

# Do signs of an effusion of the temporomandibular joint on magnetic resonance imaging correlate with signs and symptoms of temporomandibular joint disease?

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## Abstract

Effusions are common among patients with disorders of the temporomandibular joint (TMJ), but publications are limited and results inconsistent about the correlation between them and important clinical variables, in particular severity of pain and degenerative disease. We organised a retrospective study of patients who presented for the evaluation and management of arthralgia of the TMJ and myofascial pain at the University of Michigan between 2011 and 2014. Inclusion criteria were: patients who had pain that was primarily arthrogenous, and coexisting myogenous pain, who had had initial non-surgical treatment, and arthroscopy of the TMJ with or without intramuscular injection of onabotulinumtoxinA (Botox,<sup>®</sup> Allergan, Weston, FL, USA). The primary outcome variables were pain at rest as measured by visual analogue score (VAS) and the presence of degenerative disease of the joint. The secondary outcome variables included the position of the disc and whether it was perforated, signs of synovitis, maximal interincisal opening (MIO), and duration of symptoms. We studied 47 patients (94 TMJ) who met the inclusion criteria. We found no significant differences in pain at rest before or after arthroscopy, between patients with and without effusions, or in maximal MIO or duration of symptoms between the two groups. There was, however, a significant relation between effusions and degenerative joint disease. Effusions were also associated with a lower probability of the disc being in a normal position and a higher probability of anterior disc displacement without reduction.

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## Introduction

Effusions are common in disorders of the temporomandibular joint (TMJ), and studies have shown that they are present in up to half of all joints with anterior disc displacement without reduction and up to 40% of joints with anterior disc

displacement with reduction.<sup>1</sup> However, there are few and inconsistent reports about the correlation between effusions and important clinical variables such as severity of pain and degenerative joint disease.

An effusion of the TMJ is defined as excess intra-articular synovial fluid within the TMJ space. It is identified by hyperintensity within the joint space on a T2-weighted magnetic resonance image (MRI). Joint effusions are thought to indicate an inflammatory process, with several studies having shown increased concentrations of proteins and proinflamm-

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matory cytokines in the synovial fluid and tissue of joints with effusions.<sup>2</sup> Occasionally an effusion of the TMJ may be found in conjunction with acute septic arthritis, gouty arthritis, pseudogout, metastatic joint effusion, and synovial chondromatosis.<sup>3–5</sup>

Recently, orthopaedic studies have shown a correlation between effusions of the knee joint and compartment-specific contributions to both weight-bearing and non-weight-bearing knee pain.<sup>6,7</sup> In contrast, papers about the TMJ have found an inconsistent correlation between effusions and temporomandibular arthralgia. Khawaja et al examined 312 TMJ and found that effusions were not associated with arthralgia or with other clinical variables, with the exception of the position of the articular disc in the sagittal plane.<sup>8</sup> Park et al found that effusions of the TMJ had no significant association with spontaneous facial pain, and no relation to pain on palpation of the masticatory muscles.<sup>9</sup> In contrast to these findings, Bas et al found a significant correlation between pain scores measured on a visual analogue scale (VAS) and the presence of effusions on MRI. They also identified a significant positive correlation between increased width of the capsule and effusions on ultrasound imaging.<sup>10,11</sup>

The purpose of this study was to assess the correlation between TMJ effusions and relevant clinical and radiographic variables, specifically the presence of arthralgia in the TMJ, degenerative joint disease on MRI, and arthroscopic findings. We hypothesised that there is no difference in clinical and radiographic variables in patients with and without effusions of the TMJ. The specific aims of the study, therefore, were as follows: first, to compare the incidence and severity of arthralgia of the TMJ; secondly, to compare the presence of degenerative joint disease on MRI; thirdly, to compare secondary variables (including position and perforation of the disc, active maximal interincisal opening (MIO), and duration of symptoms); fourthly, to compare arthroscopic findings; and lastly to compare the outcomes of TMJ arthroscopy in those with and without effusions.

## Methods

### *Study design/sample*

We designed a retrospective cohort study of all patients who presented for evaluation and management of arthralgia of the TMJ and myofascial pain at the University of Michigan between 2011 and 2014. Patients had to have pain that was primarily arthrogenous together with coexisting myogenous pain, and to have had a preoperative MRI of the TMJ. They should also have had initial non-surgical treatment, and TMJ arthroscopy with or without an intramuscular injection of onabotulinumtoxinA (Botox<sup>®</sup>, Allergan, Weston, FL, USA).

Patients who had other procedures on the TMJ, those with primary neuropathic pain, and those who did not have preoperative or postoperative outcomes of interest documented,

were excluded. All procedures were done by a single surgeon in the Department of Oral and Maxillofacial Surgery, and the study was exempted from the need for ethics approval by the institutional review board, and followed the guidelines stated in the Helsinki Declaration.

### *Variables*

Personal, diagnostic, clinical, and operative data were collected, including sex, age, specific diagnosis of the TMJ being treated, the condition of the disc, number and type of previous operations, pain at rest on VAS (0–10), presence of degenerative joint disease on MRI, position of the disc on MRI, presence of perforation of the disc on MRI and on arthroscopy, duration of symptoms, and active MIO.

The primary outcome variables recorded were pain at rest on VAS and the presence of degenerative joint disease. Secondary outcome variables recorded included the position of the disc on MRI, perforation of the disc on MRI, the presence of synovitis on arthroscopy, MIO, and duration of symptoms.

### *Collection of data*

Physical examination was according to the criteria laid down in the Research Criteria for Temporomandibular Disorders. All measurements were made by the same observer both before and after the intervention. Pain scores were recorded on VAS (0–10, with 10 being the most severe). MIO was measured (mm) using a curvilinear ruler (TheraBite Jaw ROM Scale, Great Lakes Ortho, Tonawanda, NY, USA) between maxillary and mandibular central incisors on active opening. Effusions of the TMJ were identified on T2-weighted MRI and reported by the neuroradiologist. Degenerative joint disease and the position of the disc were assessed on proton density sequences of the MRI in both open and closed positions. Degenerative joint disease was diagnosed if there were signs of flattening, erosion, osteophytes, or the formation of subchondral cysts. The extent of the findings was used to classify severity as none, mild, moderate, or severe. Arthroscopic findings of synovitis of the TMJ were recorded in the same fashion, and fragmentation or perforation of the articular disc was also noted on arthroscopy.

### *Surgical technique*

Single puncture arthroscopy as described by McCain and de la Rua (quoted by Zhuo and Cai<sup>12</sup>) was done with an outflow needle for joint lavage and diagnostic sweep. Intramuscular injections of onabotulinumtoxinA (Botox<sup>®</sup>, Allergan, Weston, FL) were given at sites of maximal tenderness within the masseter and temporalis muscles. Patients who complained of tenderness over the anterior ramus or coronoid were also given an injection of Depo-Medrol (methylprednisolone acetate, Henry Schein, Melville, NY, USA) at the insertion of the temporalis tendon using a total dose of 40 mg/side.

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