

# Tomographic Changes in the Temporomandibular Joint Following Arthroscopic Surgery With Lysis and Lavage and Eminencia Release

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*Seventy-one patients (128 joints) who underwent temporomandibular arthroscopies with lysis and lavage, capsular stretch, and release of adhesions and lateral capsular fibrosis were followed for an average of 24 months. Prearthroscopic and postarthroscopic temporomandibular joint tomograms were compared; 77.3% of the temporomandibular joints showed no postoperative changes, and 22.7% of the temporomandibular joints studied showed changes. The majority of these tomographic changes involved increase in condylar flattening and beaking. However, postoperative painful symptoms significantly decreased regardless of the radiographic findings.*

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The temporomandibular joint (TMJ) is a unique joint, but it shares some of the same disease processes as the other synovial joints.<sup>1,2</sup> The exact etiology of many of these disease conditions is unknown, but the pathophysiology of anterior disc displacement and the development of degenerative changes in the TMJ have been well studied.<sup>1,3-5</sup> It has been hypothesized that microtrauma or macrotrauma to the TMJ may cause early inflammatory changes, which lead to a loss of lubrication by hyaluronate acid and chondroitin sulfate.<sup>6</sup> The injured synovium then proliferates in an attempt to repair or regenerate damaged intracapsular structures. Capsulitis and synovitis lead to the production of hyaluronidase, which breaks down hyaluronic acid within the joint. This loss of lubrication, combined with inflammatory changes<sup>7,8</sup> in the joint capsule and capsular fibrosis, leads to relative immobility of the joint within the superior compartment, especially during translatory movement of the mandible.<sup>2,3</sup>

In internal joint derangement, the disc may be displaced anteriorly and reduction may occur as the condyle translates forward, which accounts for the opening click. However, if the amount of adhesion is severe, or if the disc is deformed, it will not reduce on opening. When the clicking disappears, the patient can experience a closed lock. In either case, the bilaminar zone area as well as the lateral attachments to the poles of the condyle are stretched, possibly leading to a perforation. The altered joint dynamics and increased shearing stresses may lead to the flattening of the condyle in its anterosuperior curvature. This condition can also be accompanied by bone resorption and flattening around the crest of the eminence, lipping of the condylar head, and the formation of subchondral cysts.<sup>9</sup> The increase in remodeling activity of the condyle and eminence may also manifest itself as an increase in subchondral sclerosis on radiographs.<sup>3</sup>

Occasionally, the disc may not be anteriorly displaced, but may be relatively immobile in its relation to the articular eminence due to lateral fibrosis.<sup>10</sup> As the condyle tries to translate using the inferior compartment, the lateral disc attachment becomes increasingly lax, which, in turn, allows the disc to migrate anteromedially. As discal displacement progresses anteromedially, the lateral attachment migrates forward while it is being stretched by the condyle as it attempts to translate underneath the disc.<sup>11,12</sup> Condylar beaking and lipping develop as a result of the lateral attachment pulling on the lateral condylar pole, as does wear of the convex superior surface of the lateral head of the condyle.<sup>13,14,15</sup>

It has been hypothesized that the mobilization of tissues within and around the joint, combined with reduction of load concentration, allows mesenchymal cell reprogramming and potentially enhances the formation of pseudo-disc articulations and condylar remodeling.<sup>2,16</sup>

The arthroscopic surgical approach to the TMJ presented in this study is aimed at mobilizing the disc by releasing adhesions, removing fibrosis, and removing of pain mediators. The postoperative results showed a reduction of pain and improvement of the mandibular range of motion.<sup>17</sup> However, the disc position in the closed mouth position remains displaced postoperatively.<sup>18</sup>

The objective of this study was to evaluate any tomographic bony remodeling changes in the TMJ following arthroscopic surgery.

## Materials and Methods

Case records of 71 patients who had undergone TMJ arthroscopic surgery were reviewed. The criteria for selection of these patients included:

1. A diagnosis of internal joint derangement (IJD) and anteriorly displaced disc (ADD) confirmed by either preoperative MRI and/or arthrogram.
2. Presence of symptoms of painful limitation of joint function for at least 6 months.
3. Failure to respond to conservative therapies (nonsteroidal anti-inflammatory drugs [NSAIDs], physical therapy, soft diet, splint therapy).
4. Arthroscopic evidence of disc immobility secondary to superior joint compartment adhesions.
5. Only cases involving lysis and lavage, lateral eminence release, and capsular stretch procedures were selected. Cases involving arthroplasty (ie, using the motorized shaver) or open joint arthroplasty were excluded.

