

Temporomandibular joint arthrocentesis complications: A rare arteriovenous fistula

Matteo Val, Ragazzo Mirko, Anna Colonna, Matteo Pollis, Ovidiu Ionut Saracutu, Daniele Manfredini & Luca Guarda-Nardini

To cite this article: Matteo Val, Ragazzo Mirko, Anna Colonna, Matteo Pollis, Ovidiu Ionut Saracutu, Daniele Manfredini & Luca Guarda-Nardini (26 Oct 2025): Temporomandibular joint arthrocentesis complications: A rare arteriovenous fistula, CRANIO®, DOI: [10.1080/08869634.2025.2580033](https://doi.org/10.1080/08869634.2025.2580033)

To link to this article: <https://doi.org/10.1080/08869634.2025.2580033>



Published online: 26 Oct 2025.



Submit your article to this journal [↗](#)



Article views: 7



View related articles [↗](#)



View Crossmark data [↗](#)

RESEARCH ARTICLE



Temporomandibular joint arthrocentesis complications: A rare arteriovenous fistula

Matteo Val DDS^a, Ragazzo Mirko MD^b, Anna Colonna DDS^a, Matteo Pollis DDS^a, Ovidiu Ionut Saracutu DDS^a, Daniele Manfredini DDS, MSc, PhD, Dr Ortho, DABOP^a and Luca Guarda-Nardini MD, DDS^b

^aSchool of Dentistry, Department of Medical Biotechnology, University of Siena, Siena, Italy; ^bUnit of Oral and Maxillofacial Surgery, Ca' Foncello Hospital, Treviso, Italy

ABSTRACT

Background: Temporomandibular joint (TMJ) arthrocentesis is a minimally invasive procedure for internal derangements and degenerative conditions. Although generally safe, rare but serious complications can occur, requiring clinical vigilance.

Case: A 37-year-old male with bilateral TMJ osteoarthritis presented with severe pain (VAS 8/10), restricted opening (34 mm), and MRI-confirmed bilateral anterior disc displacement without reduction and effusion. After unsuccessful conservative therapy, he underwent three single-needle arthrocentesis sessions with intra-articular hyaluronic acid. Post-treatment, he developed a pulsatile preauricular swelling and tinnitus. Imaging identified an arteriovenous fistula between the superficial temporal artery and external jugular vein. Endovascular repair was unfeasible, so surgical ligation, discectomy, and arthroplasty with amniotic membrane interposition were performed, achieving full recovery and improved mouth opening (45 mm at 6 months).

Conclusion: This rare vascular complication highlights the need for early recognition of atypical postoperative signs. Prompt imaging and a multidisciplinary approach ensure safe management and favorable outcomes.

KEYWORDS

Temporomandibular joint; arthrocentesis; arteriovenous fistula; TMJ disorders; surgical arthroplasty; TMJ Complications; single-needle technique

1. Introduction

Temporomandibular disorders (TMDs) encompass a wide range of conditions affecting the temporomandibular joint (TMJ), masticatory muscles, and associated structures [1]. Epidemiological studies indicate that TMDs affect approximately 5% to 12% of the population, with a higher prevalence in women and individuals aged 20 to 40 years [2–4].

The etiology of TMD is known to be multifactorial, and is explained at best by the biopsychosocial model, which poses the accent on the complex interplay between biological, psychological and psychosocial factors that explain the onset of pain in TMD patients. Specific anatomical features [5], certain psychological traits [6–8], and patients' susceptibility to pain [9,10] are the main factors to analyze when assessing temporomandibular disorders.

Common clinical findings include jaw pain, limited mandibular movement, joint sounds, and functional impairment [11,12], along with high levels of psychological impairment [13,14] that is commonly assessed through the psychometric scales of the DC/TMD Axis II [15].

Given the complex clinical scenario, the management of TMD involves a multidisciplinary approach [1], with

different lines of treatment. Multiple brief cognitive behavioral therapy sessions delivered in person [16] or through telehealth [17] have been found to reduce patients' pain intensity, in combination with physical therapy [18,19]. Additionally, anti-inflammatory drugs have been found to be efficacious in reducing pain due to the antiphlogistic effects [20]. In this regard, TMJ arthrocentesis, a minimally invasive procedure involving the lavage of the upper joint space, has also been found effective in reducing inflammation and improving jaw function [21]. Specific indications for arthrocentesis include disc displacement with/without reduction [22,23], closed lock, and degenerative joint diseases [24] unresponsive to non-surgical treatments [25–27].

Different variations of the original technique proposed by Nitzan et al. [21] have been proposed throughout the years, along with the single-needle arthrocentesis technique, introduced and described for the first time by Guarda-Nardini et al. in 2008 [28]. The single-needle technique involves the insertion of a single cannula into the superior joint space, allowing for joint lavage and the administration of therapeutic agents such as hyaluronic acid. This technique has demonstrated long-term efficacy in managing TMJ degenerative joint

disease. The longest prospective study on the single-needle technique [29] has shown a significant improvement in pain and jaw function over a 10- to 22-year follow-up period.

While arthrocentesis is recognized as a minimally invasive and generally safe procedure, it is not free from risks. The most frequently reported postoperative sequelae include transient swelling, hematoma, temporary facial nerve paresis, open bite, and vertigo, which usually resolve spontaneously [30–32]. However, more severe complications, though rare, may also occur, underlining the importance of careful case selection, precise technique, and the ability to promptly manage adverse events in clinical practice. As highlighted by Vaira et al. [33] in their comprehensive review of complications after TMJ arthrocentesis, awareness of these potential events is crucial to ensure patient safety and appropriate decision-making regarding surgical indications. In this context, it is essential to emphasize that minimally invasive and surgical interventions should be performed only when clinically and radiologically justified [25] and always with due consideration of the risk–benefit balance.

