Relationship between intra-articular adhesions and disc position in temporomandibular joints: Magnetic resonance and arthroscopic findings and clinical results

Alejandrina Millon-Cruz[*], Rafael Martín-Granizo, Alejandro Encinas, Alberto Berguer

Department of Oral and Maxillofacial Surgery, Hospital Clínico San Carlos, Calle Profesor Martin Lagos s/n, Madrid 28040, Spain

A B S T R A C T

Objective: The objective of this study was to evaluate the relationship between intra-articular adhesions (IA) and disc position on magnetic resonance imaging (MRI) and direct arthroscopic vision, and to compare the presence of IA and clinical symptoms in patients diagnosed with internal derangements (ID) of temporomandibular joint (TMJ), along with their clinical outcomes.
Methods: A total of 67 patients (134 TMJs) were included in the study. All patients were refractory to previous conservative treatment, and MRI was performed before surgery in all cases. The incidence of IA was evaluated in relation to disc displacement, type of displacement (with or without reduction), and stage of ID according to the Wilkes-Bronstein classification. Patients were divided into an adhesion and non-adhesion group. The association between the two groups with respect to preoperative clinical parameters (maximal interincisal opening, locking duration, joint pain, patient age) and postoperative parameters at 6 and 12 months was evaluated.
Results: The incidence of IA was 44% and the most common location was the anterior recess of the joint. IA were found in 58.3% of the joints with disc displacement without reduction, and in 28.9% of those with disc displacement with reduction ($p < 0.05$). In joints with well-positioned discs, adhesions were found in 15% of the cases. Patient age and locking duration were significantly higher in the adhesions group ($p < 0.05$). In relation to clinical outcome, there was no clinically relevant difference between groups at 6 and 12 months.
Conclusions: In TMJ with disc displacement without reduction, the presence of IA was significantly higher than in joints with well-positioned discs or displacement with reduction, which leads to the hypothesis that disc hypomobility is an important factor in the genesis of adhesions.

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1. Introduction

Intra-articular adhesions (IA) are an important finding in patients diagnosed of internal derangements (ID) of temporomandibular joint (TMJ) treated with arthroscopy. IA or adherence is defined as bands of connective tissue that connect different intracapsular structures, but their etiology and pathogenesis is still unknown.

Several hypotheses have been proposed on the mechanism of the onset of adhesions and its relationship with articular degeneration. Kaminishi and Davis (1989) reported two theories. The first is that alterations in the lubrication system of the joint and the presence of synovitis subsequently lead to fibrin deposition and onset of adhesions. The second theory is based on the healing process of hematomas in the synovial membrane, which promotes the formation of scar tissue and adherences. Recently, Israel et al. (2006) proposed that the acute and chronic articular overload, which exceeds the adaptive mechanisms, induces articular changes and the release of inflammatory mediators and free radicals, resulting in tissue damage as synovitis, osteoarthritis, and adhesion formation.

Several classifications to rate the different types of adhesions have been proposed. First, Kaminishi and Davis (1989) classified IA as fibrous bands, fibrosynovial bands, intracapsular fibrosis, capsular fibrosis, bone-disc bands, and pseudowalls. Later, Murakami and Segami (1993) classified adhesions into 10 types

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* Corresponding author. Tel.: +34 913303192.
  E-mail address: amilloncruz@hotmail.com (A. Millon-Cruz).

according to their severity and correlation with clinical symptoms. Yang (1998) classified adhesions into 4 groups according to their shape, size and location, as well as their involvement in disc mobility.

Nowadays, the detection of IA is performed by direct vision in arthroscopy. There are several studies of IA discovery on T2 sequences of MRI (Zhang 2009a,, Yura et al., 2011), but these studies have not yet demonstrated high accuracy for diagnosis, in contrast to disc perforations (Shen, 2014). Magnetic resonance (MR) arthrography (Yang 2005, Venetis, 2011) has a higher specificity and sensitivity for the IA diagnosis, but the high cost of this invasive technique and the need for trained personnel limit its use.

Therefore, the aims of this study were as follows: to evaluate the relationship between intra-articular adhesions (IA) and disc position on MRI and direct arthroscopic vision; and to compare the presence of IA and preoperative clinical symptoms in patients diagnosed with ID, along with their clinical outcomes at 6 and 12 months after arthroscopy surgery.

