

Magnetic Resonance Imaging Characteristics of Synovial Chondromatosis of the Temporomandibular Joint

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Aims: To determine the characteristic magnetic resonance imaging (MRI) findings of synovial chondromatosis of the temporomandibular joint (TMJ). **Methods:** MRI was carried out in 11 cases of synovial chondromatosis of the TMJ, which had been confirmed surgically and histologically. **Results:** Severe bony changes were not apparent. One or more hypointensive loose bodies were seen in 7 of the 11 cases. A considerable amount of synovial fluid, often with capsular expansion, was a common finding. **Conclusion:** A diagnosis of synovial chondromatosis of the TMJ must be considered when the amount of synovial fluid is abnormally large and the disc position is fairly normal, as seen on closed- and open-mouth MRI of the TMJ, without any associated severe changes in disc shape or bony structure.

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Key words: synovial chondromatosis, temporomandibular joint, magnetic resonance imaging, synovial fluid, joint loose body

Synovial chondromatosis is a rare, benign condition characterized by the formation of metaplastic cartilaginous nodules in synovial and subsynovial connective tissues of the joints.

Milgram¹ divided the synovial chondromatosis into 3 subgroups: (1) an active intrasynovial disease with no loose bodies, (2) transitional cases with intrasynovial nodules and free loose bodies, and (3) multiple loose bodies with no active intrasynovial disease.

Involvement of the temporomandibular joint (TMJ) is very rare. Since the first documented case of synovial chondromatosis in the TMJ was described by Axhausen in 1933, few histopathologically confirmed cases have been reported.^{2,3}

Radiologic findings of synovial chondromatosis of the TMJ are widening of the joint space, limitation of motion, irregularity of joint surfaces, presence of calcified loose bodies, and sclerosis or hyperostosis of the glenoid fossa and the mandibular condyle⁴; the presence of loose bodies in the joint space is the most characteristic radiographic feature. However, calcification and ossification of these loose bodies are necessary for them to be seen on conventional radiograms. Arthroscopy is a useful diagnostic tool to detect all loose bodies that are not visible on plain x-ray.⁵ Computed tomography (CT) and magnetic resonance imaging (MRI) are also considered to be excellent diagnostic tools for synovial chondromatosis of the TMJ.^{6,7} MRI has been used widely with great benefit in the diagnosis of internal derangement of the TMJ,⁸ and is also excellent for the definition and delineation of various extensions of the disease, including the synovial chondromatosis of the

TMJ.⁶ However, there have been few reports based on MRI of synovial chondromatosis of the TMJ. The presence of a large volume of synovial fluid within the superior and/or inferior joint space is a common finding of MRI T2-weighted images. Loose cartilaginous bodies, a striking expansion of the joint capsule, and normal disc position are also commonly seen on MRI.^{6,9-13}

The purpose of this article was to determine the characteristic MRI findings in 11 cases of synovial chondromatosis of the TMJ, which had been confirmed surgically and pathologically.

Materials and Methods

Twelve patients with the synovial chondromatosis of the TMJ underwent surgical treatment in the TMJ Clinic of Yongdong Severance Hospital, Yonsei University, between 1992 and 2000. All cases were confirmed histopathologically. MRI was taken with a 1.0 Tesla MRI scanner (Magnetom, Siemens, Erlangen, Germany) with 3-inch surface coils and 3-mm slice thickness images at 3-mm intervals. In 11 cases, MRI T1- and T2-weighted images were performed before surgery, and in 1 case, an arthrogram alone was performed and this case was excluded. The 11 selected cases were categorized into 3 groups, according to Milgram's classification¹ of clinical, surgical, and pathologic findings, and their MRI characteristics were examined. Disk shape and position, bony change of the condylar head and the glenoid fossa, widening of the joint space, and low signal loose bodies were examined on closed- and open-mouth MRI T1-weighted images. The amount of synovial fluid and the degree of expansion of the joint capsule were evaluated on T2-weighted images.

When the high signal intensity was observed within the anterior and posterior boundary of the disc or localized within the anterior recess and disc, the amount of synovial fluid was categorized as a large amount. An extremely large amount of synovial fluid was demonstrated to exist when the high signal intensity was observed in the whole superior and/or inferior joint space(s) with capsular expansion.

Results

The 11 patients consisted of 10 women and 1 man. The mean age was 32.3 years (range: 23 to 51 years). Six joints were on the right side and 5 on the left. Three cases were categorized as

Milgram's phase 2 and 8 as Milgram's phase 3. Seven cases showed normal disc position (Figs 1 and 2), while 4 cases were diagnosed as exhibiting anterior disc displacement with or without reduction (Figs 3 and 4). Severe bony changes such as cortical bony erosion, sclerosis, and osteophytosis were not seen on MRI (Table 1). Hypointensive loose bodies were not seen on MRI in 4 cases, while 1 or more hypointensive loose bodies were seen in the other 7 cases (Figs 1 and 5).

