A Study on the Reliability of Clinical Diagnosis for TMJ Internal Derangement

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CONTENTS

Ⅰ. INTRODUCTION

Temporomandibular disorders (TMD) is one of the most common chronic pain disorders in maxillofacial area, and their importance is still increasing in that the signs and symptoms of TMD are found in 30-50% of general population, and patients who need treatment are up to 3-5%.

Regardless of this high prevalence rate, various kinds of diagnostic methods such as clinical diagnosis, radiographic diagnosis, mandibular kinesiography, thermography, electromyography, and sonography have been used as diagnostic methods in random without clear indication, and the reports about the sensitivity and specitivity of these methods show difficulty in continued application of these methods.

Before arthrogram or magnetic resonance imaging (MRI) was introduced, osseous changes and the degree of translation by orthopantomogram, transcranial view, and/or tomogram were only available information we could get.

Since arthrography has been introduced, we could know articular disc morphology and position, dynamic movement on function, articular ankylosis, and perforation on disc and/or attachment. The development of MRI made it possible for us to know borderline area between disc and attachment as well as articular morphology/position and degenerative change of bony structure. Therefore, more accurate diagnosis of TMD became possible.

But, high fee due to expensive equipment and physical trauma due to invasive procedures have become problems. Especially, injection of contrast media and repeated exposure to radiation can be harmful to the patients in arthrography. In MRI, the patients with claustrophobia and with metallic implants are contraindicated.

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Considering the fact that each progressive stage of temporomandibulat joint internal derangement(TMJ ID) have different characteristics, it is desirable to establish clinical and radiographic diagnostic methods suitable for each stage. The studies on the accuracy of clinical diagnosis of TMJ ID stage have been reported, but the results were so various that it is very difficult to acquire the meaningful conclusions.

The purpose of this study is to know the accuracy of clinical diagnostic method compared with diagnosis by arthrography and/or MRI for clinically diagnosed TMJ ID patients. These results will be a help for establishing furthermore accurate clinical diagnostic criteria.

Ⅱ. MATERIALS AND METHODS

1. Subjects

Thirty-two subjects (fifty-three joints) were selected from patients who visited in the Orofacial Pain Clinic, Dept. of Oral Medicine and Oral Diagnosis, Seoul National University Dental Hospital. All patients were diagnosed as TMJ internal derangement based on clinical examination and conventional radiography. Arthrography and/or MRI were taken for more precise diagnosis.

2. Methods

(1) Clinical Examination

History taking, clinical examination (the size of mouth opening, TMJ noise, joint and muscle palpation, etc.) and routine radiographic examination for TMD patients were performed to the subjects or joints. Clinical diagnoses were classified into normal, disc displacement with reduction, disc displacement without reduction, disc displacement with reduction associated with degenerative joint disease, and disc displacement without reduction associated with degenerative joint disease. Standard panoramic view and transcranial projection were included in routine radiography. TMJ panoramic view was added to differentiate if it shows degenerative change or not.

The diagnostic criteria for TMJ internal derangement in clinical examination are as follows[10].

① Normal : The size of maximum mouth opening is more than 40mm, and the size of lateral movement is more than 7mm. No TMJ noise. No TMJ pain.

② Disc displacement with reduction : A clicking or popping is detected, but it disappears when mouth opening and closing is achieved with protrusion of mandible.

③ Disc displacement without reduction : TMJ noise is not detected but there is or has been mouth opening limitation. The size of lateral movement to the non-affected side is less than that of lateral movement to the affected one.

④ Disc displacement with reduction associated with degenerative joint disease : The criteria of disc displacement with reduction are satisfied and the crepitus is detected at the same time.

⑤ Disc displacement without reduction associated with degenerative joint disease : The criteria of disc displacement without reduction are satisfied and the crepitus is detected at the same time.

(2) TMJ Arthrography

The individually corrected lateral sectography(Quint, U.S.A.) was performed by the aid of contrast media (Rayvist, Schering) under fluoroscopy (Philips, BV25).

TMJ arthrographic criteria for the classification of TMJ internal derangement are as follows[11].

① Normal : The posterior part of the disc is located superior side of the mandibular condyle.

② Disc displacement with reduction : in the intercuspal position, The disc is located anterior to the normal site in the closing position. The normal disc-condyle relationship is established in the opening position.

