A Clinical Report on the Effect of CRS Usage in Degenerative Temporomandibualr Joint Disease with Anterior Open Bite Applying Bone Scan

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CONTENTS

I. INTRODUCTION

The most common etiologic factor that either causes or contributes to degenerative joint disease (osteoarthritis) is mechanical overloading of the articular structures of the temporomandibular joint, but the precise cause is unknown[1]. When bony changes are active, the condition is often painful and referred to as osteoarthritis and limited mandibular opening is characteristic because of the joint pain and a soft end feel is common unless the osteoarthritis is associated with an anteriorly dislocated disc and crepitation can typically be felt[1]. The diagnosis is usually confirmed by TMJs radiographs, which reveal evidence of structural changes in the subarticular bone of the condyle or fossa(flattening, oteophytes, erosions)[1].

Condylar resorption can be defined as progressive alteration of condylar shape and decrease in mass, as a result, most patients exhibit a decrease in posterior face height, retrognathism, and progressive anterior open bite with clockwise rotation of the mandible[2]. Management of condylar resorption remains controversial but orthognathic surgical correction was advocated only if condylar resorption has ceased preoperatively and the condyles have stabilized[2] Several authors have advocated stabilization of the TMJs before surgery using preoperative occlusal appliance therapy to prevent further resorption and to obtain more stable results[3,4].

This case is a clinical report in the patients with degenerative joint disease in TMJs, using CRS for stabilization of TMJs and using bone scan for evaluation of effect of occlusal appliance therapy.

II. CASE

A 24-year-old woman presented with a chief complaint of intermittent pain during mastication and joint sound on Lt preauricular area and anterior

open bite has been developed since 5 years ago. She had had tongue thrust habit at child and falling down history at elementary student.

At first visit(97′ 14/October), she complained of pain of both posterior capsular area at palpation, and 51mm of maximum mouth opening and 45mm of maximum comfortable mouth opening was seen. A Simple click sound on Lt TMJ, crepitus on Rt TMJ was detected. Resistant and loading response was negative. A severe anterior open bite(7mm) was seen. A relatively small size of both condyle and height of ramus was noted on the panoramic and transcranial radiography and anterior dislocation of both disc without reduction on magnetic resonance imaging. Up to above signs and symptoms, the degenerative joint disease and anterior dislocation of disc without reduction on both TMJs was diagnosed temporally. Active joint disease was noted on first bone scan(97′ 27/October) on both TMJs and then CRS was constructed(97′ 4/November) and physical therapy was done continuously. The decreased uptake compared with first bone scan was noted on second bone scan(97′ 10/December) and she didn't complain of joint pain. The reduced activity on third scan(98′ 30/January) was seen compared with second and also she didn't complain of joint pain and then CRS was removed(98′ 25/February). The reduced uptake was noted on fourth bone scan(98′ 5/June) compared with previous bone scans. At present, we are doing continuous observation and preorthognathic orthodontic treatment is being done to her at the department of Orthodontics in Chonnam University Hospital.

To confirm the reduction of scanned activity, the density of hot spot of Lt. and Rt. condyle and maxilla was determined by using Densitometer (VICTROREEN, USA) on anterior view of first, second, fourth bone scan by three times and average score was calculated and for normalizing the scanned activity, the ratio of density of condyle

Table 1. Density of Rt & Lt condyle, maxilla and ratio of density of condyle vs maxilla on anterior view of bone scan

Site \ Date	1st (27/10 97′)	2nd (10/12 97′)	4th (5/6 98′)
Rt condyle	0.88±0.13	0.33±0.12	0.24±0.08
Lt condyle	0.81±0.17	0.37±0.14	0.19±0.04
Maxilla	1.32±0.21	0.88±0.26	0.85±0.24
Rt condyle/Max	0.66±0.11	0.37±0.13	0.28±0.08
Lt condyle/Max	0.61±0.09	0.42±0.11	0.23±0.04