On T2-weighted images, a large amount of synovial fluid was found in 2 cases (Fig 6), and an extremely large amount of synovial fluid with capsular expansion was seen in the other joints. In 1 case, this was seen only in the inferior joint space (Fig 7).

Discussion

Synovial chondromatosis of the TMJ is reported to affect women more than men by a ratio of 1.5:1, in the age range of 40 to 50 years, and on the right side.^{10,14} However, this study indicated different patient characteristics: Ten of the 11 cases were female, the mean age was 32.3 years, and there was no predilection for the right side. These results might be due to the small number of cases and the fact that the Korean patients of this study had a different diet, sleeping habits, and socio-cultural background than the western/Caucasian patients of the studies previously reported. However, such racial influences on the incidence of the synovial chondromatosis of the TMJ can only be speculated and need to be explored further.

The synovial chondromatosis can be divided into 3 phases¹: (1) an active intrasynovial disease, with no loose bodies; (2) transitional lesions with both active intrasynovial proliferation and free loose bodies; and (3) multiple free osteochondral bodies with no demonstrable intrasynovial disease. Phase 1 cases may not show any clinical signs or symptoms and there were no such cases in this study. Thus, of the 11 cases, 3 were in phase 2 and 8 in phase 3, and each was confirmed histologically and surgically.

Herzog and Mafee⁹ stated that the MRI characteristics of synovial chondromatosis of the TMJ were a striking expansion of the joint capsule, which was also commonly discovered during surgery; a large volume of fluid within the joint cavity; loose cartilaginous bodies consistently present as small areas of low signal intensity; and an irregular but well-positioned articular disc. Most recent reports also concur with these findings.

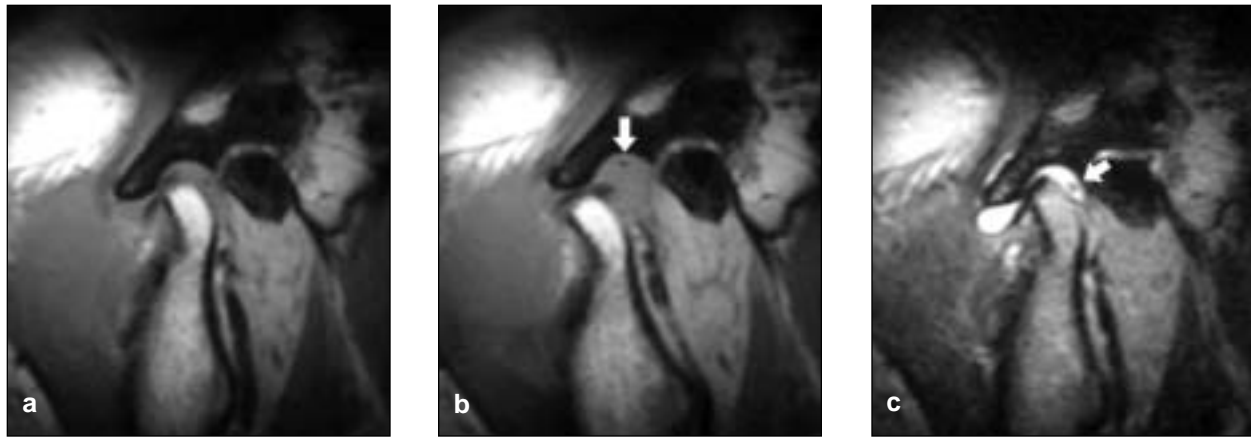


Fig 1 Patient KYS. The disc-condyle relationship appears normal but the condyle-disc complex is displaced inferiorly (a and b). Significant bony changes are not evident. The T2-weighted image (c) shows an extremely large amount of synovial fluid visible as a high signal intensity that expands the joint capsule. Arrow = loose body.



Fig 2 Patient OEJ. The disc-condyle relationship appears more or less normal but the condyle-disc complex is displaced inferiorly. Loose bodies are not visible in these cuts.

Loose bodies of the synovial chondromatosis differ from the loose bodies secondary to osteochondral fractures and joint surface disintegration such as degenerative arthritis and avascular necrosis.¹⁵ In those cases, bony changes may be seen on MRI. Marked bony changes such as cortical sclerosis, erosion, and osteophytosis were not seen in the TMJs of this study. Noyek et al⁴ considered, among others features, irregular joint spaces, the presence of calcified loose bodies, and sclerosis of the mandibular condyle or glenoid fossa to be characteristic radiologic findings of synovial chondromatosis, but these findings are not exclusive to synovial chondromatosis and are often noted in degenerative joint diseases.¹⁴ Hypointense loose bodies were not seen in 4 cases (Table 1) in the current MRI study, probably because of their low mineral content.¹¹

The articular disc of the TMJ with synovial chondromatosis has a normal position⁹ or is anteriorly displaced.^{6,10,12,16} Therefore, disc position may not be a specific finding of synovial chondromatosis. In this study, 7 of the 11 cases showed a fairly normal disc position in relation to the condyle, while the condyle-disc complex was displaced inferiorly when the superior joint space was affected, probably because of the expansion of the joint spaces. The expansion of the joint space affects primarily the superior joint space,¹⁰ but the inferior joint space might also be affected.¹⁷ In this investigation, this occurred only in 1 case (Fig 7).

