

## THE OUTCOME OF TEMPOROMANDIBULAR JOINT DISC REPOSITIONING WITH RETRODISCAL CONTRACTURE

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### *ABSTRACT*

**Statement of the Problem:** One of the common surgical procedure for management of mechanical interferences in TMJ is disc repositioning procedure. Disc repositioning for TMJ internal derangement is established procedure with variable success and means of fixation. The purpose of this study is to assess the outcome of using temporomandibular joint (TMJ) arthroscopy disc repositioning with retrodisical contracture as a minimally invasive surgical treatment for TMJ internal derangement (ID).

**Materials and Methods:** 25 patients, were treated in the period from 2015- 2017. All patients were evaluated for changes in preoperative versus postoperative clinical assessment through visual analog scale score (VAS), maximum interincisal opening distance, Joint loading Sign, joint noise and pain, muscle pain, diet and medication intake.

**Methods of Data Analysis:** All patients were followed up for 1 year after treatment. Statistical analyses included the Student t test and Chi square test to determine if there were significant differences in preoperative and postoperative assessments.

**Results:** 25 patients (32 TMJ), the mean age was 39 years; 21 were female and 4 male. 13 classified as Wilkes II, 19 as Wilkes III. The success rate was 72% based on improvement of joint pain. The study showed statistically significant improvement in all outcome variables except muscle pain.

**Conclusion:** Clinical outcome data presented show that TMJ arthroscopy disc repositioning with retrodisical contracture is an effective, predictable surgical treatment. The present study further specifies Wilkes II, early III TMD patients as the most successful category of patients for such procedure.

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## INTRODUCTION

Pain and dysfunction are the cardinal symptoms of temporomandibular joint (TMJ) functional disorder. Such a dysfunction is called internal derangement (ID) of the TMJ and it is caused by antero-medial displacement of the articular cartilage<sup>1</sup>. Wilkes 5 stages classification 1989<sup>2</sup> remains the gold standard to describe the severity of TMJ ID. Based on clinical, radiological and operative findings the severity of the TMJ ID ranges from symptom-free disc displacement to severe arthritic changes. Although 90% of TMJ ID are successfully treated using conservative protocols like occlusal splints and physiotherapy, yet the remaining 10% will require further interventions such as arthroscopic or open joint surgeries<sup>3-5</sup>. Disc repositioning technique introduced by McCarty and Farrar in 1979 has been widely used, separately or with other procedures such as arthroplasty and eminectomy, to correct mechanical interference in the TMJ resulting in alleviation of pain and improvement of the range of motion. Success rates for these procedures ranged from 77% to 100%. In some studies and from 82% to 94% in others<sup>6-13</sup>. Technical difficulties, postoperative complications and long hospital stay related to open joint surgeries gave way to the introduction of less invasive procedures such as TMJ arthrocentesis and TMJ arthroscopy. Recently TMJ arthroscopy became popular, minimally invasive, safe and effective treatment modality for TMJ ID.<sup>14,15</sup> First stage TMJ arthroscopy includes a diagnostic sweep followed by lysis and lavage of the superior joint space. Second stage arthroscopy includes disc repositioning (discopexy) with fixation either by a single suture passing from the inferior joint space through the disc, McCain technique, or a suture passing through the disc to the external auditory canal, Tarro technique. Both techniques are done under arthroscopic vision with high success rates. Other fixation techniques includes pins<sup>15-31</sup>

All proposed discopexy techniques include disc reduction with or without anterior release followed by retrodiscal contracture and finally disc fixation. In specific cases disc maintains its normal position on top of condyle under function test during the procedure which brings us to think that in such cases retrodiscal contracture shall be enough to maintain disc position with no need for suture, or pin fixation. Retrodiscal contracture aiming to create scarification in elastin fibres discovered by Ohnishi along oblique protuberance as done in dislocation cases followed by limited range of motion exercises for 3-6 weeks to ensure maturation of scars formed holding the disc in position and preventing it from dislocating.<sup>32</sup>

The aim of this study was to assess the outcome of using temporomandibular joint (TMJ) arthroscopy disc repositioning with retrodiscal contracture for treatment of TMJ internal derangement (ID) Wilkes II, early III.

The investigator hypothesized that such a minimally invasive procedure would have a successful outcome navigating the need of disc fixation in those specific cases of Wilkes II with transient locks, early III, where disc maintain its position after manual reduction.

## PATIENTS AND METHODS

### Study Design:

From June 2015 to May 2017, 25 subjects underwent arthroscopic disc repositioning followed by retrodiscal contracture at faculty of dentistry, Cairo University.

### Inclusion criteria:

- Unilateral or bilateral TMJ disorder in the form of pain, clicking and /or locking.
- Willkes stages from II to early III

**Exclusion criteria:**

- Presence of: Central perforation of articular disc, Wilkes IV, V, and late III with non-reduced disc far away from condylar position, Advanced arthrofibrosis, ankylosing osteoarthritis and subjects who had any prior surgery (except the primary diagnostic scope).