③ Disc displacement without reduction : The disc is located anterior to the normal disc position in any of mandibular position.

④ Disc displacement with reduction associated with degenerative joint disease : The criteria of disc displacement with reduction are satisfied. Flattening, erosion, osteophyte, and sclerosis are detected on mandibular condyle and/or temporal fossa in tomogram.

⑤ Disc displacement without reduction associated with degenerative joint disease : the criteria of disc displacement without redution are satisfied. Flattening, erosion, osteophyte, and sclerosis are detected on mandibular condyle and/or temporal fossa in tomogram.

(3) TMJ Magnetic Resonance Imaging

The subjects were referred to MRI center in Seoul National University Hospital, and MRI was taken with Sigma Horizon 1.5 T(General Electronics Co., U.S.A). T1 weighted spin-echo (SE) image of sagittal plane in maximum mouth opening and intercuspal position was obtained. For the classification of TMJ internal derangement, the same criteria used in the arthrography was applied.

Ⅲ. RESULTS

Thirty-two subjects(53 joints), included in this study, were diagnosed by clinical and conventional radiographic methods, and divided into stages of TMD ID(Table 1). They were grouped according to the imaging methods. Eighteen joints were examined with MRI only. Twenty five joints were examined with arthrography only. Ten joints were examined with both MRI and arthrography(Table 2).

Table 1. Stages of TMD ID by clinical and conventional radiography.

A	B	C	D	E	total
5	33	14	1	0	53

A. normal
B. disc displacement with reduction
C. disc displacement without reduction
D. disc displacement with reduction associated with degenerative joint disease
E. disc displacement without reduction associated with degenerative joint disease

Table 2. Distribution of temporomandibular joints according to the imaging methods

MRI only	Arthrography only	Both	Total
18	25	10	53

In comparision of MRI diagnosis with clinical one, 20 of 28 joints showed the same results (71.4%) (Table 3). All four joints diagnosed as normal , 3 of 20 joints diagnosed as disc displacement with reduction, and 1 of 4 joints diagnosed as disc displacement without reduction by clinical examination showed different diagnostic results by MRI.

In comparison of arthrographic diagnosis with clinical one, 32 of 35 joints by arthrogram showed the same results with those of the clinical examination (91.1%)(Table 4). One of 2 joints diagnosed as normal , 1 of 20 joints diag

Table 3. The accuracy of diagnosis by clinical examination compared with the diagnosis by MRI.

Joint No.	Clinical diagnosis	MRI diagnosis	accord (Yes/No)
1	B	B	Y
2	B	B	Y
3	B	B	Y
4	B	C	N
5	C	E	N
6	A	B	N
7	A	B	N
8	B	C	N
9	B	B	Y
10	C	C	Y
11	B	B	Y
12	B	B	Y
13	B	B	Y
14	B	B	Y
15	B	B	Y
16	B	B	Y
17	A	B	N
18	B	B	Y
19	C	C	Y
20	C	C	Y
21	B	C	N
22	B	B	Y
23	B	B	Y
24	A	B	N
25	B	B	Y
26	B	B	Y
27	B	B	Y
28	B	B	Y
Percentage of accordance			20/28(71.4%)

A. normal
B. disc displacement with reduction
C. disc displacement without reduction
D. disc displacement with reduction associated with degenerative joint disease
E. disc displacement without reduction associated with degenerative joint disease

Table 4. The accuracy of diagnosis by clinical examination compared with the dignosis by arthrography

Joint No.	Clinical diagnosis	Arthrographical Dx.	accord (Yes/No)
19	C	C	Y
20	C	C	Y
21	B	B	Y
22	B	B	Y
23	B	B	Y
24	A	B	N
25	B	B	Y
26	B	B	Y
27	B	B	Y
28	B	B	Y
29	D	C	N
30	B	C	N
31	B	B	Y
32	B	B	Y
33	B	B	Y
34	C	C	Y
35	C	C	Y
36	C	C	Y
37	B	B	Y
38	B	B	Y
39	C	C	Y
40	C	C	Y
41	B	B	Y
42	B	B	Y
43	B	B	Y
44	B	B	Y
45	B	B	Y
46	C	C	Y
47	A	A	Y
48	2	B	Y
49	2	B	Y
50	3	C	Y
51	3	C	Y
52	3	C	Y
53	3	C	Y
Percentage of accordance			32/35(91.1%)

A. normal
B. disc displacement with reduction
C. disc displacement without reduction
D. disc displacement with reduction associated with degenerative joint disease
E. disc displacement without reduction associated with degenerative joint disease

Table 5. The accuracy of diagnosis by clinical examination compared with the diagnosis by MRI and arthrography.