The aim of the present study is to present a case of a unique complication, caused by the formation of an arteriovenous fistula between the superficial temporal artery and the external jugular vein, following the single needle approach to perform TMJ arthrocentesis. The paper describes all the diagnostic and treatment phases, focusing on the surgical management of the arteriovenous fistula.

For the present paper, the authors have adhered to the CARE guidelines for case reports [34,35].

2. Case report

2.1. Patient information

A 37-year-old male came to the attention of the Unit of Oral and Maxillofacial Surgery, Ca'Foncello Hospital, Treviso, Italy. The patient's chief complaint was the presence of bilateral TMJ pain, which was more pronounced on the left side. His medical, family, and psychosocial history was unremarkable, with no particularly relevant information to this report. The patient had no known allergies or systemic conditions, and no history of past interventions.

2.2. Clinical findings

The clinical examination was performed by one examiner (M.V.) that assessed the presence of:

- Pain during mastication of 8/10 intensity on the visual analogue scale (VAS);
- Pain at rest (VAS 5/10) localized to the left TMJ;
- Palpable crepitus over the left TMJ;
- Tenderness upon palpation of the zygomatic attachment of the left masseter and at the level of the anterior temporalis muscles;
- Limited maximum interincisal distance (MID) of 34 mm;
- Presence of bilateral linea alba on the buccal mucosa and lingual scalloping;

2.3. Diagnostic assessment

Given that the presence of the linea alba on the buccal mucosa was suggested to be an important sign of a high frequency of bruxism [36,37], it was decided to monitor awake bruxism using a smartphone application (BruxApp, World Medical Applications Srl, Italy) [12,38].

The clinical scenario was compatible with the diagnosis of Myofascial pain (ICD-9 729.1) and

Arthralgia (ICD-9 524.62) based on DC/TMD classification [39] due to excessive overload of the TMJ and associated structures [1]. It was decided to prescribe a magnetic resonance imaging (MRI) to better assess the severity of the condition. The MRI revealed the presence of bilateral osteoarthritic changes of the mandibular condyles, with anterior disc displacement without reduction with limited opening (ICD-9 524.63) [39] and effusion in the left TMJ [40] (Figure 1).

2.4. Therapeutic intervention

The treatment started with a 30-minute session of cognitive behavioral therapy, aimed at explaining to the patient the etiology of TMD and the importance of resting the masticatory muscles to reduce the intensity of the symptoms. In particular, the patient was introduced to the concept of bruxism and to the different forms of masticatory muscle activities [41] that can induce an overload of the TMJ, underlining the deleterious impact of mandible bracing and teeth clenching [42]. Generic advice aimed at improving sleep schedule [43] and reducing anxiety was also provided [44].

Given the high intensity of pain reported during mastication, two weeks of pharmacological anti-inflammatory regimen were prescribed:

- Prednisone 25 mg daily for 5 days, followed by 12.5 mg daily for another 5 days.

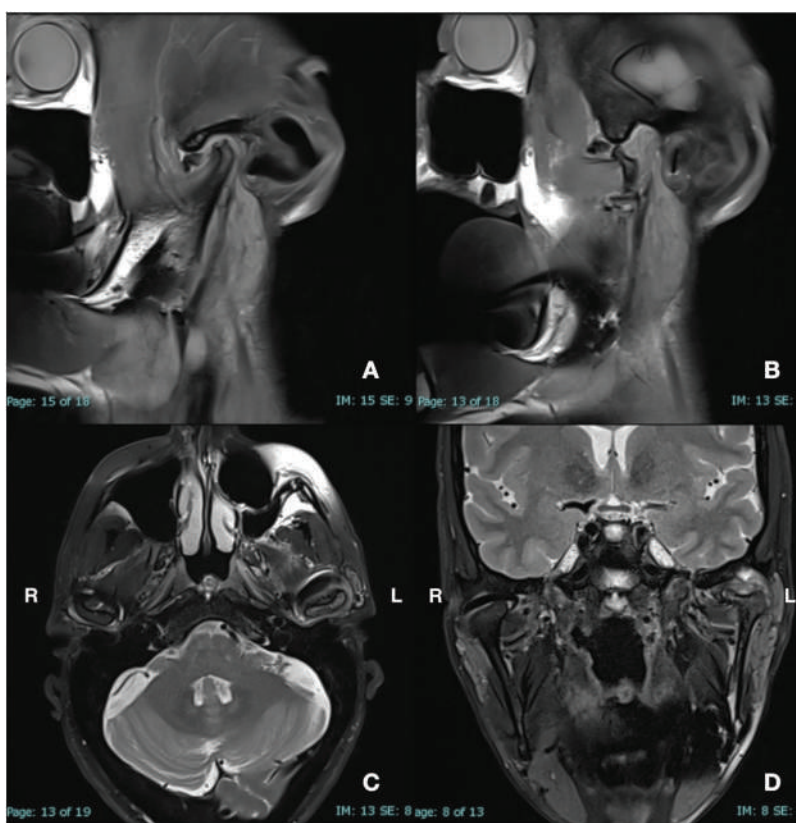


Figure 1. A: Proton density-weighted sagittal image of the left temporomandibular joint in the closed-mouth position, demonstrating anterior disc displacement, condylar flattening with osseous changes, and a small amount of effusion in the superior joint compartment. B: Corresponding sagittal view in the open-mouth position, showing persistent anterior disc displacement. C: Axial T2-weighted image revealing joint effusion on the left side. D: Coronal view further highlights osseous changes of the left condyle and associated joint effusion. **Legend:** R = Right, L = Left.

- Ibuprofen 600 mg as needed, up to every 8 hours with food.
- Thiocolchicoside 4 mg; twice daily for 10 days.