**Outcome Variables:**

The primary outcome variable was the improvement of joint pain up to 12 months postoperative. Pain was evaluated by using a visual analog scale (VAS) ranging from 0 to 100 (0 = no pain, 100 = severe maximum pain).

Other outcome variables included, maximum interincisal opening (MIO), the need for medications, joint loading sign, and muscle pain.

Arthroscopic disc repositioning with retrodisal contracture procedure was performed to all candidates under general anesthesia via endotracheal intubation as follows:

**Double-Puncture Technique:** After a diagnostic sweep was completed using a 1.9 mm 30 arthroscope (Smith and Nephew) in a 2.0 inner diameter, 2.2 mms outer diameter cannula. The condyle was in closed position. The second puncture placed in the most antero-lateral corner of the superior joint space using triangulation techniques. The irrigation needle was removed, and the joint was insufflated with 2 cc of irrigation fluid.<sup>33,34</sup> Once intraarticular, the trocar is removed, and drainage of the irrigating fluid was noted through the cannula. The assistant stabilized the working cannula while the surgeon proceeded with instrumentation. A straight probe was used to translate both cannulas into the posterior recess. Then manual disc reduction was attempted to reduced dislocated disc being aligned along oblique protuberance while applying pressure moving the probe in upward and anterior direction, once the disc is reduced, disc stability in reduced position was tested with jaw mobility. As disc maintained

its' normal position, we proceeded to retrodisal scarification step

**Retrodisal scarification or contracture:**

Retrodisal tissue was contracted using Coablation (Arthrocare.USA) for redundant synovium created after disc reduction, and targeting specifically the elastin fibers along and deep to the oblique protuberance. The lesions were then continued as far laterally as possible along the posterior capsule wall. Contracture was visible during the procedure, but the maturation occurred 2 to 3 weeks postoperatively as the scar thickened. disc position and fixation confirmed with jaw mobility under arthroscopic visualization. Then all instruments were removed. Postoperative assessments: Same assessments were performed as preoperative assessment methods to be compared and statistically analyzed.

**Statistics analysis:** Statistical analyses included the Student t test and Chi square test to determine if there were significant differences in preoperative and postoperative assessments.

**Data Analysis**

Selection of cases according to Wilkes classification was done by clinical, radiographic, and arthroscopic examinations. Wilkes II patients experienced restricted range of motion due to disc displacement with reduction with transient locking, which case episodal pain. Wilkes early-stage III cases presented with disc displacement without reduction with close proximity of disc to condylar position which result in long term restricted range of movement developing more chronic pain and altered function.

Statistical analysis was performed using SPSS (Statistical package for the social sciences) version 15, Echsoft corp., U.S.A. Paired Student t-test was used to compare continuous variables. Chi square test of independence was used to show relationships between binary or categorical variables. In all tests, results were considered statistically significant if the

P- value was equal or less than 0.05. A positive chi square test was followed by obtaining the critical value for standardized residual (converted to z score). The critical value that corresponds to 0.05 is  $\pm 1.96$  and the variable was considered significant if its critical value was more than 1.96 or less than -1.96.

**RESULTS**

25 patients 4 males and 21 females suffering from internal derangement of TMJ. The mean age was 39 +11.4 years. The number of unilateral joints was 18 (72%), and bilateral joints was 7 (28%) with a total of 32 joints. The mean Follow up period was 379.3 +27.8 days. According to Wilkes classification 13 joints were diagnosed as Wilkes II, 19 as early Wilkes III. Table (1) No complications noticed after surgical procedure .

TABLE (1)

Studied Variables	N (%)	Mean±SD
No. of patients	25	
Gender		
Male	4 (16%)	
Female	21 (84%)	
Age (Years)		39±11.4
No. of Joints	32	
Unilateral	18 (72%)	
Bilateral	7 (28%)	
Follow up Period (days)		379.3±27.8
Wilkes Classification		
II	13 (40.6%)	
III	19 (59.4%)	

The success of the arthroscopic disc repositioning with retrodiscal contracture was chiefly determined by the improvement of joint pain 12 months

postoperatively. Accordingly, post-surgical assessments revealed a statistically significant success rate of 72% in the studied group of patients. (Table 2)

TABLE (2) Outcome of Arthroscopic Disc repositioning with retrodiscal contracture

Success		Failure		Chi square P value
n	%	n	%	
23	72	9	28	0.01

The study showed that arthroscopic disc repositioning with retrodiscal contracture had significantly improved MIO, and Joint Loading JL by the end of follow up period. On the other hand, there was no significant improvement of the joint noise and muscle pain. (Tables 3,4) .