Joint No.	Clinical diagnosis	Dx. by arthrography	Dx. by MRI
19	C	C	C
20	C	C	C
21	B	B	C
22	B	B	B
23	B	B	B
24	A	B	B
25	B	B	B
26	B	B	B
27	B	B	B
28	B	B	B

A. normal
B. disc displacement with reduction
C. disc displacement without reduction
D. disc displacement with reduction associated with degenerative joint disease
E. disc displacement without reduction associated with degenerative joint disease

nosed as disc displacement with reduction, and 1 joint diagnosed as disc displacement with reduction combined with degenerative change by clinical examination didn't show the same diagnosis by arthrography. All 12 joints diagnosd as disc displacement without reduction by clinical examination showed the same diagnosis by arthrography

Ten joints were examined by both MRI and arthrography. Nine out of ten joints showed same diagnostic results and eight out of this nine joints showed same diagnostic results by clinical examination (Table 5).

Ⅳ. DISCUSSION

The number of TMD patients is still increasing, but the causing factors of TMD are so various and complex that the adoption of accurate diagnostic and treatment modalities is confusing. The development of technolgy has made contribution on the development of diagnostic and treatment equipments. On the other hand, high fee due to expensive equipment and physical trauma owing to repeated invasive tests are still problems. Clinicians should provide patients as less burden as possible in physical and financial aspects on medical practice. This can be possible by employment of modern equipments selectively according to signs and symptoms of patients. Although the advanced diagnostic imaging technics are very important aid in the diagnosis of TMD, clinicians should adopt them only in such cases that clinical examinations and conventional radiographic tests cannot explain the signs and symptoms reasonably.

Efforts have been made continuously to acquire appropriate diagnostic methods according to signs and symptoms of TMD patients. Autopsy, arthroscopy, MRI, computed tomography and arthrography have been used to compare the reliability between clinical and diagnostic imaging methods. In comparative studies on diagnostic methods by autopsy, Westessen reported that arthrography was superior in deciding the position and morphology of articular disc.[8,9] MRI was known as an excellent modality in detecting the borderline between disc and posterior attachment as well as the position and morphology of disc.[12] Computed tomography showed good results in detecting osseous changes.[13] Tanimoto et al. reported that arthrography surpassed CT in detecting the position and morphology of articular disc.

Bibb et al. compared the diagnostic efficiency of arthroscopy, tomography, and arthrography methods in vivo. Arthroscopy detected condylar surface contour and the position and extent of disc perforation well. In arthrography, the

position and shape of articular disc and dynamic joint position were detected very well. In tomography, bony changes were best visualized. [15] Rao et al. compared MRI and arthrography with arthroscopy as a standard. He reported that arthrography was superior in detecting the disc position, disc perforation and adhesion. And also he reported that MRI was best in degenerative changes. [16] Kerstens et al. [17] and Tasaki et al. [18] also reported the advantages and disadvantages of arthrography and MRI.

Consequently only one modality was not satisfactory for diagnosing progressive stages of TMJ ID. The previous reports on the accuracy of clinical diagnosis showed much difference. [2-5] These differences are largely due to selection of subjects, clinical diagnostic criteria, clinician's examination and arthrographic skill, and the difference of MRI quility.

This study revealed that the clinical diagnosis showed the same results with arthrographic diagnosis in the case of 32 out of 35 joints (91.1%). In MRI, the percentage of accordance was 71.4% (20 of 28 joints). Of 10 joints diagnosed by both MRI and arthrography, 9 showed the same diagnosis by MRI and arthrography. Among 9 joints, 8 showed the same results with clinical diagnosis

This study confirmed the previous suggestions by Nitzan et al.[5] that arthroscopy and MRI were necessary in such a case that clinical and routine diagnostic test could not explain the signs and symptoms of TMD. If the widely used clinical diagnostic methods were conducted by experts using strict diagnostic criteria, these procedures will provide patients more opportunity by decreasing physical and financial burden.