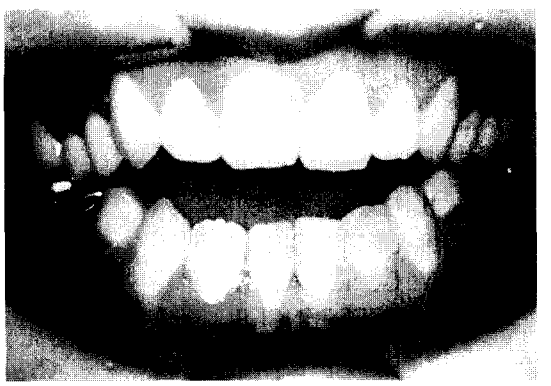
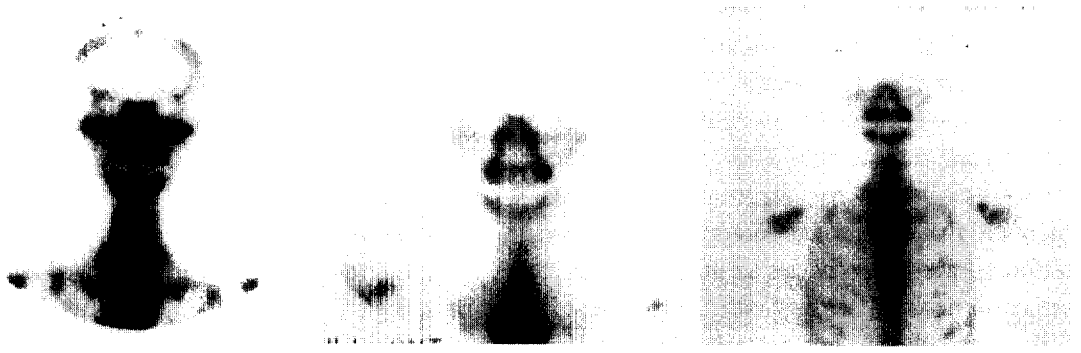


Fig. 1. The intraoral aspect of patient at first visit.

Fig. 2. The panoramic radiography at first visit



1: 27/10 97', 2: 10/12 97', 4: 5/6 98'.

Fig. 3. The anterior view of picture of bone scan

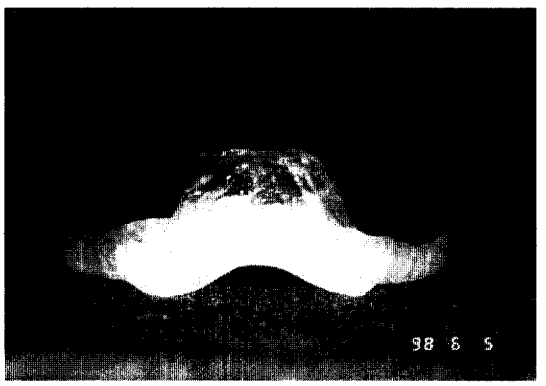
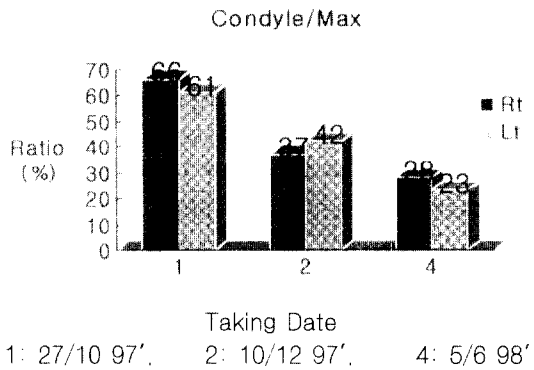


Fig. 4. The CRS used for treatment.



1: 27/10 97', 2: 10/12 97', 4: 5/6 98'.

Fig. 5. Ratio of density of condyle vs maxilla on bone scan

to that of maxilla was also calculated. Standard t-test and ANOVA were performed. The density of Rt condyle, Lt condyle, maxilla on first bone scan were 0.88, 0.81, 1.32 each, and the density of them on second scan were 0.33, 0.37, 0.88 each, and the density of them on fourth scan were 0.24, 0.19, 0.85 each. As a result, the ratio of density of Rt condyle, Lt condyle to density of maxilla on first bone scan were 0.66, 0.61 each, the ratio of them on second scan were 0.37, 0.42 each, and the ratio of them on fourth scan were 0.28, 0.23 each. The scanned activity was reduced all significantly following the progression of CRS therapy.

