



Synovial Chondromatosis of the Temporomandibular Joint: A clinical and arthroscopic study of 16 cases

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ABSTRACT

Objectives: Present and overview the clinical finding, management and arthroscopic study of Synovial Chondromatosis (SC) cases in Temporomandibular Joint (TMJ) treated by our team.

Study design: During year 2008–2018, 16 TMJ SC cases were treated and reviewed. The clinical manifestations, radiographic data, arthroscopic study and pathologic findings were recorded and analyzed.

Results: Average age of first visit was 32.68. The ratio of male/female was 2/14, right/left was 7/9. The most common symptoms were pain, continuous crepitus and limited mouth opening (LMO). All cases were examined by computed tomography (CT) and magnetic resonance imaging (MRI) preoperative and proved by pathology postoperative. The diagnostic rates of CT and MRI were 12.5% and 93.75% respectively. 1 case could not be detected by both, but by arthroscopy. Particles in all cases occurred in the upper joint cavity and were all removed by arthroscopic technique. No recurrence was found after 3 years follow-up.

Conclusions: MRI and arthroscopic technique could be the first choice in the diagnosis and treatment of SC. Most cases were in stage 3 of the disease at the first visit. Low recurrence rate may be attributed to the improvement of intra-articular environment after surgery. Larger sample sizes are needed for further study.

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1. Introduction

SC is the most common benign nodular cartilaginous proliferation of synovial tissue of the joint (Miller et al., 2002). Usually, it occurs in larger joints, such as knees, elbows, wrists, shoulders and hips. However, the occurrence of SC in TMJ is rare (Carls et al., 1995; Ardekian et al., 2005; Holmlund et al., 2003; Ida et al., 2008). To date, only about 360 cases of SC have been reported (Cai et al., 2011; Bai et al., 2017; Chen et al., 2015; Liu et al., 2016). The etiology of primary SC is unknown. Trauma, infection and embryological disturbances may be the cause of secondary SC (Holmlund et al., 2003). Most patients come for treatment because of the preauricular pain, joint sound and LMO. Surgery is necessary because of

the non-curable and progressive nature of SC (Koyama et al., 2001). Depending on the extension of the lesion, size and location of the particles, several surgical approaches have been described. Open surgery was recommended in the most studies (Ardekian et al., 2005; Cascone et al., 1996; Martín-Granizo et al., 2005). Loose bodies were removed, accompanied by synovectomy and discectomy. Condilectomy may be needed in some serious conditions (Holmlund et al., 2003).

Most of the literature about SC were case reports. Here we present and overview SC in TMJ cases treated by our team during the past 10 years. The aims are to discuss and to summarize the clinical findings and management of SC in TMJ.

2. Materials and methods

Ethical approval was given by our university ethics committee. All informed consent has been obtained. We have read the Declaration of Helsinki and have followed the guidelines in this

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investigation. This study was granted exemption by the Institutional Review Board of Shenzhen University and Shenzhen University General Hospital.

We conducted a retrospective review of consecutive cases with SC of the TMJ from January 2008 to January 2018. 16 cases of SC in TMJ were included. The clinical manifestations, CT and MRI data, arthroscopic study, and pathologic findings were recorded and analyzed.

3. Results

3.1. General information of the SC in TMJ

The average age at first visit was 32.68 years old (range from 19 to 49 years old). The ratio of male to female was 2/14. Left side was affected more than right side (right to left ratio of 7/9).

3.2. Clinical symptoms

The most common symptoms were pain, continuous crepitus and mild LMO. 4 patients suffered from LMO (25%). 8 patients suffered from crepitus (50%). 10 patients suffered from preauricular pain (62.5%) (Table 1).

3.3. Radiology findings

All cases were preliminary diagnosed by preoperative CT and MRI. Only 2 cases were detected by CT. CT scans showed ossification lesions around the condyle (Fig. 1). 15 cases were diagnosed by MRI. MRI showed free bodies within upper joint compartment (Fig. 2). The diagnostic rates of CT and MRI were 12.5% and 93.75% respectively. There was 1 case not detected by both MRI and CT. All of them occurred in the upper compartment of the joint.