V. CONCLUSIONS

This study was performed to determine the diagnostic accuracy by clinical examination compared with the arthrography and/or MRI. The results can be a help to decide the accurate indication of arthrography and MRI for the further diagnosis and treatment in TMD. Thirty-two subjects (fifty-three TMJs) were included in this study. They were selected from the patients who visited the Orofacial Pain Clinic, Dept. of Oral Medicine and Oral Diagnosis, Seoul National University Dental Hospital. All of them were diagnosed as patients with TMJ ID by clinical examination. Joints were classified into 5 groups ; normal, disc displacement with reduction, disc displacement without reduction, disc displacement with reduction associated with degenerative joint disease, disc displacement without reduction associated with degenerative joint disease.

The obtained results were as follows ;

1. By clinical examination on 53 joints, the number of normal joint was 5 (8.4%). Joints with disc displacement with reduction were 33 (62.3%). Joints with disc displacement without reduction were 14 (26.6%). Joint with disc displacement with reduction associated with degenerative joint disease was 1 (3.7%). There was no joint diagnosed as disc displacement without reduction associated with degenerative joint disease (0%).
2. Thirty-two out of 35 joints diagnosed by arthrography showed the same results with clinical diagnosis(91.1%). Twenty out of 28 joints diagnosed by MRI showed the same results with clinical diagnosis(71.4%).
3. Of 10 joints diagnosed by both MRI and arthrography, 9 joints(90%) showed the same diagnosis by MRI and arthrography. Among 9 joints, 8 joints(88.9%) showed same results with clinical diagnosis.
4. Clinical examinations were proven to be useful

diagnostic modality in TMJ ID. Especially in patients with subjective symptoms diagnosed as normal by clinical examinations, diagnostic imaging methods such as MRI and arthrography were meaningful.

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국문초록

측두하악관절 내장증의 임상적 진단의 신뢰도에 관한 연구

서울대학교 치과대학 구강내과·진단학 교실

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본 연구는 서울대학교 치과병원 구강진단과 악안면 동통진료실에 내원한 환자중 임상적 검사에 의해 악관절 내장증으로 진단된 총 32명 53개의 측두하악 관절을 대상으로 악관절 조영술이나 자기공명영상을 실시하여 임상적 진단의 정확도를 알아보고 향후 이 결과를 적절히 활용하여 정확한 적응증의 설정에 도움을 주고자 시행되었다. 각 악관절을 임상적 검사, 조영술 및 자기공명영상 검사를 기준으로 정상, 정복성 관절원판 변위, 비정복성 관절원판 변위, 퇴행성 관절 질환을 동반한 정복성 관절원판 변위, 퇴행성 관절 질환을 동반한 비정복성 관절원판 변위로 구분하였다. 이상의 연구를 통하여 다음과 같은 결론을 얻었다.

1. 악관절 내장증으로 내원한 환자 32명, 총 53개 관절중, 정상인 경우가 5예, 정복성 관절원판 변위인 경우가 33예, 비정복성 관절원판 변위인 경우가 14예, 퇴행성 관절 질환을 동반한 정복성 관절원판 변위인 경우가 1예이었고, 퇴행성 관절 질환을 동반한 비정복성 관절원판 변위인 경우는 없었다.
2. 악관절 조영술 검사를 시행한 35개의 관절중 임상적 검사와 일치하는 경우는 32개로 그 일치율은 91.1%이었으며, 자기공명영상 검사를 시행한 28개의 관절중 임상적 검사와 일치하는 경우는 20개로 그 일치율은 71.4%이었다.
3. 악관절 조영술 및 자기공명영상 검사를 동시에 시행한 10개 관절중 악관절 조영술 및 자기공명영상 검사가 일치하는 경우는 9개이었으며 이중 8개 결과는 임상적 진단과 일치되는 소견을 보였다.
4. 임상적 검사는 악관절내장증의 진단에 유용한 방법임이 확인되었다. 그러나 임상적으로는 정상으로 진단되었지만 주관적인 증상을 가진 환자에게는 자기공명영상 검사와 악관절조영술 검사 등의 영상 진단술식이 필요할 것으로 사료된다.