6. Patients who had concomitant arthroscopy and orthognathic surgery, or in whom a postoperative tomogram may be affected because of subsequent orthognathic surgery, also were excluded.

The protocol included:

1. Axially corrected sagittal preoperative tomograms of the TMJ were taken. Coronal views were also taken in most cases.
2. The same axially corrected tomograms were taken postoperatively after 6, 12, 18, and 24 months.
3. The same sectographic machine (utilizing the same laboratory) was used and cuts were made to the same depths (sagittal and coronal).
4. The preoperative and postoperative tomograms were compared with the following parameters: (a) width of joint space; (b) increase or decrease of condylar beaking; (c) increase or decrease of condylar flattening; (d) increase or decrease of subchondral sclerosis; and (e) any other changes such as eminentia changes or size of condyle.
5. Other pertinent information such as history of trauma, parafunctional habits, orthodontics, third molar extractions, malocclusion, preoperative and postoperative range of motion, postoperative pain levels, patients' perception of surgery success, possible need for another surgery (arthroscopy or open joint surgery), and subsequent orthognathic surgery were recorded.

## Results

Examinations were performed on 71 patients (67 women, 4 men; 128 joints). The duration of the follow-up ranged from 6 to 48 months, with the majority at around 24 months (Table 1). It was found that 99 (77.3%) of the TMJs did not show any postoperative tomographic changes, and 29 (22.7%) showed some changes.

The types of tomographic changes observed are shown in Table 2. The most prevalent changes were an increase in condylar flattening and beaking, both usually occurring together (Figs 1a to 2b). Changes that were considered indicative of favorable remodeling, such as an increase in joint space or decreased condylar flattening, were seen in only about 10% of the joints (Figs 3a and 3b). One condyle showed a generalized thinning and decrease in size. One condyle in another patient became severely degenerated. In this particular patient, while one joint underwent arthroscopy and the other underwent



**Table 1** Distribution of Joints by Duration of Follow-Up

Duration (mo)	No. of joints with tomographic changes	No. of joints without tomographic changes
6	12	29
12	1	26
18	1	13
24	10	25
30	0	5
36	3	1
48	2	0
Total	29	99

**Table 2** Distribution of Tomographic Changes

Tomographic change	No. of joints (%)
Increase condylar flattening	15 (30.9)
Decrease condylar flattening	5 (9.1)
Increase subchondral sclerosis	2 (3.6)
Decrease subchondral sclerosis	0 (0)
Increase joint space	6 (10.9)
Decrease joint space	5 (9.1)
Increase condylar beaking	15 (27.3)
Decrease condylar beaking	3 (5.5)
AVN	1 (1.8)
Thinning and decrease in size of condyle	1 (1.8)
Total	55*

\*There are joints that have more than one tomographic feature change.



**Figs 1a and 1b** TMJ before (*left*) and after (*right*) arthroscopy. Note increase in subchondral sclerosis and condylar flattening in postarthroscopic TMJ.



**Figs 2a and 2b** TMJ before (*left*) and after (*right*) arthroscopy. Note decreased subchondral sclerosis, increase condylar flattening, and beaking in postarthroscopic TMJ.



**Figs 3a and 3b** TMJ before (*left*) and after (*right*) arthroscopy. Note increase in joint space and decrease in subchondral sclerosis in postarthroscopic TMJ.

diagnostic arthroscopy followed by open joint arthroplasty, both joints showed similar severe degenerative changes. The joint with an open joint procedure was excluded from this study.

One patient (2 joints) from the "no change" group needed a second arthroscopy, and two patients (4 joints) from the "positive change" group needed another arthroscopy. Four patients (6 joints) from the "no change" group required an open joint surgery at a later date, and none of the patients from the "positive change" group needed any open joint surgery.

Postoperative pain level was measured on a visual analog scale with "0" signifying no pain and "5" signifying excruciating pain. The average postoperative pain level in the "no change" group was 1.73, while that in the "positive change" group was 1.4.

## Discussion

The TMJ, like other synovial joints, undergoes remodeling changes<sup>19,20</sup> as a means of adapting to physical stress. As the functional stresses that are placed on the TMJ become excessive, articular tissue breaks down as it exceeds the capability for remodeling and repair to occur.<sup>21</sup> The net effects of these degenerative changes are condylar flattening, tubercle resorption, posterior attachment perforation, and irregularity of the articular surface.<sup>22</sup>

Authors have attempted to correlate the association of radiographic findings and TMJ disease. Muir and Goss<sup>15</sup> studied the radiologic morphology of asymptomatic TMJs in 200 female patients

and found that greater than 90% of the TMJs examined were radiologically "abnormal." Flattening was found in 70% of the dentate group and 85% of the edentulous group, and sclerosis was found in 89% of the dentate group and 85% of the edentulous group. Osteophytes on the condyle were found in 21% of the dentate group and 29% of the edentulous group.

