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The Prevalence of TMJ Osteoarthritis in Korean TMD Patients

한국인 측두하악장애 환자에서의 측두하악관절 골관절염 발생률에 관한 연구

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Abstract

The Prevalence of TMJ Osteoarthritis in Korean TMD Patients

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Osteoarthritis(OA) is a progressive joint disease characterized by an imbalance of articular cartilage biosynthesis and degradation attributed to both inflammatory and biomechanical factors. In temporomandibular joint(TMJ), OA is also an age-related disease like other joints. And some epidemiological researches have established higher prevalence of TMJ disease and temporomandibular pain in females than males. This study aims to investigate the incidence of TMJ OA in Korean TMD patients based on computed tomographs(CT) images to provide the epidemic characteristics of TMJ OA.

A retrospective cross-sectional study was performed on clinical records and radiographs taken of 1,038 patients(297 male and 741 female, mean age 31.1 ± 17.4 years and 34.0 ± 16.2 years, respectively) who visited a clinician, associate

professor Jeongyun Lee at the TMJ & Orofacial Pain Clinic of Seoul National University Dental Hospital for their TMD symptoms examined in 2010. The plain radiograghs include orthopantomogram, TMJ orthopantomogram, and transcranial radiographs, which were routinely taken in the TMD diagnostic procedure and CT, which was taken to verification of TMJ osteoarthritis.

The obtained results were as follows:

1. The incidence of TMJ OA is 18.11%(188 patients in 1038 patients). The prevalence of TMJ OA in female patients is 21.05%(156 patients in 741 patients), 1.94 times($P<0.001$) higher odds than that in male patients(10.77%, 32 patients in 297 patients), and relatively high in young adult, in their third decade.
2. The positive TMJ OA patients group according to RDC/TMD including plain radiograghs has 15.79 times($P<0.001$) higher odds than the negative group.
3. However, the prevalence of TMJ OA has no statistically significant correlation with age in both genders. Likewise, the prevalence of TMJ OA has also no statistically significant correlation with the present of pain and the disc displacement diagnosed by only clinical examination based on the RDC/TMD.

In conclusion, the prevalence of TMJ OA in TMD patients is higher in female than male, and there is no correlations between the prevalence of TMJ OA in TMD patients and age unlikely the other joints. Furthermore, the prevalence of TMJ OA in TMD patients has no relationships with the clinical signs like pain and disc displacement. It can be suggested that the epidemiologic characteristics of TMJ OA differs from those of other joints, and a more extensive study based on the general population is necessary.

Keywords : temporomandibular joint, temporomandibular disorders, osteoarthritis, prevalence

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INDEX

TABLE INDEX

FIGURE INDEX

I. INTRODUCTION

Osteoarthritis(OA) is a progressive joint disease characterized by an imbalance of articular cartilage biosynthesis and degradation attributed to both inflammatory and biomechanical factors.[1] In temporomandibular joint(TMJ), osteoarthritis is also an age-related disease like other joints.[2-5] And some epidemiological researches have established higher prevalence of TMJ disease and temporomandibular pain in females than males.[2, 3, 5] Previous studies have provided estimates of the prevalence of degenerative TMJ disease ranging from 11% to 35%.[6, 7]

Diagnosis of TMJ OA can be done either by symptoms taken from a physical examination or by radiograghical diagnosis. The clinical signs of TMJ OA are crepitus(grinding in the joint) associated with movement, restriction of jaw movements, and pain within the joint cavity, which tends to be intermittent.[8] In radiograghical records of TMJ OA patient, some bony changes occur in the TMJ condyles. The most frequent condylar bony change observed was sclerosis(30.2%) followed by surface erosion(29.3%), flattening of the articular surface(25.5%), and deviation in form(13.2%), like a cane-shape, a lateral or medial pole depression, a condylar surface flattening, and bifid-shaped condyle. And lesser frequent condylar changes observed were osteophyte(8.0%) and subcortical cyst(5.5%).[9]

However, most of previous studies on the prevalence of OA in temporomandibular disorder(TMD) patients were based on autopsy samples or samples limited in age or number.[10-12] This study aims to investigate the incidence of TMJ OA in 1038 Korean TMD patients based on computed tomograghs(CT) images to provide the epidemic characteristics of TMJ OA.

