Synovial entrapment in alloplastic temporomandibular joint replacement


Abstract. Complications of alloplastic temporomandibular joint (TMJ) prostheses can lead to stress and anxiety for the patient and the surgical team, and prosthesis substitution is sometimes required. The aim of this case report is to describe the surgical finding of synovial entrapment with interposed fibrosis in a postoperative alloplastic TMJ revision, managed effectively with adequate surgical debridement. The authors believe that synovial entrapment needs to be considered as a possible postoperative complication of total joint replacement when no clear symptoms of infection, metal hypersensitivity, osteolysis, or heterotopic bone formation are present. The implications of synovial entrapment in TMJ alloplastic replacement remains relatively unpredictable and poorly understood.

Key words: total joint replacement; temporomandibular joint; temporomandibular joint disorders; synovial plica syndrome; prosthesis failure.

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The number of alloplastic temporomandibular joint replacement (TMJR) procedures is expected to increase 58% by the year 2030. In a survey of 4638 TMJR procedures, the incidence of TMJR surgical revision was 3% and the incidence of replacement was 4.9%. Despite the relatively low incidence of TMJR revision, from a clinical and economic perspective, the consequences are relevant. Therefore, it is important to report all possible causes of TMJR complications with the main goal of progressing medical knowledge, increasing predictability, and consequently improving patient quality of life.

The most common complications of TMJR are periprosthetic joint infection, heterotopic bone formation, dislocation of the condylar component, continued post-TMJR pain, material hypersensitivity, neuroma formation, screw loosening, fracture, and synovial entrapment syndrome. Synovial entrapment is a relatively new concept in TMJ; however, in the orthopaedic field, synovial-like fibrous membranes were first reported after total hip and knee replacement in 1986 and 1990, respectively. Subsequently, Jerosch and Schroder described the development of intra-articular plicae as a cause of pain in knee arthroplasty. Synovial entrapment syndrome in TMJR was first reported in 2010 by Westermark et al. for Biomet (Biomet Microfixation, Jackson- ville, FL, USA) and TMJ Concepts prostheses (TMJ Concepts, Ventura, CA, USA). However, current understanding of the signs and symptoms of synovial entrapment as a complication of TMJR is still insufficient.

This article describes a case of symptomatic postoperative TMJR, managed effectively with adequate surgical debridement. The surgical finding of synovial entrapment with interposed fibrosis was determined to be a possible cause of the symptoms.

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Case report
A healthy 35-year-old woman was referred to our department after several failed TMJ surgeries. The patient had persistent pain and limited mouth opening. Imaging exams revealed a right fibrous ankylosis. She underwent a unilateral custom TMJ (TMJ Concepts). At 2 years and 5 months after TMJR, the patient demonstrated new episodes of pain at the operated site (score 7/10 on a visual analogue scale (VAS)), with intermittent swelling and progressive mouth limitation (reduced from 37 mm to 16 mm). No improvement occurred with antibiotics, non-steroidal anti-inflammatory drugs (NSAIDs), or physiotherapy. Changes were not observed on computed tomography scan and no infection criteria were present. At first, the authors hypothesized a diagnosis of metal hypersensitivity. However, lymphocyte transformation testing is not available in Portugal, so this hypothesis was not confirmed. With no clear diagnosis, it was decided that additional open surgery should be performed to debride the joint area. Considerable fibrosis resembling synovial tissue was noted surrounding the joint area, with part of the tissue showing an inflammatory appearance. Fibrous/synovial tissue was also observed between the alloplastic condyle and fossa (Fig. 1). This interposed tissue mimicking a joint disc in an alloplastic reconstruction was a surprising and unexpected finding.

All tissue was excised and carefully electrocoagulated, with special care to avoid scuffing the alloplastic components of the TMJR device. The joint area was scrubbed with iodine solution and irrigated with vancomycin and gentamicin. The total surgery time was 28 minutes. Histopathological assessment demonstrated the presence of synovial tissue with low inflammatory infiltration (Fig. 2), suggesting synovial entrapment. At the 6-month postoperative follow-up, the patient was pain-free (VAS pain score of 0/10), with a maximum mouth opening of 36 mm.