3.4. Arthroscopic technique and findings

All cases were treated by arthroscopic technique under local anesthesia. Two single-channel cannulas were inserted into the articular cavity, and the arthroscope could be placed into either one of them. At the same time, lavage was conducted using Ringer solution through the cannulas. There were many cartilaginous nodules floating in the upper space of the joint. The number of free bodies varied from 40 to hundred, size ranged from 0.5 to 6.5 mm. All the free bodies could be removed by a cannula even though the size was bigger than 3 mm. Loose bodies smaller than 3 mm were

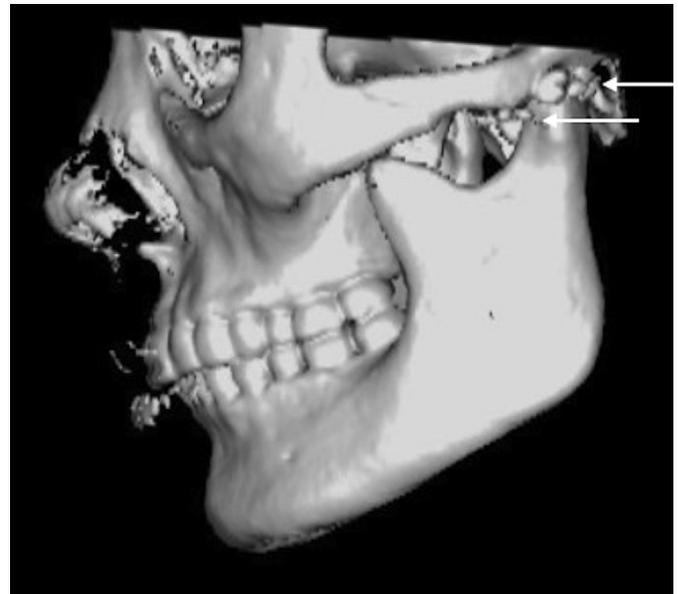


Fig. 1. CT scans showed ossification lesions near the condyle.

flushed out. Loose bodies bigger than 3 mm were removed by biopsy forceps which were inserted into the other cannula under direct vision without any additional incision but a little wider skin incision. We used biopsy forceps to remove the free bodies about 6.5 mm in size as we reported before (Zhu et al., 2013). After removing all the free bodies, synovectomy was also performed in order to reduce the recurrence rate.

Among these 16 cases, we found that, at the first visit, only 1 case (6.25%) was in the stage 1–2 described by Milgram (Milgram, 1977). In stage 1, we could observe cartilaginous metaplasia confined to synovial membrane (Fig. 3a). In stage 2, nodular synovitis and detached bodies are present (Fig. 3b). 15 cases (93.75%) were in stage 3. In the advanced stage, we could observe many free bodies in the joint space without synovitis (Fig. 3c).

3.5. Pathology findings

All the specimens were fixed in buffered formalin and examined microscopically after surgery. We observed typical loose bodies were composed by chondrocytes. A layer of synovium covered the surface of the bodies (Fig. 4).

Table 1
Clinical information of 16 SC cases.

Case	gender	age	side	trauma	LMO	crepitus	pain	MRI	CT	arthroscopic
1	F	19	L	–	3 cm	+	–	+	–	+
2	F	21	L	–	2.5 cm	–	+	+	+	+
3	F	25	L	–	3.3 cm	+	–	+	–	+
4	M	28	R	–	3.4 cm	+	–	+	–	+
5	F	34	L	–	3 cm	+	–	+	–	+
6	F	40	R	–	3.5 cm	+	–	–	–	+
7	F	46	R	–	1.5 cm	–	+	+	–	+
8	F	49	R	–	3.1 cm	–	+	+	+	+
9	M	25	L	–	3 cm	+	+	+	–	+
10	F	43	L	–	2.9 cm	–	+	+	–	+
11	F	26	R	–	3.1 cm	–	+	+	–	+
12	F	40	L	–	3.5 cm	+	–	+	–	+
13	F	28	L	–	2.7 cm	–	+	+	–	+
14	F	37	L	–	3.2 cm	–	+	+	–	+
15	F	30	R	–	3.3 cm	+	–	+	–	+
16	F	32	R	–	3 cm	–	+	+	–	+

Abbreviations: M, male; F, female; L, left; R, right; –, no; +, yes.