II. MATERIALS AND METHODS

1. Subjects

A retrospective cross-sectional study was performed on clinical records and radiographs taken of 1,153 patients who visited the TMJ & Orofacial Pain Clinic of Seoul National University Dental Hospital for the examination of their TMD symptoms in 2010. Finally, 1,038 patients(297 male and 741 female, mean age 31.1 ± 17.4 years and 34.0 ± 16.2 years, respectively) who were diagnosed with TMD based on the Research Diagnostic Criteria for Temporomandibular Disorder(RDC/TMD) were enrolled for study while the patients who had major deformity, TMJ fracture, and systemic diseases known to affect the TMJ, such as rheumatoid arthritis were excluded. The research protocol was approved by the Institutional Review Board of the University Hospital (#CRI12038).

2. Diagnosis of TMD and TMJ OA

Diagnosis of TMD based on RDC/TMD and TMJ OA was performed by single TMD specialist, one of the authors, Lee. At the first step of diagnosis, clinical examination was done based on the RDC/TMD Axis I and plain radiographs including orthopantomogram, TMJ orthopantomogram, and transcranial radiographs. After then, once any radiographic or clinical sign of TMJ OA was suspicious, CT was taken additionally to confirm the osteoarthritic changes of the joint.

RDC/TMD diagnosis was made dichotomously to simplify the analysis, determining if the joint could be classified into

pertinent RDC group, I, II, and III, or not. In the case of RDC group III, classification was done in two different way, pain and arthritis/arthrosis. For pain, RDC IIIa and RDC IIIb were classified into RDC IIIpain, and RDC IIIb and RDC IIIc were classified into RDC IIIOA.

3. Statistical analysis

Chi-square test and binary logistic analysis were performed to analyze the relationship between the prevalence of TMJ OA and age, gender, and each RDC group. All statical analyses were performed using SPSS 21.

III. RESULTS

1,038 patients(297 male and 741 female, mean age 31.1 ± 17.4 years and 34.0 ± 16.2 years, respectively) were analyzed. As shown in Figure 1 and Table 1, approximately twice as many women visited the clinic for TMD examination as men, and most patients were in their third decade, i.e. 20s. The incidence of TMJ OA is 18.11%(188 patients in 1038 patients). The prevalence of TMJ OA in female patients is 21.05%(156 patients in 741 patients), 1.94 times($P<0.001$, Table 2) higher odds than that in male patients(10.77%, 32 patients in 297 patients), and relatively high in young adult, in their third decade. As shown in Table 2, the positive TMJ OA patients group according to RDC/TMD including plain radiograghs has 15.79 times($P<0.001$, Table 2) higher odds than the negative group.

However, the prevalence of TMJ OA has no statistically significant correlation with age in both genders as shown in Figure 2. Likewise, the prevalence of TMJ OA has also no

statistically significant correlation with the present of pain and the disc displacement diagnosed by only clinical examination based on the RDC/TMD.

IV. DISCUSSION

Although the results of epidemiological studies of TMJ OA vary according to diagnostic criteria,[5, 6, 9] TMJ OA is generally considered as an age-related joint disease as those of other joints of the body and a gender-related joint disease, female predominance.[13, 14] But, other studies have reported that there is no significant gender difference in the actual incident of TMJ OA.[15] And some studies have even reported a higher incidence of OA in men.[16, 17] It is also true that there is no established epidemiological evidence based on a large scale sample of general population to support such a relationship or a difference compared to other joints between age or gender and TMJ OA. Moreover, it is very well known that TMD is a multi-factorial disease.[14] In this study, it was tried that the effects on the TMD occurrence of seasonal and social factors were excluded by the enrollment of whole TMD patients in a year. For better consistency and reliability of diagnosis, 1,038 patients were chosen, who had been diagnosed by single TMD specialist at the TMJ & Orofacial Pain Clinic of Seoul National University Dental Hospital.

