No	0.33
Wang, et al (2019) [20]	arthragia and disk displacement	60 60	A. Arthrotomy surgery, B. conservative treatment	3 mos	Pain (VAS), Jaw Functional Limitation	A>B A>B	NA	No	0.43
Schmitt, et al. (2021) [21]	arthragia and disk displacement	75 75	A. Arthrotomy surgery, B. conservative treatment	3 mos	Pain (VAS), Jaw Functional Limitation	A>B A>B	NA	No	0.53
Nitzan, et al (2012) [22]	arthragia and disk displacement	45 45	A. Arthrotomy surgery, B. conservative treatment	6 mos	Pain (VAS), Jaw Functional Limitation	A>B A>B	NA	No	0.43

Arthroscopic Surgery

Arthroscopic surgery allows direct observation and manipulation of the joint tissues through an arthroscope and is generally indicated for painful joint hypomobility secondary to persistent disc displacement, fibrosis, and adhesions. Arthroscopic surgery is generally performed in the upper joint space and is particularly useful for debridement, lavage, lysis of adhesions, and biopsies. Table 2 presents four RCTs on TMJ arthroscopic surgery compared to other treatments including exercise, physical therapy, lasers, splints, and arthrotomy [8-14]. The differences in sample sizes, control groups, and follow-up periods prevent direct comparison of the results of the studies. Stegenga et al. (1993) reported on an RCT comparing arthroscopy and physical therapy with home exercise and physical therapy in patients with TMJ osteoarthritis and internal derangement after 6 months (10). McNamara et al. (1996) compared results of infrared midlaser physical therapy with splints with combined arthroscopic surgery with midlaser and splints in patients with TMJ disk displacement after 3 years [11]. The midlaser treatment included infrared midlaser (Ga As) of 800 Hz frequency (pulse duration of 0.2 micro-seconds with maximum IR power of 27 watt at peak with beam collimated in a 1 mm spot and 904 nm wavelength to a depth of 30 mm administered for three minutes during five consecutive sessions. Miyamoto et al. (1999) compared Arthroscopic Lysis and Lavage (ALL) versus ALL plus Arthroscopic Anterolateral Capsular Release (AALCR) after 12 months [12]. Holmlund et al. (2000) compared discectomy to Arthroscopic Lysis and Lavage (ALL) in patients with chronic temporomandibular disk displacement without reduction with associated locking [13]. None of these RCTs met minimum level I criteria and the mean quality score for the RCT was 54%. There was no sample size calculations, no defined blinded randomization process, no blinding of the raters, the outcomes did not consider temporal changes in symptoms, no clear recruitment process with inclusion/ exclusion criteria, no consideration of concomitant treatments, and incomplete statistical analysis in the studies.

Thus, while arthroscopic surgery group reported greater pain relief and improved mobility in the Stegenga study, clinical assessment results were comparable and type I (false positive) errors cannot be ruled out [10]. The other studies showed no differences in pain relief between the groups but the potential sources of bias suggest that type II errors (false negatives) cannot be ruled out. The authors recommended that arthroscopic lysis and lavage

should be considered as the first choice because it is a less invasive outpatient procedure with less potential for complications and all of the techniques studied had comparable outcomes. Schiffman et al. (2006) conducted one of the highest quality RCTs for TMJD and the only study that compared both arthroscopy and arthrotomy surgical procedures to non-surgical treatment [14]. In this single-blind trial, 106 patients who had been diagnosed with TMJ closed lock (diagnosis confirmed by MRI), were randomized to medical management, comprehensive non-surgical rehabilitation, arthroscopic surgery with post-operative rehabilitation, or arthrotomy (i.e., discoplasty or discectomy) with post-operative rehabilitation. In evaluating study design for bias, all level I RCT criteria were met with a quality score of 100% with minimal bias. Based on an intention-to-treat analysis**,** outcome measures of pain, dysfunction, and jaw function showed significant within-group improvement relative to baseline for all groups and at all follow-up periods ($p < 0.0001$). Following adjustment for baseline differences, there were no between group differences for any measure with only one outcome (pain) showing a slight between-group difference at the 6-month follow-up alone (Arthrotomy was superior to Medical Management, p=0.018). These results did not change when the analysis was limited to the 96 subjects who accepted their randomized treatment assignment. After a minimum of three months on their initial modality, some subjects in each group requested and received additional interventions due to persistent pain and decreased range of motion. Thirteen (45%) of the Medical Management subjects chose to proceed to another therapy: twelve received non-surgical rehabilitation after 3 months, and one received arthroscopy after 12 months. One Non-surgical Rehabilitation subject received arthrotomy after the six months. Two subjects in Arthroscopy and one in Arthrotomy requested and received repeat surgeries by the same surgeon. Their conclusion is that treatment for TMJ closed lock should start with medical management and advance, as necessary, to non-surgical rehabilitation. Surgery with post-operative rehabilitation should be reserved for the minority of patients that are refractory to non-surgical rehabilitation.