III. DISCUSSION

Although the cause is unknown, condylar resorption has been associated with rheumatoid arthritis, systemic lupus erythromatosis, and orthognathic surgery[5-14]. Some investigators claim that a high mandibular plane angle is also a predisposing factor[15,16]. Crawford et al reported that progressive condylar resorption seems to be a predeliction for females with preexisting temporomandibular joint dysfunction in whom large mandibular advancements are done[17]. Several articles on the subjects of condylar resorption as a cause of relapse after

orthognathic surgery have been published[3,15,16]. Huang et al reported that mandibular orthognathic surgery may play an important role as a predisposing factor that results in condylar resorption, and that the patients with TMJs dysfuction after orthognathic surgery may progress to relapse, and advocated that orthognathic surgery should only be performed when the condyles are stable and is best limited to maxillary surgery only, if possible, and that condylectomy and costochondral grafting appears to give stable results[2].

The Technetium-99m methylene diphosphonate (Tc-99m MDP) radioisotope label allows for diphosphonate deposition and localization to be visualized with a γ camera and camera detects γ photons emitted as the radioisotope decays and the camera is linked to a computer that generates and analyzes electronic images directly obtained from the scans[18]. Pogrel et al reported that a frequently used diagnostic technique consists of quantitationg the uptake of bone-seeking radiopharmaceuticals, particularly technetium-99m methylene diphosphonate (Tc-99m MDP), in the condyle as a reflection of active or inactive disease and that bone scintigraphy of the mandibular condyles may be used to evaluate ongoing resorption[18]. The limited bone scan appears useful in detecting early degenerative changes in the temporomandibular joint[19], and it has been used to document the normal metabolism and pathologic conditions of bone[20]. Harris et al reported that the increased uptake of radiopharmaceutical in the TMJs may be due to metabolic changes, intra-capsular fracture, remodeling of the articular surfaces and secondary osteo-arthrotic changes[21]. Cisneros and Kaban used the fourth lumbar vertebra(L4) as a reference bone because it can be dependably localized and uptake is symmetric and they expressed relative condylar uptake as a ratio of uptake of condyle to that of the fourth lumbar vertebra[20]. In our report, we used the maxilla as a reference bone that was near condyle because the localization of maxilla was easy relatively and the maxilla was valuable if bone scan was limited to craniocervical region, and we compared the ratio of density of condyle to that of maxilla as change of uptake before treatment with after CRS therapy.

Arnett and Tambollero reported 6 patients with progressive condylar resorption treated by orthognathic surgery of whom 5 had further resorption postoperatively. The one stable case was the only patient who had preoperative occlusal appliance therapy to stabilized the TMJs. A second orthognathic surgery group(8 patients) had stabilization with appliances and antiinflammatory medications before orthognathic surgery, and in seven the results were stable over the long term and they therefore advocated stabilization of the TMJs before surgery to prevent further resorption[3]. Merkx and Van Damme treated 8 patients who developed condylar resorption after sagittal split osteotomy and noted unsatisfactory results in 4 patients retreated with repeated orthognathic surgery, but more stable results in 4 patients treated by an occlusal appliance and other orthodontic or prosthodontic management[4].

Finally this case revealed that the uptake of bone scan was reduced corresponding to reduction of ratio of density of bone scan of condyle to maxilla as using CRS in the patients with degenerative joint disease related to the change of clinical symptoms. It seems that condylar resorption and progression of degenerative change is suppressed by stabilization of TMJs due to using CRS. If orthognathic surgery is performed after stabilization of TMJs and suppression of degenerative change is obtained by using CRS, the results may be more stable.

Ⅳ. CONCLUSION

If the orthognathic surgery is needed because

anterior open bite or condylar resorption is occurred as a result of progressive joint disease, it seems that progression of degenerative joint disease is suppressed using CRS for stabilization of TMJs before the orthognathic surgery. This case seemed to reveal that bone scan is valuable to evaluate disease activity in the patients with degenerative joint disease as well as various clinical methods.

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국문초록

전치부 개교합을 보이는 퇴행성 관절질환에서 골스캔을 이용한 중심위교합장치의 효과 평가에 대한 임상례

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본 증례는 측두하악관절의 퇴행성 변화를 보이는 환자에서 악교정 수술의 시행 전에, 중심위교합장치를 통해 측두하악관절의 안정화를 유도하고, 또한 골스캔을 이용하여 장치의 치료효과를 평가한 임상증례이다.