The diagnosis of TMJ OA can be done either by symptoms taken from a physical examination or by radiograghical diagnosis. The clinical signs of OA are crepitus associated with movement, restriction of jaw movements, and pain within the joint cavity, which tends to be intermittent.[8] However, diagnosis using clinical examination has little reliability due to lacking any correlation between the sign and symptoms. On the

other hand, radiographic examination is very valuable for detecting degenerative changes in osseous components.[18] Therefore, in the TMJ & Orofacial Pain Clinic of Seoul National University Dental Hospital, degenerative change of the mandibular condyle was evaluated using all three types of radiographs consisting of orthopantomogram, TMJ orthopantomogram, and transcranial radiographs routinely taken for the diagnosis of TMD. Although computed tomography(CT) and magnetic resonance imaging(MRI) are the most valuable radiographic tools in diagnosing OA,[13, 19] they technically cannot be performed on every single patient due to the high cost or risks of high dose radiation exposure. With physical examination and plain radiographs, clinician can get suspicious that patient is affected by TMJ OA. If patient has a possibility of TMJ OA, additional radiographs such as CT examination is needed for verification of TMJ OA despite of the high cost or risks of high dose radiation. In this study, TMD was diagnosed by physical examination with plain radiographs according to the RDC/TMD and TMJ OA was confirmed by CT. Findings in degenerative osseous changes in radiographic examination were sclerosis, surface erosion, flattening of the articular surface, and osteophyte formation.

In this study, the risk of TMJ OA was 1.94 times($P<0.001$, Table 2) higher in women than in men. This result is consistent with the results of previous studies.[2-5] The reason for this phenomenon is unclear, but it may be due to the differences of sex hormones, pain perception, responses to stress, and psychological factors.[3, 20, 21] Several studies have not found any gender differences in degenerative change of the TMJ,[15, 22] while others have reported a higher prevalence in men.[16, 17]

Previous studies about RDC/TMD, the validity of RDC/TMD Axis I diagnoses is low,[23-25] especially GroupⅢ.[23] In this study, the prevalence of TMJ OA has also no statistically

significant correlation with the present of pain and the disc displacement diagnosed by only clinical examination according to the RDC/TMD. However, the low validity of RDC/TMD Axis Ⅰ diagnoses is not the only reason for this result. The lacking any correlation between the sign and symptoms of TMJ OA also makes confounding factors. On the other hand, the positive TMJ OA patients group according to RDC/TMD including plain radiograghs has 15.79 times($P<0.001$, Table 2) higher odds than the negative group. It does not mean that the validity of RDC/TMD Axis Ⅰ diagnoses is high. This result probably came from plain radiograghs data, not clinical signs, crepitus.

In previous studies, the TMJ OA is age-related disease, increasing with aging.[4, 5, 11, 15, 26] However, the prevalence of TMJ OA was not statistically different between age groups in this study. TMJ OA is not always symptomatic and the pain sensitivity can be decrease with increasing age.[27] These factors probably lead to the result. Whatever the relationship between the occurrence of TMJ OA and age, it is obvious that the age related tendency of TMJ OA is not similar with the other joints, of which the prevalence of OA shows a steep increase around middle age.[28] The frequency of TMJ OA in young patients was as high as 10-20%. This is consistent with the results of previous studies, in which OA was observed before adolescence, and the symptoms of OA were found to occur mainly in the third decade of life, and degenerative change of the mandibular condyle seems to start at a young age.[11, 29] This low correlation between age and occurrence of OA change of the TMJ implies that there may be some difference in pathophysiology between the TMJ and other joints. Such difference may arise from the fact that the TMJ has a different mechanical load-bearing system compared to other weight-bearing joints, not that it has a biochemically different pathophysiology. And considering the comprehensive meaning

of the degeneration of the joint involving most abnormal tissue response to functional overload such as change of the position or shape of the TMJ disk, loosening of the ligamental tension, and of the synovial component, it is logical to think that the onset of TMJ OA in adolescents and young adults means that it can lead to a harmful effects during growth of TMJ. Therefore, endeavor for the development of effective early diagnosis, treatment and prevention of bone destruction is required.