Discussion
Over the last few years, several reports have addressed the indications for revision and replacement of the alloplastic TMJ. The most common extrinsic causes are infection, wear and fracture of the prosthesis, allergy to the prosthesis, foreign body reaction, heterotopic bone formation, dislocation of the condyle component, osteolysis, neuroma formation, and synovial entrapment syndrome. Some in-
trisinic aetiologies have also been described: chronic centrally mediated pain, persistent myofascial/muscular pain, complex regional pain syndrome I, temporals tendonitis, coronoid impingement, Frey syndrome, and integrin formation.\(^{1,8}\)

In most reports, the implications of synovial entrapment in TMJR remain relatively unnoticed. This phenomenon has been the subject of debate in recent years and its association with symptoms is controversial. Hardaker et al.\(^5\) described thickened and fibrotic synovial plicae with some inelasticity, consequently leading to synovitis, chondral damage, and pain. Hypotheses related to synovial entrapment in alloplastic devices include: (1) a response of the mesenchymal tissues surrounding the prosthesis; (2) the chemical and physical composition of the replacement elements; and (3) the presence of molecules involved in inflammatory processes, such as interleukin-1β and interleukin-6, tumour necrosis factor-alpha, transforming growth factor-beta, and prostaglandin-E2, as shown in some biochemical studies in synovial-like tissue.\(^{10-15}\) The release of these molecules can be related to mechanical stress.\(^15\)

This phenomenon has also been confirmed in the TMJ, related to internal derangement\(^{6,16,17}\). It was described for the first time in TMJ alloplastic devices by Westermark et al.\(^2\) as a dense, fibrous connective tissue without signal of inflammatory cells or foreign body reactions and synovial-like tissue between the capsule and disc observed in TMJ prosthesis revision (Biomet Microfixation and TMJ Concepts). Also, Monje et al.\(^9\) reported a case of synovial metaplasia with a temporary silicone implant. Recently, Davis et al.\(^18\) reported a case series of nine patients with failed TMJ prostheses, managed with TMJ arthroscopy. They verified the presence of a pseudocapsule between the fossa and condylar portion, and biopsy results showed synovium, fibrous connective tissue, degenerated fibrocartilage, and focal dystrophic calcifications, with negative results for pathogens. Similar to TMJR, other orthopaedic surgeons have described fibrous plicae after alloplastic knee replacement in 26 patients in five different zones, for which arthroscopic resection successfully resolved the patients’ symptoms.\(^6\) Arthroscopic interventions for problematic alloplastic TMJR should be restricted to experienced arthroscopic surgeons to avoid damage the alloplastic joint components, and an open approach would be more suitable for the less experienced arthroscopist.\(^8\)

It appears that the association of synovial plicae with symptoms and clinical findings continues to be controversial. However, the present report reinforces the possible implications of synovial entrapment with an interpositional fibrous pseudodisse between the alloplastic condyle and fossa as a TMJR complication.

A limitation of this study was that cultures of the tissues to exclude the hypothesis of low-grade biofilm, as previously described by Gruber et al., were not performed.\(^19\) The authors believe that synovial entrapment needs to be considered as a possible postoperative complication of TMJR when no clear symptoms of infection, metal hypersensitivity, osteolysis, or heterotropic bone formation are present. If this pathological entity is suspected, debridement as a surgical revision can provide clinical improvement, either by arthroscopy or open surgery, depending on the surgeon experience. Future studies in this field may help to develop easier ways to diagnose this phenomenon in alloplastic joints as it remains relatively unpredictable and poorly understood.

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**Competing interests**

The authors have no conflict of interest to declare.

**Ethical approval**

Not required.

**Patient consent**

The patient provided written informed and free consent for the publication of this report, in accordance with current legislation.

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