Following this regimen, the patient reported minimal symptom relief at the control appointment at two weeks. Thus, it was decided to perform three sessions arthrocentesis of the left TMJ at two weeks interval, using the single-needle technique [24,45,46] as follows:

Arthrocentesis of the temporomandibular joint begins with patient positioning in a semi-supine posture with the head turned contralaterally. The skin is marked along the Holmlund-Hellsing line to identify the posterior entry point, typically 10 mm anterior and 2 mm inferior to the tragus. After disinfecting and draping the area, local anesthesia is administered subcutaneously and intra-articularly. A single 16-gauge needle is inserted into the superior joint space, with correct positioning confirmed by smooth injection and patient feedback. Pulsed lavage with 3 lavage of 20 mL of sterile

saline is then performed through the same needle, often accompanied by gentle mandibular mobilization. Following lavage, 1 mL of high molecular weight hyaluronic acid is injected to enhance joint lubrication. The needle is removed, hemostasis is achieved with gentle pressure, and a sterile dressing is applied. Postoperative care includes cold compresses, a soft diet for 1–2 days, and ibuprofen if needed. No sutures are required, and the procedure is completed under local anesthesia in an outpatient setting.

3. Follow-up and outcome

After three sessions of arthrocentesis (one every 2 weeks), the patient experienced a slight improvement in symptoms (chewing pain VAS 7/10, rest pain VAS 4/10) and increased MID to 37 mm. Nevertheless, at the control appointment (2 months after last arthrocentesis), it was noticed that the patient developed a pulsatile swelling in the left preauricular area, accompanied by tinnitus.

The computed tomography (CT) (Figure 2) angiography (Figure 3) and conventional angiography revealed an arteriovenous fistula (AVF) between the superficial temporal artery and the external jugular vein, with multiple vascular connections that preclude endovascular intervention. The vascular malformation was categorised as Type IIIa according to the Yakes Classification [47], which indicates multiple inflow arterioles shunting into an aneurysmal vein with a single outflow vein.

The patient was informed of the necessity to undergo surgical intervention, both to address the arteriovenous fistula and to remove the degenerated articular disc, thereby aiming to restore proper mandibular function. Common side effects were thoroughly detailed to him, including postoperative pain and swelling, limited mouth opening (trismus), hematoma, and temporary facial nerve weakness. The patient has elected to proceed with surgical treatment.

The surgical management was performed by three operators (M.V. L.G.N., M.R.) (Figure 4a-f). The patient was positioned in supine under general anesthesia with oronasal intubation. A preauricular incision (modified Al-Kayat – Bramley approach) was marked, extending slightly superiorly toward the temporal region to improve exposure of the superficial temporal artery (STA) and the external jugular vein (EJV). Sharp and blunt dissection was performed through the subcutaneous tissue, preserving the facial nerve branches (particularly the temporal and zygomatic branches) under magnification. The arteriovenous fistula was identified superficial to the TMJ capsule, between the superficial temporal artery and a tributary of the external jugular vein. Careful blunt dissection exposed the afferent STA branch and the efferent

venous outflow, showing abnormal high-flow communication with turbulent flow (confirmed intraoperatively). Temporary vascular clamps were applied proximally and distally to the arterial and venous branches to control bleeding. The fistulous communication was ligated and transected using non-absorbable sutures (5-0 prolene). Both the STA and EJV branches were ligated and resected if non-essential for vascular supply or venous drainage. Hemostasis was carefully verified, and the vascular field was inspected to ensure no residual shunting. The TMJ capsule was incised vertically and the upper joint compartment exposed. A complete meniscectomy was performed, removing the non-functional disc. Arthroplasty included smoothing of articular surfaces and limited condylar contouring to improve joint congruence. A sterile, cryopreserved human amniotic membrane [48,49] was placed in the joint space as an interpositional graft, in the attempt to reduce fibrosis, promote regenerative healing and improve joint lubrication. The membrane was positioned without fixation, relying on anatomical containment. The TMJ capsule and fascia were sutured with absorbable sutures. The subcutaneous tissue and skin were closed in layers with resorbable and non-resorbable sutures, respectively. The procedure was completed without complications.

Postoperative care included Antibiotic prophylaxis (Antibiotic prophylaxis (Amoxicillin with clavulanic acid 875 + 125 mg, one tablet every 8 hours for 7 days., Anti-inflammatory medication (Ibuprofen 600 mg as needed, up to every 8 hours with food), Cold compression and functional rehabilitation after 1- 2 days

At the 6-month follow-up, the patient reported complete resolution of pain and tinnitus, with a MID of 45 mm and no signs of facial nerve impairment.



Figure 2. Pre-operative angio-TC scan, a is a sagittal view of the left TMJ showing an abnormal shunting between the temporalis artery and the giugular external vein, while B is a coronal view of the same aspect. **Legend:** R = Right, L = Left, Post = Posterior, Ant = Anterior