V. CONCLUSIONS

The prevalence of TMJ OA in Korean TMD patients is higher in female than male, and relatively high in young adults. This age-independent tendency is not familiar with the other joints, of which the prevalence of OA shows a steep increase around middle age. Therefore, it can be suggested that the epidemiological characteristics of OA in TMJ differ from that in other joints, and that a more expansive study to explain the accurate epidemiological and biological characteristics of TMJ OA based on the general population is required.

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Table 1. Age and gender distribution in the sample of 1036 patients.

Decades of Age	Male		Female	
	Non-OA	OA	Non-OA	OA
1	1(100.0)	0(0.0)	3(100.0)	0(0.0)
2	90(90.0)	10(10.0)	115(76.7)	35(23.3)
3	93(88.6)	12(11.4)	204(80.6)	49(19.4)
4	23(92.0)	2(8.0)	94(77.0)	28(23.0)
5	16(84.2)	3(15.8)	60(81.1)	14(18.9)
6	10(100.0)	0(0.0)	59(78.7)	16(21.3)
7 and older	32(86.5)	5(13.5)	50(78.1)	14(21.9)
Total	265(87.4)	32(12.6)	585(75.8)	156(24.2)

Parenthesis indicates %.

Table 2. Incidence of TMJ OA among total 2076 joints according to gender, RDC Ⅰ, RDC Ⅱ, RDCⅢOA, RDCⅢPain.

Decades of Age	OA in age group	Gender		RDCI	RDCII	RDCIIIOA	RDCIIIPain
		Male	Female				
1	0(0.0)	0(0.0)	0(0.0)	0(0.0)	3(37.5)	0(0.0)	3(37.5)
2	63(12.6)	14(7.0)	49(16.3)	204(40.8)	187(37.4)	67(13.4)	161(23.8)
3	83(11.6)	14(6.7)	69(13.6)	352(49.2)	261(36.5)	104(14.5)	220(24.0)
4	41(13.9)	2(4.0)	39(16.0)	156(53.1)	98(33.3)	46(15.6)	90(27.2)
5	27(14.5)	4(10.5)	23(15.5)	98(52.7)	57(30.6)	27(14.5)	55(23.7)
6	24(14.1)	0(0.0)	24(16.0)	76(44.7)	41(24.1)	36(21.2)	54(26.5)
7 and older	29(14.4)	7(9.5)	22(17.2)	88(43.6)	45(22.3)	43(21.3)	75(28.7)
Total	267(12.9)	41(6.9)	226(15.2)	974(46.9)	692(33.3)	323(15.6)	658(25.1)
Exp(B)	1.036		1.94***	0.80	1.06	15.79***	1.32
95% C.I	0.947-1.135		1.34-2.82	0.59-1.08	0.78-1.45	11.61-21.48	0.97-1.79

Parenthesis indicates %.

*: Analyzed by binary logistic analysis.

*: P<0.05, **: P<0.01, ***: P<0.001

Legends of Figures

Fig. 1. Age and gender distribution of TMD and TMJ OA patients.

Fig. 2. Incidence rate of TMJ OA in TMD patients.