환자는 24세의 여성으로 5년전부터 전치부 개교합이 발생되기 시작하였고, 고형식 저작시 좌측 전이부에 간헐적인 통증이 발생한다는 주소로 본원에 내원하였다. 임상검사상 촉진시 양측 관절낭 후방부에 압통을 호소하였으며, 각각 51, 45mm 의 최대개구량 및 최대무통성개구량을 보였다. 좌측 악관절부에서 단순 관절잡음, 우측 악관절부에서 염발음이 청취되었으며, 저항검사 및 부하 검사에는 특기할 반응을 보이지 않았다. 약 7mm의 전치부 개교합의 소견을 보였으며, 파노라마 사진과 횡두개 방사선 사진 소견상 양측 과두의 크기 및 하악지의 높이가 다소 작은 소견이 관찰되었고 자기공명영상 소견상 양측성 비정복성 관절원판의 전방전위가 관찰되었다. 1997년 10월 27일 첫 번째 골스캔 소견상 양측 측두하악관절에 활성이 증가된 관절질환이 관찰되었다. 골스캔의 전방 사진에서 Densitometer(VICTROREEN, USA)를 이용하여 좌, 우측 과두부위와 상악골부위의 가장 어두운 부분의 흑화도를 측정하였다. 각각 3회씩 측정하여 평균을 구하고, 좌, 우측 과두대 상악골의 흑화도의 비율을 계산하였다. 첫 번째 골스캔의 평균 흑화도는 우측 과두, 좌측 과두, 상악골이 각각 0.88, 0.81, 1.32 였다. 1997년 11월 4일 중심위교합장치를 장착하였고, 지속적인 물리치료를 시행하였다. 1997년 12월 10일 두 번째 골스캔 소견상 이전 검사와 비교하여 흡수가 감소된 소견을 관찰하였으며 임상검사시 무통이었다. 두 번째 골스캔의 평균 흑화도는 우측 과두, 좌측 과두, 상악골이 각각 0.33, 0.37, 0.88 이었다. 1998년 1월 30일 세 번째 골스캔 소견상 두 번째 골스캔과 비교하여 활성도가 감소된 소견을 관찰하였고 임상검사시 무통이었다. 1998년 2월 25일 술전 교정 위해 중심위교합장치의 장착을 중지시켰다. 1998년 6월 5일 네 번째 골스캔 소견상 이전 검사들과 비교시 흡수가 감소된 소견을 관찰하였다. 네 번째 골스캔의 평균 흑화도는 우측 과두, 좌측 과두, 상악골이 각각 0.24, 0.19, 0.85 였다. 현재 지속적인 관찰중이며 본원 교정과에서 악교정수술 위한 술전교정을 시행중이다. 결국 첫 번째 골스캔의 과두 대 상악골의 평균 흑화도의 비율은 우측과 좌측이 각각 0.66, 0.61 이었고, 두 번째 골스캔에서는 우측과 좌측이 각각 0.37, 0.42 였고, 네 번째 골스캔에서는 우측과 좌측이 각각 0.28, 0.23 이었다. 각 골스캔의 과두 대 상악골의 평균 흑화도의 비율 사이에 유의한 차이가 있는지 검증하기위해 Standard t-test 와 ANOVA를 시행하였다. 이상의 결과에서 첫 번째, 두 번째, 네 번째 골스캔으로 갈수록 좌, 우측 과두 대 상악골의 흑화도의 비율이 유의하게 감소했음을 알 수 있었다.

결론적으로 본 증례에서는 전치부 개교합이 발생되어 악교정수술이 필요한 환자에게 측두하악관절의 안정화를 위해 중심위교합장치를 사용함으로써 퇴행성 관절질환의 진행을 억제시킬 수 있고, 퇴행성 관절질환의 활성도에 대한 평가시 골스캔이 유용할 수 있음을 보여주었다고 사료된다.

Key words : degenerative joint disease, condylar resorption, anterior open bite, CRS, bone scan, stabilization of TMJs, orthognathic surgery