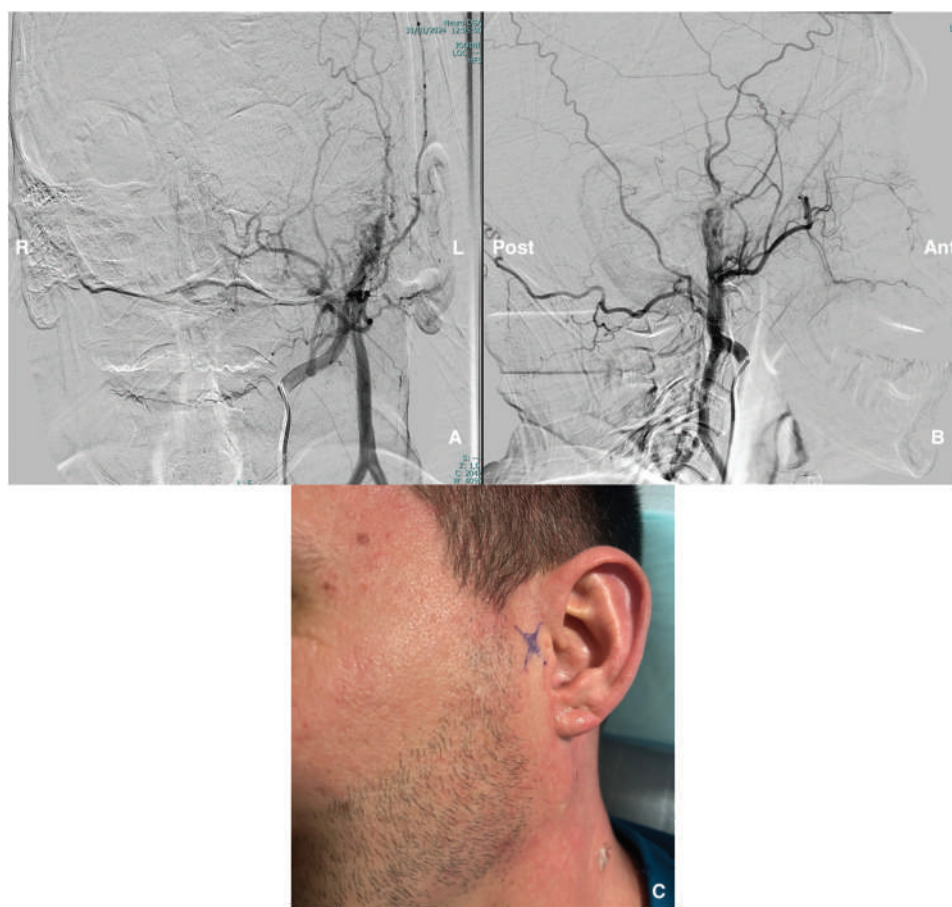


Figure 3. A: Coronal projection from digital subtraction angiography demonstrating an arteriovenous fistula between the superficial temporal artery and the external jugular vein on the left side. B: Corresponding sagittal angiographic view confirming the vascular connection and abnormal shunting pattern. C: Clinical presentation showing a pulsatile mass located anterior to the left ear, marked with an “X” on the skin to identify the area of vascular anomaly. **Legend:** R = Right, L = Left, Post = Posterior, Ant = Anterior

Informed consent was obtained from the patient for all surgical procedures described in this report. This study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of Ca’Foncello Hospital with protocol code 581/CE Marca.

4. Discussion

Arthrocentesis of the temporomandibular joint (TMJ) is generally regarded as a safe and effective procedure for the management of internal derangements and degenerative joint disease, especially in patients who do not respond to conservative therapies [50]. Over the past two decades, its adoption has grown substantially due to its minimally invasive nature, short procedural time, and rapid recovery [26]. Most patients experience a reduction in pain and an improvement in mandibular mobility [27], particularly when arthrocentesis is

combined with intra-articular injections of agents such as hyaluronic acid [26], PRP/PRF [51,52].

Despite its favorable safety profile, arthrocentesis is not entirely without risks. Most reported complications are transient and benign, including temporary facial nerve paresis due to local anesthetic diffusion, mild edema of the periarticular region, ipsilateral open bite, and occasionally hematoma or vertigo [30]. These typically resolve without intervention and are considered part of the expected risk spectrum of the procedure [31].

Nevertheless, in more rare cases, the patients can develop complications that requires additional interventions. In the present case report, the patient developed an arteriovenous fistula (AVF) between the superficial temporal artery and the external jugular vein – an exceedingly rare complication of TMJ arthrocentesis. To date, only isolated reports exist in the literature, such as the case described by Fanti et al. [53], underscoring the importance of raising awareness about this

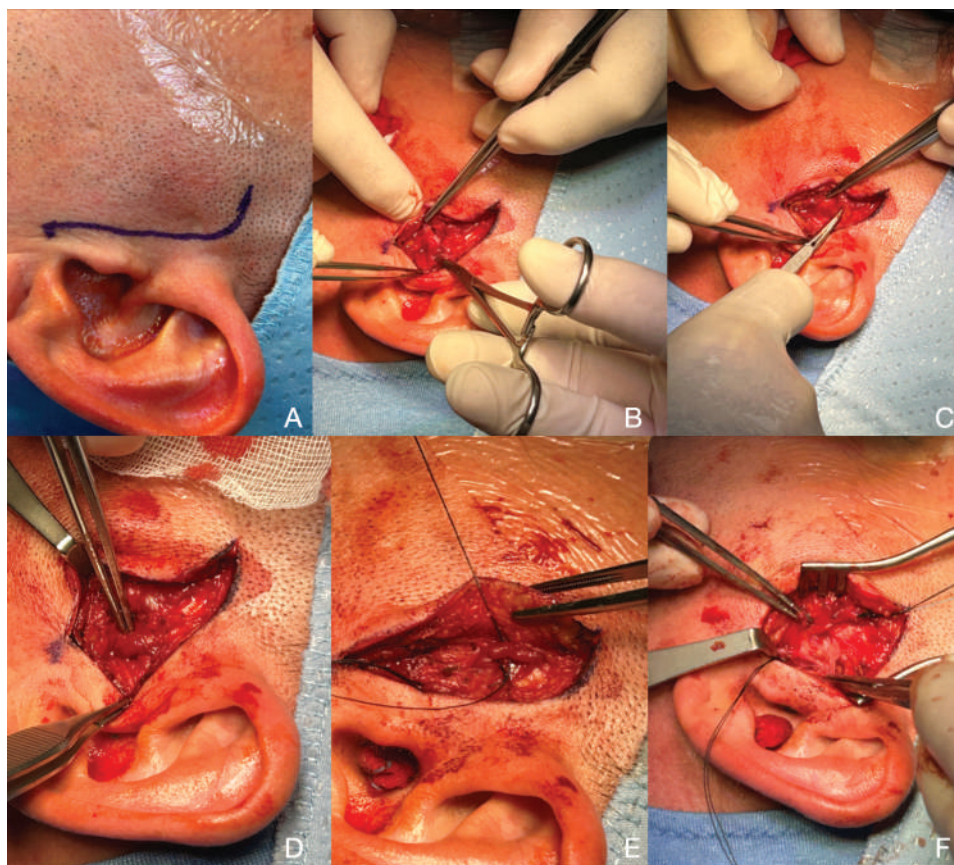


Figure 4. Intraoperative sequence demonstrating the surgical approach for closure of the arteriovenous fistula between the superficial temporal artery and the external jugular vein. A: Preauricular marking indicating the planned incision for surgical access to the fistula. B: Initial dissection through the subcutaneous tissue to expose the vascular structures. C: Careful identification and isolation of the fistulous communication between the superficial temporal artery and the external jugular vein. D: Progressive exposure of the vascular structures with retraction and meticulous dissection. E: ligation of the fistulous tract with preservation of adjacent neurovascular structures. F: Final step showing closure of the arteriovenous communication and confirmation of hemostasis prior to layered wound closure.

potentially underestimated risk. Because AVFs may present with variable symptoms and follow different clinical courses, their true incidence could be higher than reported, as some patients may remain undiagnosed or be managed outside the TMJ specialty field.

The clinical manifestation was a pulsatile swelling in the preauricular region associated with tinnitus, which appeared shortly after completing a series of five arthrocentesis sessions. Vascular imaging with CT angiography and conventional arteriography confirmed the diagnosis, revealing a complex web of vascular connections that precluded endovascular closure. If left untreated, AVFs may evolve over time, leading to local symptoms (swelling, bruit, tinnitus, pain), regional consequences (progressive soft tissue damage, cosmetic deformity, risk of hemorrhage), and, in prolonged or severe cases, systemic cardiovascular effects such as high-output cardiac failure [54]. Importantly, not all AVFs require immediate surgery: some may be

managed conservatively or via endovascular approaches, with treatment decisions guided by the surgeon's expertise, lesion characteristics, and symptom progression [54].

In our case, The AVF likely resulted from iatrogenic injury to a vascular structure during the needle insertion or lavage process. The anatomical proximity of the TMJ to major superficial vascular structures such as the superficial temporal artery and the retromandibular vein highlights the importance of careful technique and precise anatomical knowledge during the procedure. While rare, such events emphasize the need for clinicians to remain vigilant for atypical symptoms post-intervention, such as pulsatile masses or auditory disturbances.

The patient ultimately underwent surgical correction via an inverted "L" preauricular approach. The procedure included ligation of the AVF, discectomy, and joint remodeling with interposition of an amniotic membrane – a technique shown to reduce

fibrosis and support joint healing [49,55]. The decision to perform simultaneous TMJ surgery [56] was guided by persistent articular symptoms and the intraoperative opportunity to directly address the joint degeneration noted on imaging. The surgical outcome was excellent: the patient experienced complete resolution of both the vascular complication and TMJ-related pain, with restored mandibular function and a maximum interincisal opening of 45 mm at six months.

Although extremely rare in TMJ interventions, arteriovenous fistulas have been reported in other maxillofacial [57,58] and neurosurgical [59] contexts, typically as consequences of inadvertent vascular injury. To minimize the risk of such complications, several preventive measures should be considered:

- **Protocol planning** prior to arthrocentesis, including detailed review of medical history and preoperative laboratory evaluation (PT, aPTT, platelet count), especially in patients with suspected coagulopathies.
- **Use of ultrasound-guided needle placement**, a standard increasingly adopted in anesthesiology, which may improve localization and reduce the risk of vascular penetration.
- **Appropriate surgical environment**, ensuring that clinicians have immediate access to vascular imaging and surgical backup if complications arise.
- **Embedding patient-centered communication**, explaining possible risks and unusual warning symptoms to foster timely reporting.

Follow-up should not be limited to the evaluation of joint pain and mobility. Clinicians should be vigilant for “unusual symptoms” that may signal vascular injury, including pulsatile tinnitus, new-onset bruit, preauricular or cervical swelling, persistent local pain, or audible vascular sounds. Early recognition of these manifestations allows prompt referral for vascular imaging and intervention, minimizing long-term morbidity.

Managing complications with clear communication is essential. In the present case, the patient valued the transparent explanation of the condition and the rationale for surgical intervention, which strengthened trust and confidence in the surgical team. Ultimately, this underscores that while TMJ arthrocentesis remains a safe and effective minimally invasive procedure, rare complications such as AVFs require both clinical preparedness and a multidisciplinary approach for optimal management.

5. Conclusion

Although arthrocentesis remains a cornerstone in the minimally invasive treatment of TMJ disorders, this case illustrates the rare possibility of significant vascular complications. It underscores the need for thorough clinical assessment and imaging in cases of unusual postoperative symptoms and supports the value of a multidisciplinary approach when managing such complex scenarios. The successful resolution of both the fistula and the underlying joint pathology in this case further demonstrates that, when necessary, surgical intervention can be a definitive and curative solution.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The author(s) reported there is no funding associated with the work featured in this article.

References

- [1] Manfredini D, Häggman-Henrikson B, Al Jaghsi A, et al. Temporomandibular disorders: iNfORM/IADR key points for good clinical practice based on standard of care. *Cranio*. 2025;43(1):1–5. doi: [10.1080/08869634.2024.2405298](https://doi.org/10.1080/08869634.2024.2405298)
- [2] Valesan LF, Da-Cas CD, Réus JC, et al. Prevalence of temporomandibular joint disorders: a systematic review and meta-analysis. *Clin Oral Investig*. 2021;25:441–453. doi: [10.1007/s00784-020-03710-w](https://doi.org/10.1007/s00784-020-03710-w)
- [3] Saracutu OI, Manfredini D, Bracci A, et al. Comparison between ecological momentary assessment and self-report of awake bruxism behaviours in a group of healthy young adults. *J Oral Rehabil*. 2025;52(3):289–295. doi: [10.1111/joor.13895](https://doi.org/10.1111/joor.13895)
- [4] Guarda-Nardini L, Piccotti F, Mogno G, et al. Age-related differences in temporomandibular disorder diagnoses. *Cranio*. 2012;30(2):103–109. doi: [10.1179/crn.2012.015](https://doi.org/10.1179/crn.2012.015)
- [5] Colonna A, Manfredini D, Lombardo L, et al. Comparative analysis of jaw morphology and temporomandibular disorders: a three-dimension imaging study. *Cranio*. 2020;38(3):158–167. doi: [10.1080/08869634.2018.1507094](https://doi.org/10.1080/08869634.2018.1507094)
- [6] Heikkinen EV, Kakko N, Näpänkangas R, et al. Prevalence of temporomandibular disorders (TMD) and their association with sociodemographic factors and depression/anxiety symptoms in Northern Finland birth cohort 1986. *Cranio*. 2024;2024:1–11. doi: [10.1080/08869634.2024.2437205](https://doi.org/10.1080/08869634.2024.2437205)
- [7] Manfredini D, Bandettini di Poggio A, Cantini E, et al. Mood and anxiety psychopathology and temporomandibular disorder: a spectrum approach. *J Oral Rehabil*.

- 2004;31(10):933–940. doi: [10.1111/j.1365-2842.2004.01335.x](https://doi.org/10.1111/j.1365-2842.2004.01335.x)
- [8] Kurup S, Perez-Pino A, Litt M. The association between temporomandibular disorders signs and symptoms, bruxism, and health variables: a cross-sectional study. *Cranio*. 2024;2024:1–9. doi: [10.1080/08869634.2024.2425918](https://doi.org/10.1080/08869634.2024.2425918)
- [9] Kandasamy S. The painful mind. *Cranio*. 2024;42(4):361–363. doi: [10.1080/08869634.2024.2333178](https://doi.org/10.1080/08869634.2024.2333178)
- [10] Maixner W, Fillingim R, Booker D, et al. Sensitivity of patients with painful temporomandibular disorders to experimentally evoked pain. *Pain*. 1995;63(3):341–351. doi: [10.1016/0304-3959\(95\)00068-2](https://doi.org/10.1016/0304-3959(95)00068-2)
- [11] Manfredini D, Arveda N, Guarda-Nardini L, et al. Distribution of diagnoses in a population of patients with temporomandibular disorders. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2012;114:e35–41. doi: [10.1016/j.oooo.2012.03.023](https://doi.org/10.1016/j.oooo.2012.03.023)
- [12] Colonna A, Lobbezoo F, Bracci A, et al. Long-term study on the fluctuation of self-reported awake bruxism in a cohort of healthy young adults. *J Oral Rehabil*. 2025;52(1):37–42. doi: [10.1111/joor.13872](https://doi.org/10.1111/joor.13872)
- [13] Manfredini D, Borella L, Favero L, et al. Chronic pain severity and depression/somatization levels in TMD patients. *Int J Prosthodont*. 2010;23:529–534.
- [14] Yap AU, Chua EK, Tan KB, et al. Relationships between depression/somatization and self-reports of pain and disability. *J Orofac Pain*. 2004;18(3):220–225.
- [15] Assiri K. Relationships between personality factors and DC/TMD Axis II scores of psychosocial impairment among patients with pain related temporomandibular disorders. *Sci Rep*. 2024;14(1):26869. doi: [10.1038/s41598-024-78216-6](https://doi.org/10.1038/s41598-024-78216-6)
- [16] Litt MD, Shafer DM, Kreutzer DL. Brief cognitive-behavioral treatment for TMD pain: long-term outcomes and moderators of treatment. *Pain*. 2010;151(1):110–116. doi: [10.1016/j.pain.2010.06.030](https://doi.org/10.1016/j.pain.2010.06.030)
- [17] Sangalli L, Gilmore GR, Moreno-Hay I, et al. Feasibility of brief behavioral telehealth interventions for sleep and pain in adults with chronic musculoskeletal orofacial pain: an idiographic clinical trial. *Cranio*. 2025;2025:1–20. doi: [10.1080/08869634.2025.2476606](https://doi.org/10.1080/08869634.2025.2476606)
- [18] La Touche R, Boo-Mallo T, Zarzosa-Rodríguez J, et al. Manual therapy and exercise in temporomandibular joint disc displacement without reduction. A systematic review. *Cranio*. 2022;40:440–450. doi: [10.1080/08869634.2020.1776529](https://doi.org/10.1080/08869634.2020.1776529)
- [19] Shimada A, Ishigaki S, Matsuka Y, et al. Effects of exercise therapy on painful temporomandibular disorders. *J Oral Rehabil*. 2019;46(5):475–481. doi: [10.1111/joor.12770](https://doi.org/10.1111/joor.12770)
- [20] Andre A, Kang J, Dym H. Pharmacologic treatment for temporomandibular and temporomandibular joint disorders. *Oral Maxillofac Surg Clin N Am*. 2022;34(1):49–59. doi: [10.1016/j.coms.2021.08.001](https://doi.org/10.1016/j.coms.2021.08.001)
- [21] Nitzan DW, Naaman HL. Arthrocentesis: what, when, and why? *Atlas Oral Maxillofac Surg Clin N Am*. 2022;30(2):137–145. doi: [10.1016/j.cxom.2022.06.008](https://doi.org/10.1016/j.cxom.2022.06.008)
- [22] Al-Moraissi EA, Al-Otaibi K, Almaweri AA, et al. Treatment of painful temporomandibular joint disc displacement without reduction: network meta-analysis of randomized clinical trials. *Int J Oral Maxillofac Surg*. 2024;53(7):584–595. doi: [10.1016/j.ijom.2024.02.004](https://doi.org/10.1016/j.ijom.2024.02.004)
- [23] Guarda-Nardini L, Manfredini D, Ferronato G. Short-term effects of arthrocentesis plus viscosupplementation in the management of signs and symptoms of painful TMJ disc displacement with reduction. A pilot study. *Oral Maxillofac Surg*. 2010;14:29–34. doi: [10.1007/s10006-009-0179-z](https://doi.org/10.1007/s10006-009-0179-z)
- [24] Rosati R, Val M, Manfredini D, et al. Baseline masticatory muscles' performance may predict pain relief in temporomandibular disorders. *Oral Dis*. 2024;30(8):5349–5359. doi: [10.1111/odi.15011](https://doi.org/10.1111/odi.15011)
- [25] Guarda-Nardini L, De Almeida AM, Manfredini D. Arthrocentesis of the temporomandibular joint: systematic review and clinical implications of research findings. *J Oral Facial Pain Headache*. 2021;35(1):17–29. doi: [10.11607/ofph.2606](https://doi.org/10.11607/ofph.2606)
- [26] Guarda-Nardini L, Ferronato G, Manfredini D. Two-needle vs. single-needle technique for TMJ arthrocentesis plus hyaluronic acid injections: a comparative trial over a six-month follow up. *Int J Oral Maxillofac Surg*. 2012;41(4):506–513. doi: [10.1016/j.ijom.2011.11.007](https://doi.org/10.1016/j.ijom.2011.11.007)
- [27] Zhang JM, Yun J, Zhou TQ, et al. Arthrocentesis for temporomandibular joint disorders: a network meta-analysis of randomised controlled trials. *BMC Oral Health*. 2024;24(1):1108. doi: [10.1186/s12903-024-04858-7](https://doi.org/10.1186/s12903-024-04858-7)
- [28] Guarda-Nardini L, Manfredini D, Ferronato G. Arthrocentesis of the temporomandibular joint: a proposal for a single-needle technique. *Oral Surg, Oral Med Oral Pathol Oral Radiol Endod*. 2008;106(4):483–486. doi: [10.1016/j.tripleo.2007.12.006](https://doi.org/10.1016/j.tripleo.2007.12.006)
- [29] Guarda-Nardini L, Meneghini M, Zegdene S, et al. Temporomandibular joint arthrocentesis in patients with degenerative joint disease: a 10- to 22-year follow-up. *J Oral Facial Pain Headache*. 2021;35(2):113–118. doi: [10.11607/ofph.2871](https://doi.org/10.11607/ofph.2871)
- [30] Bas B, Polat NN. A rare complication of temporomandibular joint viscosupplementation associated with the intra-articular agent: a case report. *J Oral Maxillofac Surg*. 2024;82(8):912–915. doi: [10.1016/j.joms.2024.04.008](https://doi.org/10.1016/j.joms.2024.04.008)
- [31] Baş B, Singer EA, Çankaya RTA. What are the complications of temporomandibular joint arthrocentesis? *J Oral Maxillofac Surg*. 2025;83(4):414–420. doi: [10.1016/j.joms.2024.12.012](https://doi.org/10.1016/j.joms.2024.12.012)
- [32] Nogueira EFC, Lemos CAA, Vasconcellos RJH, et al. Does arthroscopy cause more complications than arthrocentesis in patients with internal temporomandibular joint disorders? Systematic review and meta-analysis. *Br J Oral Maxillofac Surg*. 2021;59(10):1166–1173. doi: [10.1016/j.bjoms.2021.05.007](https://doi.org/10.1016/j.bjoms.2021.05.007)
- [33] Vaira LA, Raho MT, Soma D, et al. Complications and post-operative sequelae of temporomandibular joint arthrocentesis. *Cranio*. 2018;36(4):264–267. doi: [10.1080/08869634.2017.1341138](https://doi.org/10.1080/08869634.2017.1341138)
- [34] Gagnier JJ, Riley D, Altman DG, et al. The CARE guidelines: consensus-based clinical case reporting guideline development. *Dtsch Arztebl Int*. 2013;110:603–608.
- [35] Riley DS, Barber MS, Kienle GS, et al. Care guidelines for case reports: explanation and elaboration document. *J Clin Epidemiol*. 2017;89:218–235. doi: [10.1016/j.jclinepi.2017.04.026](https://doi.org/10.1016/j.jclinepi.2017.04.026)
- [36] Colonna A, Lobbezoo F, Ahlberg J, et al. Standardised tool for the assessment of bruxism: translation, cultural

- adaptation and pilot testing in Italy. *J Oral Rehabil.* 2025;52(2):144–150. doi: [10.1111/joor.13882](https://doi.org/10.1111/joor.13882)
- [37] Manfredini D, Ahlberg J, Aarab G, et al. Standardised tool for the assessment of bruxism. *J Oral Rehabil.* 2024;51(1):29–58. doi: [10.1111/joor.13411](https://doi.org/10.1111/joor.13411)
- [38] Colonna A, Manfredini D, Bracci A, et al. The determination of patient-based experiences with smartphone-based report of awake bruxism using a diary. *Clin Oral Investig.* 2025;29(1):40. doi: [10.1007/s00784-024-06114-2](https://doi.org/10.1007/s00784-024-06114-2)
- [39] Schiffman E, Ohrbach R, Truelove E, et al. Diagnostic criteria for temporomandibular disorders (DC/TMD) for clinical and research applications: recommendations of the International RDC/TMD consortium network* and orofacial pain special interest group†. *J Oral Facial Pain Headache.* 2014;28(1):6–27. doi: [10.11607/jop.1151](https://doi.org/10.11607/jop.1151)
- [40] Mallya SM, Ahmad M, Cohen JR, et al. Recommendations for imaging of the temporomandibular joint. Position statement from the American Academy of Oral and Maxillofacial Radiology and the American Academy of Orofacial Pain. *J Oral Facial Pain Headache.* 2023;37(1):7–15. doi: [10.11607/ofph.3268](https://doi.org/10.11607/ofph.3268)
- [41] Nykänen L, Manfredini D, Lobbezoo F, et al. Ecological momentary assessment of awake bruxism with a smartphone application requires prior patient instruction for enhanced terminology comprehension: a multi-center study. *J Clin Med.* 2022 Jun 15;11(12):3444. doi: [10.3390/jcm11123444](https://doi.org/10.3390/jcm11123444) PMID: 35743520; PMCID: PMC9224902.
- [42] Saracutu OI, Manfredini D, Bracci A, et al. Self-reported mandible bracing and teeth clenching are associated with anxiety and depression traits in a group of healthy young individuals. *J Oral Facial Pain Headache.* 2024;38(4):85–90. doi: [10.22514/jofph.2024.041](https://doi.org/10.22514/jofph.2024.041)
- [43] Herrero Babiloni A, Provost C, Charlebois-Plante C, et al. The contribution of sleep quality and psychological factors to the experience of within-day pain fluctuations among individuals with temporomandibular disorders. *J Pain.* 2024;25(9):104576. doi: [10.1016/j.jpain.2024.104576](https://doi.org/10.1016/j.jpain.2024.104576)
- [44] Melo RA, de Resende C, Rêgo CRF, et al. Conservative therapies to treat pain and anxiety associated with temporomandibular disorders: a randomized clinical trial. *Int Dent J.* 2020;70(4):245–253. doi: [10.1111/idj.12546](https://doi.org/10.1111/idj.12546)
- [45] Guarda-Nardini L, Rossi A, Arboretti R, et al. Single- or multiple-session viscosupplementation protocols for temporomandibular joint degenerative disorders: a randomized clinical trial. *J Oral Rehabil.* 2015;42:521–528.
- [46] Guarda Nardini L, Manfredini D, Colonna A, et al. Intramuscular botulinum toxin as an adjunct to arthrocentesis with viscosupplementation in temporomandibular disorders: a proof-of-concept case-control investigation. *Toxins (Basel).* 2024 Aug 16;16(8):364. doi: [10.3390/toxins16080364](https://doi.org/10.3390/toxins16080364) PMID: 39195774; PMCID: PMC11359951.
- [47] Yakes W, Baumgartner I. Interventional treatment of arterio-venous malformations. *Gefässchirurgie.* 2014;19(4):325–330. doi: [10.1007/s00772-013-1303-9](https://doi.org/10.1007/s00772-013-1303-9)
- [48] Nardini LG, Val M, Colonna A, et al. Treatment of condylar hypoplasia in Alagille syndrome - a case report. *Ann Maxillofac Surg.* 2024;14(1):85–88. doi: [10.4103/ams.ams_220_23](https://doi.org/10.4103/ams.ams_220_23)
- [49] Val M, Ragazzo M, Bendini M, et al. Computer-assisted surgery with custom prostheses and human amniotic membrane in a patient with bilateral class IV TMJ reankylosis: a case report. *Cell Tissue Bank.* 2022;23(2):395–400. doi: [10.1007/s10561-021-09940-w](https://doi.org/10.1007/s10561-021-09940-w)
- [50] Corrêa-Silva M, de Carvalho TMI, Zambon CE, et al. Is there a superiority between arthrocentesis and stabilizing occlusal splint for the treatment of anterior disc displacement with reduction and intermittent block and anterior disc displacement without reduction in TMJ? Randomized clinical trial. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2024;138(2):244–254. doi: [10.1016/j.oooo.2024.04.001](https://doi.org/10.1016/j.oooo.2024.04.001)
- [51] Parlawar AN, Mundada BP. Enhancing pain relief in temporomandibular joint arthrocentesis: platelet-rich plasma and hyaluronic acid synergy. *Cureus.* 2023;15:e45646. doi: [10.7759/cureus.45646](https://doi.org/10.7759/cureus.45646)
- [52] Tsai JH, Tam KW, Yang JD, et al. Effectiveness of platelet-rich plasma for treating TMJ disorders: a systematic review and meta-analysis of randomized controlled trials. *Pain Med.* 2025;26(10):655–672. doi: [10.1093/pm/pnaf042](https://doi.org/10.1093/pm/pnaf042)
- [53] Fanti JA, Reddy A, Greenbaum E, et al. Otologic complications of temporomandibular joint arthrocentesis due to arteriovenous fistula. *Clin Case Rep.* 2022;10(8):e6235. doi: [10.1002/ccr3.6235](https://doi.org/10.1002/ccr3.6235)
- [54] Al-Jaishi AA, Liu AR, Lok CE, et al. Complications of the arteriovenous fistula: a systematic review. *J Am Soc Nephrol.* 2017;28(6):1839–1850. doi: [10.1681/ASN.2016040412](https://doi.org/10.1681/ASN.2016040412)
- [55] Ragazzo M, Val M, Montagner G, et al. Human amniotic membrane: an improvement in the treatment of medication-related osteonecrosis of the jaw (MRONJ)? A case-control study. *Cell Tissue Bank.* 2022;23:129–141.
- [56] Cheung J, Aronovich S, Troost JP, et al. Is advanced arthroscopic debridement in patients with end-stage temporomandibular joint degenerative joint disease associated with improved quality of life and pain reduction? *J Oral Maxillofac Surg.* 2025;83(2):138–147. doi: [10.1016/j.joms.2024.11.003](https://doi.org/10.1016/j.joms.2024.11.003)
- [57] Takeuchi S, Takasato Y. Iatrogenic arteriovenous fistula of the superficial temporal artery after manual reduction of temporomandibular joint dislocation. *J Craniofac Surg.* 2011;22(5):1959–1961. doi: [10.1097/SCS.0b013e31822ea814](https://doi.org/10.1097/SCS.0b013e31822ea814)
- [58] Martín-Granizo R, Caniego JL, de Pedro M, et al. Arteriovenous fistula after temporomandibular joint arthroscopy successfully treated with embolization. *Int J Oral Maxillofac Surg.* 2004;33(3):301–303. doi: [10.1006/ijom.2003.0488](https://doi.org/10.1006/ijom.2003.0488)
- [59] Zheng F, Augustus Pitts H, Goldbrunner R, et al. Traumatic arteriovenous fistula of the scalp in the left temporoparietal region with intra- and extracranial blood supply. *Case Rep Vasc Med.* 2016;2016:8671472.