Using the same methods, Muir and Goss<sup>23</sup> also studied the radiologic morphology in 100 women with painful TMJs. The results showed that there was an increased frequency of degenerative changes with osteophyte formation, erosions (at all age ranges), and flattening of the condylar head (in the group less than 40 years of age) in the group with painful symptoms. It was interesting that symmetric joint changes were found in patients with unilateral pain.

In a review of the MRI in 138 symptomatic patients by Rao et al,<sup>24</sup> there appears to be a significant correlation between the severity of IJD and regressive bony condylar remodeling. In 98 joints with an abnormal condyle, the disc was normal in only 4 joints and was anteriorly dislocated in 94 joints. Conversely, of 181 joints with IJD, the condylar morphology was normal in 87 (48%) joints and abnormal in 94 (52%) joints.

The results of the present study indicated that only 22.7% of the joints showed remodeling changes following arthroscopic procedures (with lysis and lavage, eminence release, capsular stretch, and disc mobilization). Using the radiographic parameters that were chosen, 71% of these changes were considered as further degenerative



changes (flattening, lipping, decreased joint space, and increase in sclerosis).

Tomographic changes were shown to occur in all phases of follow-up (Table 1). It must be noted that since this is a retrospective study, some patients did not have their tomograms taken at the scheduled intervals. Therefore, a longitudinal study would help to illustrate better at what point in time tomographic changes would be most likely to occur and the significance of these changes.

The majority (77.3%) of the TMJs in the present study did not show any tomographic change. An explanation for this observation could be that bony changes may need more time to occur than the current follow-up duration. It is also possible that the removal of adhesions and disc mobilization prevents or delays further degenerative changes by allowing adaptive remodeling to occur.

Nonetheless, arthroscopic surgery of the TMJ can successfully treat patients with various degrees of preoperative bony degeneration.<sup>25</sup> The presence of the postoperative radiographic changes did not seem to correlate with the presence of painful symptoms. The present data indicated that the postoperative pain level in the no change group was 1.73 and that in the positive change group was 1.40 (from a visual analog scale of 0 to 5). It is uncertain whether these bony radiographic changes represent further degeneration or adaptive remodeling. A long-term longitudinal study may help to clarify some of these questions.

## Conclusion

A majority of the joints (77.3%) examined in this study did not show tomographic changes within the 6- to 24-month postoperative period. Of the 22.7% that showed changes, most of them consisted of condylar flattening and beaking. The presence of radiographic changes did not seem to correlate with pain, since both groups indicated a significant drop in pain level postoperatively.

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## Resumen

Cambios tomográficos en la articulación temporomandibular luego de la cirugía artroscópica con procedimientos de lisis y lavado y liberación de la eminencia

Se siguieron por un periodo promedio de 24 meses a 71 pacientes (128 articulaciones), quienes se habían sometido a artroscopias temporomandibulares con lisis y lavado, estiramiento capsular, y liberación de adhesiones y fibrosis capsulares laterales. Se compararon los tomogramas preartroscópicos de la articulaciones temporomandibulares (ATM); el 77.3% de las ATM estudiadas mostraban cambios. La mayoría de estos cambios tomográficos se caracterizaron por un mayor aplanamiento y curvatura condilar. Sin embargo, los síntomas de dolor postoperatorio habían disminuido significativamente a pesar de los hallazgos radiográficos.

## Zusammenfassung

Tomographische Veränderungen im Kiefergelenk nach arthroskopischer Chirurgie mit Lysis und Lavage und Lösen von Adhärenzen an der Eminencia

71 Patienten (128 Gelenke), die Arthroskopie mit Lysis und Lavage, Dehnung der Kapsel und Lösen von Adhärenzen und lateralen Fibrosen erhalten hatten, wurden für durchschnittlich 24 Monate beobachtet. Die Kiefergelenktomogramme vor und nach der Arthroskopie wurden verglichen; 77.3% der Kiefergelenke zeigten keine postoperativen Veränderungen, 22.7% der untersuchten Gelenke zeigten Veränderungen. Die Mehrzahl dieser tomographisch erkennbaren Veränderungen manifestierte sich als eine Zunahme der kondylären Abflachung und Schnabelbildung. Die Patienten hatten postoperativ—unabhängig von den röntgenologischen Veränderungen—signifikant weniger Schmerzen.