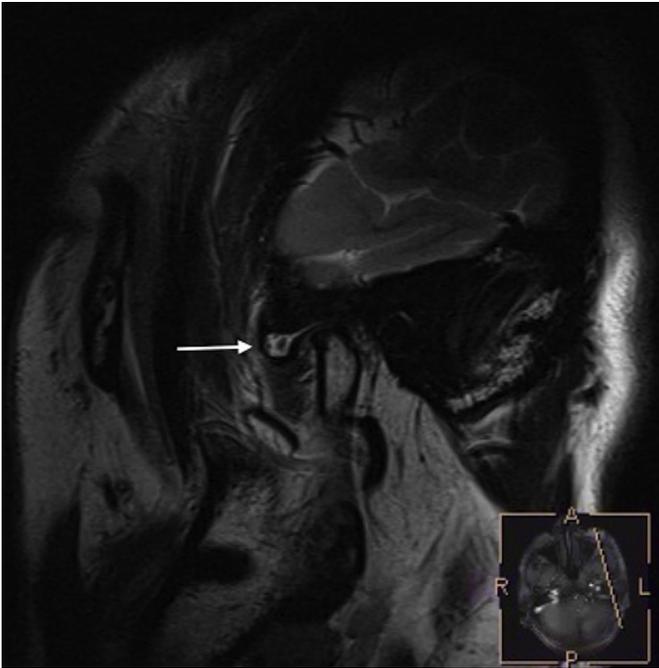


Fig. 2. MRI showed free bodies within upper joint compartment.

3.6. Follow-up results

All patients were required to be re-examined 3 months, 1 year and 3 years after surgery. The patient's symptoms of crepitus and pain in the preauricular area disappeared. The opening limit has also been improved. No recurrence was found by MRI after 3 years of follow-up.

4. Discussion

SC in TMJ is uncommon. Ambrose Paré first reported SC in 1558 (Ginaldi, 1980). It is characterized by formation of cartilaginous bodies that may be embedded and/or detached from the synovial membrane (Guarda Nardini et al., 2010).

In our study, the ratio of male to female was 2/14, although some studies reported that men were 2–4 times more likely to be affected than women (Dorfam and Czerniak, 1998). Our results are consistent with the systemic search in the National Library of Medicine's PubMed Database, women are affected more than men (Guarda Nardini et al., 2010). According to Dr. Liu's study (Liu et al.,

2016), average onset age of SC patients was 47.2 years. Systemic search in National Library of Medicine's PubMed Database also indicated the average onset age of SC cases was 46 years. Because of early detection by MRI, average onset age in this study tended to be 10 years younger than previously reported. All TMJ SC patients involved in this study were unilateral. Prevalence in the left side was higher than in the right side. This is contrary to the report by Lieger O (Lieger et al., 2007).

Preauricular pain, continuous crepitus and mild LMO were the most common symptoms of SC in this study. Some neurologic dysfunction, such as headache or hearing loss (Ardekian et al., 2005), and facial nerve paralysis have been reported in a case of massive erosion (Rosati and Stevens, 1990).

The clinical diagnosis of TMJ SC depends on imaging examination, such as conventional radiography, CT, cone-beam CT (CBCT) and MRI. In this study, preoperative diagnostic rates of CT and MRI were 12.5% and 93.75% respectively. CT scan can only detect the calcified free bodies, while MRI can detect all non-calcified cartilage free bodies. We recommend that MRI should be used as a routine preoperative examination for SC, because it can make up for missed diagnosis of CT. Only one case was detected by arthroscopy due to free bodies that could not be detected by imaging.