TABLE (3)

Studied Variable	Preoperative		Last Visit		Paired t-test P value
	Mean	SD	Mean	SD	
MIO (mm.)	30.19	8.97	38.02	3.21	0.001
Pain VAS	71.32	16.42	39.67	8.42	0.001

TABLE (4)

Studied Variable	Preoperative				Last Visit				Chi Square P value
	No		Yes		No		Yes		
	n	%	n	%	n	%	n	%	
JL Sign	17	53.1	15	46.9	25	78.1	7	21.9	0.02
Joint Noise	19	59.4	13	40.6	24	75	8	25	0.08
Muscle Pain	15	46.9	17	53.1	24	75	8	25	0.12

## DISCUSSION

The aim of this study was to assess the outcome of disc repositioning with retrodiscal contracture using temporomandibular arthroscopy for treatment of Wilkes II, early III TMJ internal derangement. The study had a success rate of 72%.

In this study we used the VAS of joint pain, MIO, joint loading sign and muscle pain as indicators for success. Improvement of those indicators by the end of the follow up period indicates that the inflammation in the joint had been dramatically reduced. Our results supports the statement saying that TMJ localized symptoms (as pain, function) are best treated by surgery. Compared to open joint surgery, minimally invasive arthroscopic procedures features many benefits with respect to hospital stay, healing time, postoperative complications and health costs yet meta-analysis studies showed comparable success rates.<sup>40</sup>

In their study Bronstein and Merrill concluded that, Wilkes II and III, TMJ ID had higher success rates for arthroscopic treatment when compared to Wilkes IV and V. Similarly, Zhang et al did not recommend arthroscopic disc repositioning for patients with TMJ ID of Wilkes stages IV or V<sup>36</sup>. However, these studies did not focus on specific arthroscopic technique for different Wilkes stages. Also there was no postoperative imaging to ensure proper disc repositioning. In 1992 McCain proofed the efficacy of arthroscopic treatment of TMJ ID by MRI which showed normal or partially normal disc positioning after discopy<sup>17</sup>. Moreover, the postsurgical clinical assessment conducted in this study and other studies may be sufficient for assessing the procedure's success<sup>12,37</sup>.

Open surgery technique for joint disc repositioning as a treatment for TMJ ID, was first described by McCarty followed by Dolwick. Their primary goal was to restore normal, functional anatomy. They reported 94% success rate.<sup>6,7</sup> In a recent study with a long follow up period,

Abromowicz and Dolwick reported successful results of 94% following over 20 years of follow-up<sup>13</sup>. However their results ignored the stage of internal derangement according to different Wilkes classifications.

Open surgery for disc repositioning can be successfully performed by several well-established techniques. Mehra and Wolford inserted a Mitek anchor into the condylar process and subsequently fixed the disc with a special suture<sup>37</sup>. Also, Sembronio introduced a similar technique without using the absorbable anchor screw<sup>12</sup>. Recent studies suggested a combination of disc repositioning and treatment of the pathological changes such as condylar resorption or degenerative disease improved results and reduced or even prevented posterior condylar degeneration<sup>38,39</sup>. Despite their effectiveness, modern clinical practices continued to search for minimally invasive alternatives to open surgical procedures

TMJ arthroscopic discopy technique was first introduced by Israel and Tarro in 1989,<sup>17,19,41</sup> followed by McCain in 1992, The efficacy of the technique was evaluated by many authors yet the impact of ID severity on the success rates of arthroscopic discopy is not well evaluated. Moreover the literature is still lacking enough successful reports on disc stability after repositioning.<sup>42</sup> In their study on 764 joints treated with arthroscopic suturing, Zhang et al,2010 reported 95.42% MRI-detected improvement in the disc position. However, the study disregarded symptoms and ID severity (Wilkes classification, etc.)<sup>36</sup>. Goizueta et al 2012 described excellent postoperative results upon disc repositioning in 16 patients using the double suture technique<sup>20</sup>. Recently Yang 2016 and Martín-Granizo 2019 supported their successful arthroscopic discopy techniques with postoperative MRI evidence on medium and long follow up periods<sup>28,30</sup>

Gonçalves *et al* in 2015 concluded that the validation of the disc repositioning procedure

requires more evidence based research, and more standardization of the technique itself to concise the range of outcomes..<sup>43</sup>

To the best of our knowledge there is no current studies evaluating the efficacy of retrodiscal contracture as a sole step for disc fixation of repositioned stable discs in Wilkes II, and early Wilkes III. This technique was used successfully for dislocation cases by Torres in 2016.<sup>32</sup> The advantages of this technique would be reenforcing the minimal invasive rationale by doing what is required to fix the mechanical obstacle with no need to use fixation means. The drawbacks would be guaranteeing the stability and long-term effect of scarification in disc positioning and avoiding additional surgery to the patients.

The present study showed that arthroscopic disc repositioning with retrodiscal contracture is an appealing technique for treatment of the Wilkes II, early III, yet relatively small sample size and short follow up period necessitate further larger studies are still needed to confirm the validity of its effectiveness by assuring the maintenance of disc position.

## CONCLUSIONS

Arthroscopic disc repositioning followed by disc stabilization via coblation of the retrodiscal tissue, is an effective minimally invasive surgical procedure to improve joint pain and function in patients with Wilkes stages II and early III TMJ ID.

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