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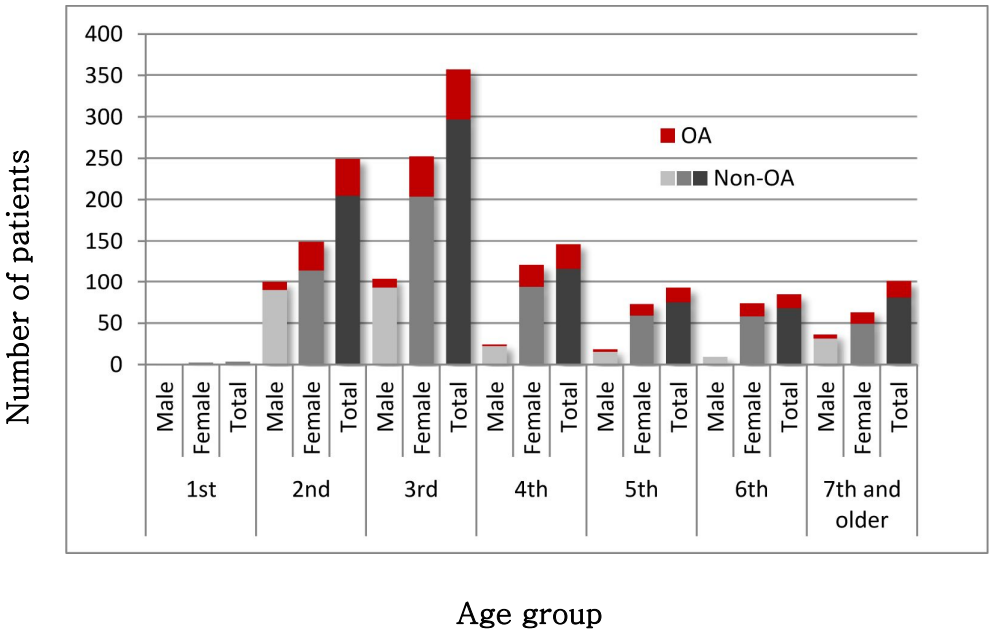
Number of patients
400
350
300
250
200
150
100
50
0
OA
Non-OA
Male
Female
Total
1st
2nd
3rd
4th
5th
6th
7th and older
Age group

Fig 1.

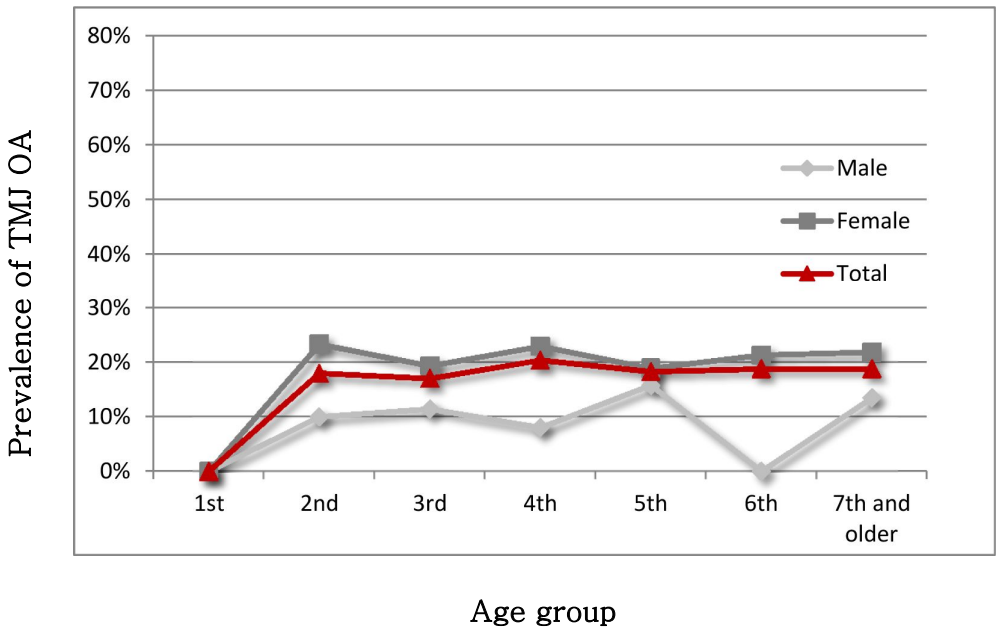
Prevalence of TMJ OA
80%
70%
60%
50%
40%
30%
20%
10%
0%
Male
Female
Total
1st
2nd
3rd
4th
5th
6th
7th and older
Age group

Fig 2.

