

THE RELATION BETWEEN TMJ OSTEOARTHRITIS AND THE INADEQUATELY SUPPORTED OCCLUSION

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ABSTRACT:

This study was carried out to investigate the effect of inadequately supported occlusion on the incidence of TMJ osteoarthritis and to investigate the reversibility of the cardinal features of the disease after restoring the occlusion by construction of the appropriate prosthetic appliance. