



## MRI characterization of temporomandibular joint synovial cysts: A case presentation with a brief review of the literature

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### Abstract

Temporomandibular joint synovial cysts pose diagnostic challenges due to their rare occurrence and clinical resemblance to other cystic lesions. This study presents an 84-year-old male with a histopathologically confirmed synovial cyst in the temporomandibular joint. The magnetic resonance imaging delineated a homogeneous unilocular lesion with hyperintensity on T1-weighted images and hyperintensity on T2-weighted and proton-density images. Notably, the cyst demonstrated dynamic displacement within the mandibular fossa during mouth opening. The aim of this study was to report the magnetic resonance imaging findings of a case presenting a temporomandibular joint synovial cyst and to provide a concise review of pertinent cases documented in the existing literature for comparative purposes.

**Keywords:** synovial cyst, temporomandibular joint, magnetic resonance imaging, diagnostic imaging

### 1. Introduction

Temporomandibular joint (TMJ) seldom hosts cystic lesions like synovial cysts (SC) and ganglion cysts (GC), which are the most common cystic lesions of other joints, including knee, hip, or wrist. SCs are fluid-filled, expansile lesions arising from displaced synovial lining and potentially communicating with the joint cavity (1-3). They develop from synovial herniation as a protective mechanism to enable joint decompression as a consequence of elevated intra-articular pressure brought on by trauma, rheumatoid arthritis, osteoarthritis, or synovitis (4-7).

Clinically distinguishing between SCs and GCs remains challenging, often necessitating a combination of radiographic and pathological investigations for an accurate diagnosis (1, 2, 6, 8). Although the most common symptoms are preauricular swelling and pain for both cysts, a spectrum of symptoms were reported, including headaches, otalgia, TMJ sounds, malocclusion, reduced mouth opening, and even facial nerve palsy (4, 6, 9-11). An SC is bordered by endothelium-containing synoviocytes and may or may not be attached to a joint's cavity, in contrast to GCs, which are lined by dense connective tissue (8, 12).

Understanding the imaging characteristics of SCs within the TMJ holds significance in distinguishing them from lesions arising in adjacent tissues (12). While case reports of such cysts in the TMJ exist, literature detailing MRI findings remains limited (1, 6, 10). This review aims to present a

histopathologically confirmed SC with the MRI and clinical observations and compare the findings with previous case studies reported in the literature.

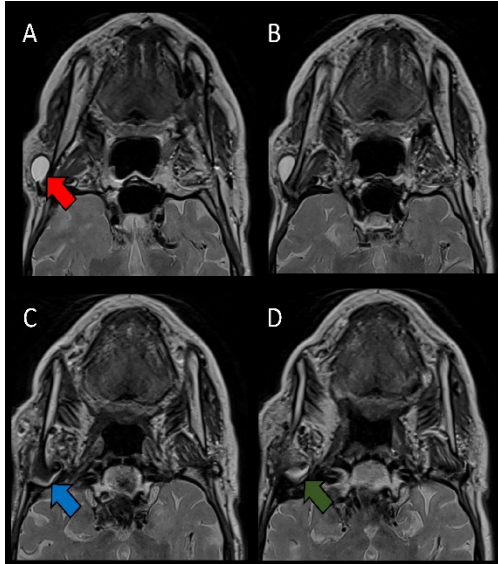
### 2. Case Report

An 84-year-old male presented with a complaint of progressive difficulty in mouth opening for the past two years. He had a medical history significant for hypertension and diabetes. Previous consultations had led to misdiagnoses and inappropriate treatments, including botox injection to masseter. The patient had no other associated symptoms, except for difficulty opening the mouth and swelling. Upon examination, the patient exhibited edentulousness and trismus, with a maximal interincisal distance of 18 mm. A fluctuant preauricular swelling was detected localized at the right preauricular area. There were no signs of pain on palpation, joint sounds, or other TMJ-related symptoms other than trismus. Facial nerve function and sensory examination were unremarkable.

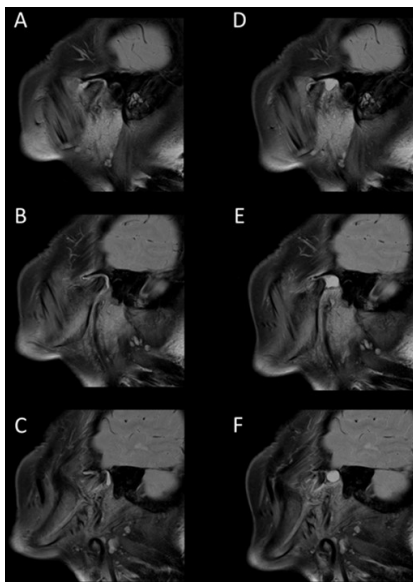
Evaluation of MRI reveals a distinct, uniform, hyperintense unilocular lesion in the mandibular fossa, encompassing both the lateral and medial aspects of the mandibular condyle. This lesion exhibited consistent characteristics of SCs, appearing homogeneously hypointense on T1W slices and hyperintense on both PDW and T2W sequences. Further examination through axial T2W highlighted the presence of transition of the

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lesion on both the lateral and medial sides of the mandibular condyle (Fig. 1). Notably, dynamic TMJ MRI revealed a posterior displacement of the lesion within the mandibular fossa upon mouth opening (Fig. 2). Additionally, concurrent with the diagnosis of the SC, imaging revealed flattening and osteophyte formation in the condylar region of the TMJ.



**Fig. 1.** The axial T2W highlighted the presence of extension of the lesion on both the lateral (A, B) and medial sides (C, D) of the mandibular condyle



**Fig. 2.** Dynamic TMJ MRI revealed a posterior displacement of the lesion within the mandibular fossa upon mouth-opening. Depicted in images A-C (mouth-closed position) and D-F (open-mouth position)

In considering the differential diagnosis for the observed cystic lesion, primary considerations were SC, GCs, and traumatic cysts. A procedure involving removing mucinous fluid from a cyst using a fine needle aimed to provide symptomatic relief by reducing the pressure within the cyst was performed. The collected sample, comprised of cells

and/or fluid, was subsequently forwarded to a pathology laboratory for cytological analysis, confirming the presence of synovial cysts through the observation of synovial fluid enclosed within the cyst, delineated by synoviocytes. Referred to the oral and maxillofacial surgery department for a comprehensive evaluation, the 84-year-old patient opted against undergoing the recommended surgical intervention, citing concerns about the potential risks associated with surgery given their advanced age.

### 3. Discussion

The identification of TMJ SCs presents a considerable diagnostic challenge, primarily owing to their infrequency and the clinical resemblance they share with other cystic lesions (1, 6, 8). According to a recent systematic review of Promerat et al. (2022), 32 TMJ SCs have been reported in the literature (6). In this review, we provide a TMJ SC in an 84-year-old male patient along with detailed clinical and MRI findings. Furthermore, we present a brief review of MRI-interpreted reports of SCs in the TMJ, which identified 17 cases, including 7 males and 10 females aged between 20 and 80, with an average age of 49.5 (Table 1). Upon juxtaposing our case findings with those reported in existing literature, several commonalities and distinctions emerged.

Among the reviewed cases, 11 of the 17 cases offered detailed information regarding borders, consistently describing them as well-defined. Internal structure details were available for 10 cases, uniformly characterized as homogeneous. All cases shared a consistent pattern of being hyperintense on T2W images and hypointense on T1W images. Our case aligns with the MRI features of TMJ SCs regarding borders, internal structure, and signal intensities documented in the literature. Notably, in terms of size, our case's largest diameter measured 19mm, falling within the reported range of observed diameters (ranging from 5mm to 30mm), albeit leaning towards the upper limit of this spectrum.

Laterality and localization varied among previously reported cases: 9 of SCs were found at the lateral side of the mandibular condyle (3, 5-7, 10, 13-15), 3 on the medial side (4, 10, 16), 1 on the posterior to the condyle (2), circumferentially (17), 1 in the epitympanic space (18), and 1 with multifocal lesions located both anterior, lateral and medial sides of TMJ (12). Bilateral SCs were present in 2 cases (17, 19), while 15 cases exhibited unilateral involvement. Although being unilateral and located lateral to the TMJ, a notable deviation from previous cases lay in the dynamic change of localization with mouth opening, which presented a lateral side on close-mouth position and shifted to the mandibular fossa with the opening of the mouth. This review represents the initial presentation of this particular finding. The potential significance lies in its capacity to contribute to the differential diagnosis of TMJ synovial cysts, as ganglion cysts (GCs), distinguished by a lining of dense connective tissue as opposed to synovium, lack communication with the joint cavity.

Conversely, SCs are delineated by an endothelial lining featuring synoviocytes and may or may not have a connection with the joint cavity (3, 8, 11, 16). Based on this difference, displacement of the cystic lesion into the mandibular space with mouth opening may signify a preference toward SCs. However, substantiation of this hypothesis necessitates further reports and extensive studies. Moreover, employing open and closed-mouth MRI techniques allows for dynamic assessment of disc derangements, offering a potential avenue for

investigating the impact of Temporomandibular Disorders (TMDs) on the occurrence of SCs. Only one case report exclusively delineated the open-mouth MRI characteristics among six instances of TMJ cysts. Although three GCs were noted to be situated anteriorly to the condyle, exhibiting displacement further anteriorly along with deformation upon mouth opening, the location of SCs was not mentioned in the open-mouth images (10).

**Table 1.** Summary of demographic, clinical, and MRI Findings of TMJ synovial cysts in literature and our case

Author	Year	Age	Sex	MRI Sequences	Signal Intensity	Borders	Internal Structure	Localization	Involvement	Largest Diameter (mm)	Swelling	Trismus	Pain	Tenderness on Palpation
Promerat et al.	2022	54	F	T1W / T2W	T2W-Hyper / T1W-Hypo	Well-Defined	Homogeneous	Lateral	Unilateral	NA	Y	NA	Y	NA
Promerat et al.	2022	65	F	T1W / T2W	T2W-Hyper / T1W-Hypo	Well-Defined	Homogeneous	Lateral	Unilateral	NA	Y	N	Y	NA
Chatelet et al.	2021	25	F	T1W / T2W /+C	T2W-Hyper / T1W-Hypo/ +C - No enhancement	Well-Defined	Homogeneous	Lateral	Unilateral	12	Y	Y	Y	Y
Buckley et al.	2019	80	F	FATSA T+C- T2W	T2W-Hyper / FATSAT-T2+C- Hyper- NA enhancement	NA	NA	Circumferential	Bilateral	20	Y	N	N	NA
Maribo et al.	2019	52	F	T2W	T2W-Hyper	Well-Defined	Homogeneous	Posterior	Unilateral	9	NA	N	Y	Y
El-Habbash et al.	2018	56	F	NA	NA	NA	NA	Lateral	Unilateral	10	Y	NA	Y	Y
Laban et al.	2015	66	M	C	NA	NA	NA	Medial	Unilateral	NA	NA	NA	Y	NA
Verma et al.	2014	33	F	FATSA T-T1W / +C	FATSAT-T1W+C- Hypointense + Enhancement	Well-Defined	Homogeneous	Lateral&Anterior& Medial	Unilateral	25	Y	Y	Y	Y

<b>Ansari et al.</b>	2013	63	F	FATSA T-T1W / T2W / +C	T2W-Hyper / FATSAT-T1W- / +C - No enhancement	Well-Defined	Homogeneous	Medial	Unilateral	5	NA	NA	Y	Y
<b>Vera-Sirena et al.</b>	2013	48	F	STIR / FATSA T-T2W - +C	STIR-Hyper / T2- FSE-Hyper / +C - NA enhancement	Well-Defined	NA	Lateral	Unilateral	20	Y	N	Y	NA
<b>Okochi et al.</b>	2012	31	M	T1W / T2W / PDW	PDW1-Hypo, T2W1 Hyper	Well-Defined	Homogeneous	Lateral	Unilateral	12	Y	N	N	Y
<b>Okochi et al.</b>	2012	20	F	T1W / T2W / PDW	PDW1-Hypo, T2W1 Hyper	Well-Defined	Homogeneous	Medial	Unilateral	8	N	N	N	N
<b>Neis et al.</b>	2010	57	M	T1W / T2W / FATSA T+C	FATSAT +C - Heterogenous enhancement	NA	NA	Epitympanic Space	Unilateral	10	Y	NA	Y	NA
<b>Goudot et al.</b>	1999	65	M	NA	NA	NA	NA	Lateral	Unilateral	15	N	Y	N	NA
<b>Chen et al.</b>	1998	59	M	NA	NA	Well-Defined	NA	Lateral	Unilateral	30	Y	NA	N	NA
<b>Bonacci et al.</b>	1996	46	M	T1W / T2W	NA	Well-Defined	NA	Lateral	Unilateral	20	Y	Y	Y	Y
<b>Farole et al.</b>	1991	22	M	NA	NA	NA	NA	NA	Bilateral	20	Y	N	Y	N

The diagnosis of a SC of the TMJ could potentially benefit from the use of ultrasound (US). US offers real-time imaging of the TMJ and its surrounding structures, presenting a non-invasive and cost-effective imaging option. It aids in visualizing fluid-filled structures within the joint and assessing associated soft tissue changes or abnormalities. However, it's important to recognize the limitations of US in visualizing TMJ cystic lesions. These limitations include challenges with resolution, interference from bony structures, and the operator's expertise. Due to the complex anatomy and the presence of bones, US may not always provide optimal visualization of TMJ cysts, especially smaller lesions or those located deep within the joint. While US can provide initial insights, it's essential to emphasize that MRI remains the gold standard for TMJ imaging, including the evaluation of synovial cysts. MRI offers superior soft tissue contrast and detailed anatomical information, making it highly sensitive and specific

for detecting and characterizing TMJ cystic lesions. Therefore, while ultrasound may serve as a preliminary imaging tool, particularly for screening purposes or when MRI is unavailable, MRI should still be considered the primary imaging modality for the accurate diagnosis and characterization of synovial cysts of the TMJ (20, 21).

Symptomatically, our case exhibited swelling and trismus, which concurs with some reported cases. The swelling was reported in 12 out of 17 cases (3, 5-7, 10, 12, 13, 15, 17, 19), while 2 did not display swelling (10, 14), and 3 did not specify. Trismus was present in 4 cases (5, 7, 12, 14), normal mouth opening in 7 (2, 3, 6, 10, 17, 19), and not specified in 6. Yet, the absence of pain and tenderness during palpation differs from the predominant symptoms noted in the literature, where pain was frequently reported, and tenderness upon palpation was observed in several cases. Pain in the TMJ region was reported in 12 cases (2-7, 12, 13, 16, 18, 19), while 5 cases did

not experience any pain (10, 14, 15, 17). Additionally, 7 cases reported tenderness upon palpation (2, 5, 7, 10, 12, 13, 16), while 2 did not exhibit tenderness (10, 19), and 8 did not specify this aspect.

FNA, a procedure involving the withdrawal of mucinous fluid from a cyst using a fine needle, stands as a promising intervention for lessening symptoms such as pain and trismus associated with SCs. This method not only aims to provide symptomatic relief by reducing the pressure within the cyst but also reduces discomfort. In our case, we aimed to enhance TMJ function post-FNA. It's crucial to acknowledge the tendency of synovial cysts for recurrence. Despite the initial relief provided by aspiration, there exists a notable risk of the cyst refilling with fluid over time, consequently reinstating symptoms. Thus, it is essential to determine whether further aspirations or exploring alternative management strategies are necessary (22, 23).

In conclusion, the rarity of SCs within the TMJ presents a diagnostic challenge due to their atypical presentation and resemblance to other cystic lesions like GCs. The case presented here, while aligning with some typical MRI characteristics and clinical features found in existing literature, showcased different aspects, notably displacement of the SC into the mandibular space with mouth opening. While surgical intervention might be the conventional course, the patient's advanced age and concerns about associated risks prompted a decision against immediate surgical management. These variations underscore the need for further investigation into the diverse manifestations of TMJ SCs, urging clinicians to consider potential atypical presentations and tailor diagnostic approaches accordingly.

#### Conflict of interest

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Informed consent was obtained to confirm patients' permission.

#### Authors' contributions

Concept: G.Ü., Design: G.Ü., Data Collection or Processing: E.Ç., G.Ü., Analysis or Interpretation: G.Ü., Literature Search: G.Ü., Writing: E.Ç., G.Ü.

#### References

- Neto N, Nunnes P. Spectrum of MRI features of ganglion and synovial cysts. *Insights Imaging*. 2016;7(2):179-86.
- Maribo Y, Stokbro K, Aagaard E, Larsen SR, Thygesen T. Synovial Cysts in the Temporomandibular Joint: a Case Report and Critical Review of the Literature. *J Oral Maxillofac Res*. 2019;10(1):e4.
- Vera-Sirera B, Tomas-Amerigo JA, Baquero C, Vera-Sempere FJ. Synovial cysts of the temporomandibular joint: an immunohistochemical characterization and literature review. *Case Rep Pathol*. 2013;2013:508619.
- LaBan MM, Wang AM, Chrisman A, Lenger A. "Numb Chin" Syndrome: Mental Nerve Mononeuropathy Resulting From a Synovial Temporomandibular Cyst. *Am J Phys Med Rehabil*. 2015;94(7):e65.
- Chatelet F, Benichou L, Ketoff S. A Synovial Cyst of the Temporomandibular Joint. *J Rheumatol*. 2021;48(2):299-300.
- Promerat A, Constant M, Ferri J, Nicot R. Temporomandibular joint synovial cysts: A systematic review of the literature and a report of two cases. *J Stomatol Oral Maxillofac Surg*. 2022;123(4):478-83.
- Bonacci CE, Lambert BJ, Pulse CL, Israel HA. Inflammatory synovial cyst of the temporomandibular joint: a case report and review of the literature. *J Oral Maxillofac Surg*. 1996;54(6):769-73.
- Steen MW, Hofstede DJ. Ganglion and Synovial Cyst of the Temporomandibular Joint: A Case Report and Literature Review. *Plast Reconstr Surg Glob Open*. 2015;3(9):e524.
- Mumert ML, Altay T, Shelton C, Harnsberger HR, Couldwell WT. Ganglion cyst of the temporomandibular joint with intracranial extension in a patient presenting with seventh cranial nerve palsy: Case report. *Journal of neurosurgery*. 2012;116(2):310-2.
- Okochi K, Nakamura S, Tetsumura A, Honda E, Kurabayashi T. Magnetic resonance imaging of temporomandibular joint cyst. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2012;113(6):827-31.
- Nys M, Verstraete L, Van Camp N, Hermans R, Politis C. Synovial and ganglion cysts of the temporomandibular joint: A case series. *Oral and Maxillofacial Surgery Cases*. 2020;6(3):100155.
- Verma S, Chambers I. Synovial cyst of the temporomandibular joint: a case report with surgical management and long-term follow-up. *Oral Surgery*. 2015;8(3):182-6.
- El-Habbash S, Padaki P, Bayoumi S, Ross P. Management of a temporomandibular joint synovial cyst in a case complicated by severe trigeminocardiac reflex. *Ann R Coll Surg Engl*. 2018;100(7):e174-e5.
- Goudot P, Jaquinet AR, Richter M. Cysts of the temporomandibular joint. Report of two cases. *Int J Oral Maxillofac Surg*. 1999;28(5):338-40.
- Chen Y, Suzuki M, Siraki S, Kayano T, Amagasa T, Takagi M. Synovial cyst of the temporomandibular joint: report of a case. *Oral medicine & pathology*. 1998;3(2):97-9.
- Ansari H, Robertson CE, Lane JI, Viozzi CF, Garza I. Auriculotemporal neuralgia secondary to TMJ synovial cyst: a rare presentation of a rare entity. *Headache*. 2013;53(10):1662-5.
- Buckley C, Beecher S, Sleeman D, O'Shaughnessy M. Bilateral synovial cysts of the temporomandibular joint. *BMJ Case Rep*. 2019;12(7).
- Neis J, Tehrani M, Dornhoffer JL. Synovial cyst of the temporomandibular joint: An unusual presentation. *Int Adv Otol*. 2010;6:1.
- Farole A, Johnson MW. Bilateral synovial cysts of the temporomandibular joint. *J Oral Maxillofac Surg*. 1991;49(3):305-7.
- Rozylo-Kalinowska I, Orhan K. Imaging of the temporomandibular joint. 2019.

21. Orhan K. *Ultrasonography in Dentomaxillofacial Diagnostics*: Springer; 2021.
22. Spinzia A, Panetta D, Russo D, Califano L. Synovial cyst of the temporomandibular joint: a case report and literature review. *International journal of oral and maxillofacial surgery*. 2011;40(8):874-7.
23. Chu K, He L, Wang Y, Yao M, Yang M, Liu S, et al. Effectiveness of Needle Aspiration versus Surgical Excision for Symptomatic Synovial Cysts of the Hip: A Single-Center, Retrospective Study. *Medical Science Monitor: International Medical Journal of Experimental and Clinical Research*. 2023;29:e940187-1.