At the first visit, 93.75% of the SC cases were mostly in the third stage of disease. We could observe many free bodies in the upper joint space by arthroscopy. The number of free bodies varied from 40 to hundreds, size ranged from 0.5 to 6.5 mm. Only 1 case was in stage 1–2 of disease. We could observe cartilaginous metaplasia confined to synovial membrane and some detached bodies. Surgical technique depends on the size, location and presence of the free bodies. Only if the free bodies were located in the lower space of the joint cavity, or invasive adjacent tissues structures such as middle cranial fossa, middle ear and carotid canal (McCaffery et al., 2017; Paparo et al., 2016; Yoshitake et al., 2016; Pau et al., 2014), was open surgery necessary. McCain and de la Rua also suggested that open arthrotomy would be needed if the free bodies size was greater than the diameter of the arthroscopic cannula (3 mm) (McCain and de la Rua, 1989). Cai et al. reported a case with 20 cm³ large solitary SC of the TMJ and removed successfully by arthroscopic procedure through additional incision in the anterior wall of auditory meatus (Cai et al., 2010). In our experience, we used lavage as conducted with Ringer solution through cannula and biopsy forceps to remove all the free bodies. Even if the size exceeded 1 times the arthroscopic cannula diameter, it could be removed without any additional incision as we reported before⁽¹⁴⁾. Arthroscopic surgery has the advantages of less trauma, shorter operative time and lower recurrence rate. It should be the first choice in the treatment of SC with particles located in the upper compartment of TMJ.

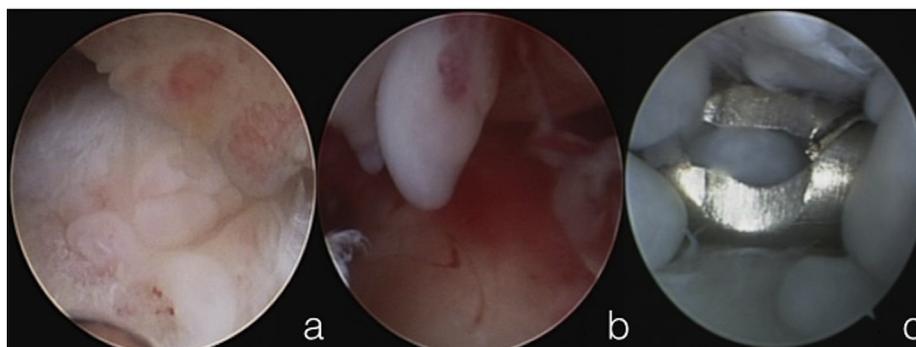


Fig. 3. a. Stage 1 of SC: cartilaginous metaplasia confined to the synovial membrane; b. Stage 2 of SC: nodular synovitis and detached bodies are present; c. Stage 3 of SC: multiple free bodies in the joint space without synovitis.

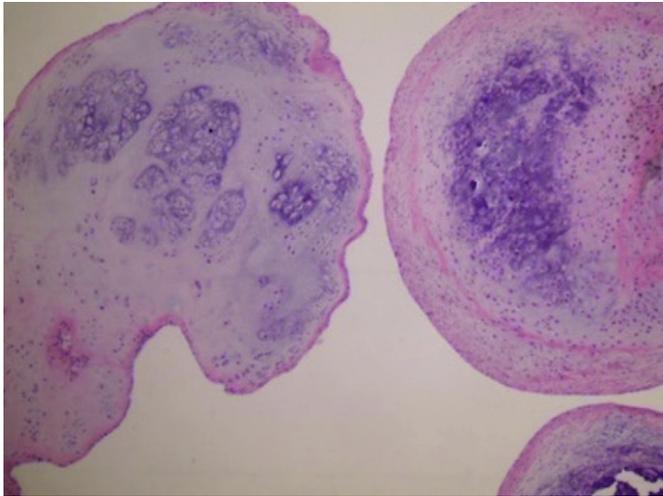


Fig. 4. Pathology of SC: typical loose body of hypercellular cartilage covered with a layer of synovium.

The patient's symptoms disappeared. No recurrence was found by MRI after 3 years of follow-up. Low recurrence rate may be attributed to the improvement of the internal environment within the joint cavity treated by arthroscopic technique.

5. Conclusion

In summary, MRI examination and arthroscopic surgery are the first choice for the diagnosis and treatment of SC in TMJ. Patients were mostly in the third stage of disease at the first visit. A large number of free bodies were seen in the upper joint cavity. We can successfully remove all the free bodies, even sizes as big as 6.5 mm diameter, by arthroscopic technique. Due to rare diseases and small sample size, further study is needed.

Financial disclosure statement

None of the authors has a financial interest in any of the products, devices, or drugs mentioned in this manuscript.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jcms.2019.02.003>.

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