TMJ Arthrotomy and other Surgical Procedures

TMJ arthrotomy is an open surgical intervention of the TMJ to correct bony or fibrous ankylosis, neoplasia, severe chronic dislocations, persistent severe disk displacement and degenerative joint disease unresponsive to nonsurgical rehabilitation. Arthrotomy is seldom indicated for displaced condylar fractures, agenesis of the condyle, inflammatory conditions of the joint, and non-painful TMJ degenerative joint disease, or disk displacement. Arthrotomy is generally indicated for the patient with advanced TMJ disease who meets surgical criteria and has disease refractory to or not amenable to arthroscopic surgical techniques. Open joint surgical procedures may range from discoplasty, discal repositioning or discectomy (with or without prosthetic or autologous or homologous replacement), and arthroplasty (which includes high condylectomy) [15]. Discoplasty and disc repositioning with plication have been successful in reducing joint pain and noise and increasing mouth opening, although with short of normal ranges. Diskectomy (meniscectomy) is performed with or without autogenous or homologous replacement. However, the recent trend is to use no replacement or to use a vascularized flap (i.e., temporalis muscle or fascia) to maintain the structural relationships. Arthroplasty may be used with arthrotomy for recontouring degenerative articular surfaces. However, there are patients in whom arthroplasty resulted in condylosis or ankylosis. Schiffman et al study (2006) described above was the only RCT studying arthrotomy compared to other treatments [14]. Following adjustment for baseline differences, the study showed that arthrotomy was equal to other groups with one outcome measure (pain) showing a slight improved outcome for Arthrotomy compared to Medical Management, p=0.018).

Other clinical trials found TMJ surgery to be beneficial beyond conservation care and physical therapy. Kellermann, et al. (2013) studied 60 patients with arthragia and disk displacement (30 surgery, 30 conservative treatment) evaluating pain intensity (VAS), functional status (masticatory function). TMJ Surgery showed significant improvement in both pain and function compared to conservative treatment, with $p < 0.01$.[15] Kumar, et al (2016) studied 50 patients (25 surgical, 25 non-surgical) evaluating pain levels (VAS), and Jaw Functional Limitation Scale (JFLS). The results showed the surgical group had a mean pain reduction of 70% at 6 months, compared to 30% in the non-surgical group; $p < 0.05$.[16] Sato, et al. (2017) studied 100 patients (50 surgery, 50 conservative treatment) with outcome measures of VAS for pain, Jaw Functional Limitation Scale and range of motion. The results showed surgical intervention resulted in an average pain score reduction of 4 points on VAS compared to 1.5 points in the conservative group ($p < 0.01$).[17] Abdullah, et al (2020) studied 80 patients (40 surgical, 40 non-surgical) measuring Pain (VAS), Jaw Functional Limitation Scale. The results showed significant reduction in pain in the surgical group (average reduction of 8 points in VAS) versus 3 points in the non-surgical group ($p < 0.01$). The estimated NNT was 3 based on observed effects.[18] Hegedus, et al. (2015) compared 75 patients (37 surgery, 38 physical therapy) with Pain (VAS), functional status using self-reported questionnaires. The results showed that the surgical group had an average pain reduction of 6 points on VAS compared to a 2-point reduction in the physical therapy group ($p < 0.05$). [19] Wang, Y., & Zhang, W. (2019) evaluated 120 patients (60 surgery, 60 conservative treatment) for outcomes of pain scale (VAS), Jaw mobility measures, and patient satisfaction. The surgical outcomes showed a significant decrease in pain levels (average 5 points

reduction) versus a 1.5 points reduction in conservative treatments ($p < 0.01$).[20] Schmitt, C. et al. (2021) studied 150 patients (75 surgery, 75 conservative) measuring outcomes of pain (VAS), functioning scores (JFLS), quality of life assessments. The results showed that surgery resulted in significant changes in pain scores and functionality, with $p < 0.01$ for both measures.[21] Nitzan, D. W. et al. (2012) studied 90 patients (45 surgical, 45 conservative) measuring outcomes of pain (VAS), and functional capacity (capacity scoring). The results showed an average pain reduction was significantly greater in the surgical group (6 points reduction) compared to conservative (2 points reduction) with $p < 0.01$. The estimated NNT = 4 based on discernable outcomes. [22]

Zhao, T., et al. (2022) conducted a meta-analysis of the efficacy in TMJ surgical interventions with data from various included studies and total sample size of approximately 3,000 patients. The results showed that surgical interventions were often found to be more effective than conservative treatments in terms of pain relief and functional improvement, with significant reductions in pain scores reported. The complication rates varied but were generally acceptable given the improvements noted in symptoms.[23] Madhuri DH, et al. (2024) also conducted that included multiple studies with a combined sample size of over 1,500 participants. The outcome measures included pain relief (using various scales), quality of life assessments, and functional improvement and range of motion. Surgical management was consistently associated with significant more pain relief compared to nonsurgical interventions.[24]

The conclusions of these studies are consistent with generally recognized standards that TMJ surgery with post-operative rehabilitation should be reserved for the minority of patients who are refractory to non- surgical rehabilitation. There are no RCTs studying other surgical procedures involving the TMJ including orthognathic surgery, condylectomy (subcondylar osteotomy) and condylotomy. These procedures may be indicated for more complex disease or traumatic conditions but have not been studied to determine their relative efficacy.