초 록

측두하악장애는 교합상태, 외상, 정서적 스트레스, 심부통증유입, 이상기능활동 등의 다양한 요인들이 복합적으로 작용하여 측두하악관절을 이루는 관절과 인대 및 저작근의 생리적 내성을 초과할 때 발생하는 다중요소적 질환이다. 이러한 측두하악장애 가운데 측두하악관절 골관절염은 관절내 연골 및 골조직의 변성과 파괴를 특징으로 한다. 측두하악관절 골관절염에 대한 기존 연구의 대부분이 임상증상만을 포함한 의무기록이나 방사선학적 기록 중 어느 한 자료에 편중하여 수행되어 왔다. 그로 인해 측두하악장애 환자의 측두하악관절 골관절염 발생 비율이나 그 예후에 관한 신뢰할만한 자료를 찾아보기 힘들다. 따라서 충분한 크기의 표본으로부터 임상기록 및 방사선학적 기록을 수집하여 측두하악관절 골관절염의 역학적 특성을 연구하는 한편, 종적 연구를 위한 기본자료를 축적하는 일은 측두하악관절 골관절염의 병인의 이해와 치료법 개발에 있어 매우 중요하다. 본 연구의 목적은 한국인 측두하악관절장애 환자를 대상으로 의무기록 및 방사선학적 자료를 통하여 측두하악관절 골관절염 발생의 역학적 특성을 조사함과 동시에 향후 측두하악관절 골관절염의 임상연구를 위한 기초자료를 제시하는데 있다.

2010년 한 해 동안 서울대학교 치과병원 구강내과 턱관절안면통증 클리닉에 측두하악장애와 관련된 통증 및 기능장애를 주소로 내원하여 한 사람의 측두하악장애 전문의에게 측두하악분석검사를 시행한 환자 1038명을 대상으로 하였다. 이들 1038명의 2076개 관절에 대한 자료로부터 CT로 확진된 골관절염 발생의 비율, 골관절염 발생과 연령별, 성별, RDC/TMD 진단 사이의 상관관계를 카이제곱검정과 이원화 로지스틱 회귀분석(binary logistic regression)을 이용하여 분석하였다.

본 연구에서는 아래와 같은 결과를 얻었다.

1. 전체 환자군에서 측두하악관절 골관절염의 유병율은 18.11%(1038명 중 188명)이었으며, 여성환자군의 경우 21.05%(741명 중 156명), 남성환자군의 경우 10.77%(297명 중 32명)의 유병율을 보여, 여성환자에게 1.94배(P<0.001) 호발하는 것으로 나타났다.
2. 임상검사와 일반방사선사진을 바탕으로 진단한 측두하악장애연구진단기준에 따라 골관절염이 있는 것으로 판단되는 경우, 그렇지 않은 경우보다 측두하악관절 골관절염 발생 위험도가

15.79배 높았다(P<0.001).

3. 그러나 연령, 측두하악장애연구진단기준에 따른 근육통 유무 및 관절원판 변위 유무는 측두하악관절 골관절염의 발생과 통계적으로 유의한 상관관계를 나타내지 않았다.

이러한 결과는 임상검사와 방사선학적 검사 결과 근육통이나 관절잡음이 있다고 해서 측두하악관절 골관절염 발생의 위험도가 높다고 할 수 없다는 점을 의미하고, 측두하악관절 골관절염이 중년 이후에 급격한 증가를 보이는 일반적인 골관절염의 경우와 다른 발생 양상을 보이며, 이는 골관절염 발생의 가장 큰 원인인 기능적 부하와 생리적 내성간의 불균형이 측두하악관절의 독특한 조직 및 기능해부학적 특징과 함께 다른 관절과는 다른 방식으로 발생할 가능성을 의미한다. 특히 성장기의 어린 연령에서 비교적 높은 발생율을 보이는 점은 골파괴가 악골 성장에 영향을 미칠 수 있음을 고려할 때 측두하악관절 골관절염에 대한 조기진단, 조기치료 및 골파괴 예방을 위한 효과적인 진단 및 치료 기술의 개발을 위한 보다 심도 있고 지속적인 후속연구가 필요함을 의미한다.

주요어 : 측두하악관절 골관절염, 측두하악장애연구진단기준 (RDC/TMD), 발생률

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