2. Material and methods

2.1. Patients

We conducted a retrospective study of 67 consecutive patients (134 TMJs) diagnosed with ID who underwent bilateral arthroscopy between January 2007 and February 2013 in our department, obtained from our database of more than 600 arthroscopies. All patients presented with unilateral or bilateral joint pain, with or without mouth opening limitation. Inclusion criteria were bilateral arthroscopy, involved bilateral TMJ disease, previous ineffective conservative treatment (soft diet, splint therapy, and physiotherapy) for at least 6 months, and 1-year follow-up. Exclusion criteria were previous TMJ open surgery, previous arthrocentesis or TMJ infiltrations, and unilateral arthroscopy.

Patients were 64 women and 3 men with a mean age of 45.3 years (range 21–68 years).

MRI of the joint was performed before surgery to evaluate the position of the articular disc. T1 and T2 sequences were done in closed and maximal mouth opening in all patients.

In all cases clinical data included joint pain using a visual analog scale (VAS), maximal interincisal opening (MIO), presence of articular clicking or locking, and duration of symptoms (in months). Follow-up evaluation was done at 6 and 12 months after surgery.

2.2. Surgery

A 1.9-mm and 30°-approach arthroscope (Dyonics HD 900, Smith & Nephew Inc., USA), including a video support, was used with 2.2-mm outer protective cannulas for diagnostic and therapeutic arthroscopy.

All arthroscopic procedures were performed by the same surgeon (R.M.G.). All subjects underwent standard bilateral arthroscopy under general anesthesia and nasothracheal intubation. After distension of the upper compartment, detection of intra-articular adhesions was performed from the posterior to the anterior aspect. The upper compartment was divided into 3 zones: posterior recess, intermediate zone, and anterior recess; and all three zones were also divided into medial and lateral parts. Adhesions were treated with lysis and lavage or were removed with a coblator electrodevice (Coblator II ENT, Arthrocare, USA) and with a biopsy forceps (Fig. 1).

After arthroscopy, all joints were classified according to the Wilkes-Bronstein classification system from stage II to V. Furthermore, patients were divided into two groups: an adhesion group and non-adhesion group.

2.3. Evaluation

We evaluated the incidence, features, and location of adhesions in our sample and their distribution according to the stage of joint degeneration (II–V). The incidence of adhesions and their relationship to the presence and type of disc displacement was also studied.

The difference between the adhesion and non-adhesion groups was analyzed with respect to preoperative clinical data and clinical outcome at 6 and 12 months after surgery.

2.4. Statistical analysis

All statistical analysis was done using SPSS 15.0.1 for Windows (SPSS Inc. USA). All variables were divided into continuous and categorical variables. A Student's t-test and t-test for paired samples were used for continuous variables. A χ^2 test was used for categorical variables. A p value of <0.05 was considered statistically significant.

3. Results

IA were observed in 59 (44%) of the 134 treated joints. The most common location was the anterior recess, with 44% of adhesions, mainly in the medial part, followed by the intermediate zone (39% of adhesions) and, finally, the posterior recess (19% of adhesion) (Fig. 2).

MRI of the TMJ before surgery revealed 14% of the joints with a well-positioned disc, displacement with disc reduction in 28%, and disc displacement without reduction in 54% of joints. In the rest, 4% of the joints, a stuck disc was observed.

3.1. Adhesions and disc position

IA were found in 58.3% of joints with disc displacement without reduction, in contrast to the joints with disc displacement with reduction, of which 28.9% showed adhesions and 15.8% of the joints showed well-positioned discs. These differences were statistically significant in χ^2 analysis ($p < 0.05$) (Table 1).

3.2. Adhesions and ID stages

A higher incidence of adhesions was found in joints with advanced stages in the Wilkes-Bronstein classification. Adhesions were present in 26.7% of joints (15/56) in stage II, in contrast to 65% of joints (13/20) with adhesions in stage IV and 80% of joints (8/10) in stage V. These differences were statistically significant in χ^2 analysis ($p < 0.05$) (Table 2).

3.3. Adhesions and clinical symptoms

In the comparative analysis between the adhesion group and non-adhesion group (45 and 21 patients, respectively), the only statistically significant differences were the duration of mouth opening limitation and the age of patients ($p < 0.05$), which were higher in the adhesion group (Table 3).

In the follow-up period, both groups showed a statistically significant improvement in pain after surgery ($p < 0.05$). The adhesion group showed a mean improvement of 49.73 points in VAS 12 months after surgery, whereas the non-adhesion group showed a mean improvement of 47.91 points. No significant differences between groups were observed (Fig. 3).

Each group experienced significantly increased oral opening at 6 and 12 months after surgery ($p < 0.05$). The non-adhesion group presented with a significantly greater MIO at 12 months after