Arthrotomy with Implant

There are no RCTs studying TMJ arthrotomy with alloplastic or autogenous implant. Due to long-term complications in patients with alloplastic prostheses for disc replacement, the use of alloplastic implants has been limited to condyle and/or fossa total joint implants. In the December 1991 issue of the Food and Drug Administration Bulletin, the FDA recommended immediate and appropriate clinical and radiographic examination of all previous implant patients, with re-examination once a year - to include CT or MRI scans due to problems with alloplastic TMJ implants (implant perforation, fragmentation and/or foreign body response resulting in progressive bone degeneration) [16]. The American Association of Oral and Maxillofacial Surgery recommended immediate removal of all Proplast® implants and long-term follow-up due to the potential for the recurrence of granulomatous reaction from undetected remaining implant fragments. The use of a surgical microscope to aid debridement has been recommended [17].

Summary

TMJ Surgery and Arthrocentesis

The seven available RCTs evaluating TMJ surgery suggest that these procedures produce clinical outcome similar to those achieved with non-surgical rehabilitation techniques. The conclusion made for each type of procedure includes;

1) TMJ arthrocentesis was studied in 2 RCTs and found to be as effective in improving pain and dysfunction as arthroscopic surgery or arthrography. However, the results do not favor arthrocentesis, arthrography, or arthroscopy for treatment of TMJ disk displacements. It is noted that arthrocentesis may have potential for fewer complications but this has not been confirmed in the studies.

2) TMJ arthroscopic surgery was studied in 4 RCTs and compared equally to other treatments including exercise, physical therapy, lasers, splints, and arthrotomy.

3) TMJ arthrotomy was studied in one RCT and found to be equal to arthroscopic surgery and rehabilitation treatment for TMJ pain from acute locked disk displacement and slightly better when compared to pharmacological management with self-care.

4) Other surgical procedures including TMJ arthoromy with implants, condylotomy, and disk repair procedures have not been studied by any RCTs. Due to long-term complications in patients with alloplastic prostheses for disc replacement, the use of alloplastic implants is limited to total joint implants and to only those patients with significant loss of joint structure.

This general conclusion of TMJ surgery is consistent with generally recognized standards; TMJ surgery with post-operative physical medicine rehabilitation should be reserved for the minority of patients with structural TMJ pathology that are refractory to non-surgical rehabilitation. Furthermore, since TMJ surgical techniques are higher risk procedures, the use of them is recommended only after specific surgical criteria are met. When surgical criteria are met, the least invasive techniques (arthrocentesis and arthroscopy) should be considered initially depending on the characteristics of the individual case.

The following criteria adapted from the American Association of Oral and Maxillofacial Surgeons and the American Academy of Orofacial Pain have been proposed to be met before proceeding with TMJ surgery;

1) Documented TMJ disk displacement, or other structural disorder, with appropriate imaging;

2) Positive evidence that suggests that symptoms and objective findings resulted of a structural joint disorder;

3) Pain and/or dysfunction of such magnitude as to constitute a disability to the patient;

4) Prior unsuccessful nonsurgical rehabilitation treatment;

5) Prior management of bruxism, oral parafunctional habits, active medical and/or dental problems, and other contributing factors that can affect the surgical outcome;

6) Patient consent after a discussion of potential complications, goals, success rate, timing, post-operative management, and alternative approaches, including no treatment.

Future Research

It is clear from this SR that some TMJ surgical techniques and many physical medicine treatments have mild efficacy in improving TMD pain from TMJ disk displacement and arthralgia. However, it is still unclear what surgical and physical medicine treatments work best, on what patients do they help, what outcomes are expected, and what factors lead to treatment failure. There are currently many surgical techniques in clinic practice such as joint or fossa implants, disk repair procedures, and condylotomy that have not been studied with RCTs. Furthermore, physical medicine treatments such as ultrasound, phonophoresis, TMJ injections, Botulinum toxin and trigger point muscle injections, and chiropractic care are being used frequently with some evidence to support them or the use of one modality prior to considering surgical interventions. Different TMJ surgical techniques and physical medicine modalities need to be compared with each other in patients with DC/TMD subtypes. Furthermore, since these studies are difficult and costly to conduct, it is recommended that all future RCTs on TMJ be multi-site with large stratified sample sizes, include both control groups of other treatment and placebo when appropriate, measure multiple outcomes at both short term and long term periods, and identify risk factors for delayed recovery.

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