High signal intensity within the joint space, known as joint effusion, is clearly visible on MRI T2-weighted images,¹⁸ more often in the joints with disc displacement.¹⁹ In most cases, synovial fluid is localized within the folded disc or in the

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Table 1 MRI Findings

| Patient | Sex | Age | Side | Milgram's Phase | MRI findings | | | | |
|---------|-----|-----|------|-----------------|---------------|--------------------------|---------------------------------|---------------------------|----------------------------------|
| | | | | | Disc position | Amount of synovial fluid | Capsular expansion [†] | Loose bodies [‡] | Severe bony changes [†] |
| KBW | F | 25 | Rt | 2 | Normal | large | - | - | - |
| JKM | F | 23 | Lt | 2 | ADsR | large | - | + | - |
| KKY | F | 24 | Rt | 2 | Normal | extremely large | + | - | - |
| KKS | F | 38 | Rt | 3 | Normal | extremely large | +* | + | - |
| KYS | F | 31 | Lt | 3 | Normal | extremely large | + | + | - |
| LKY | F | 42 | Lt | 3 | Normal | extremely large | + | + | - |
| KJY | M | 34 | Lt | 3 | Normal | extremely large | + | + | - |
| OEJ | F | 51 | Rt | 3 | Normal | extremely large | + | + | - |
| JSM | F | 33 | Rt | 3 | ADcR | extremely large | + | - | - |
| KYB | F | 30 | Lt | 3 | ADsR | extremely large | + | + | - |
| JHW | F | 24 | Rt | 3 | ADsR | extremely large | + | - | - |

* = inferior joint space.

† + = evident; - = not evident.

‡ + = observed; - = not observed.

Normal = normal disc position; ADcR = anterior disc displacement with reduction; ADsR = anterior disc displacement without reduction.

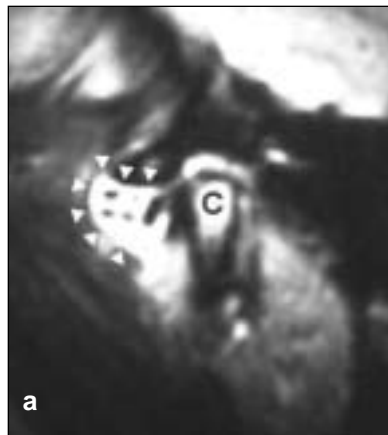


Fig 5 An extremely large amount of synovial fluid and several hypointense loose bodies are visible in the superior joint space (a). The calcified loose bodies are visible also on the CT image (b). The outline of the joint capsule in the MRI picture (a) is marked by the white triangles, while the arrows show the loose bodies in the CT image (b). C = condylar head.

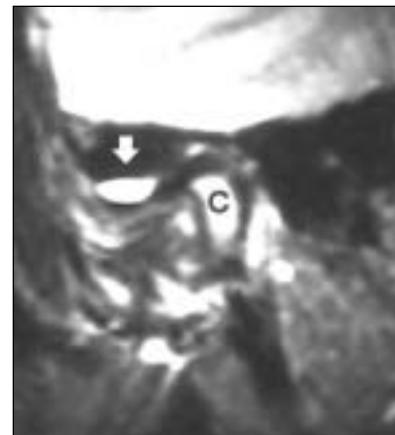


Fig 6 This image does not show a capsular expansion although the superior joint space is largely filled with synovial fluid (high signal intensity, white arrow). C = condylar head.

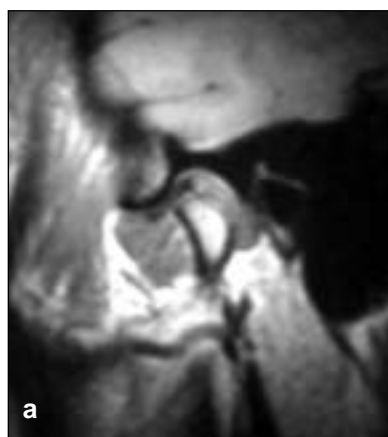


Fig 7 Patient KKS. The disc-condyle relationship appears normal (a and b), but the disc is displaced superiorly (b) because the inferior joint space is affected. The T2-weighted image (c) shows a very large amount of synovial fluid with remarkable capsular expansion of the inferior joint space.

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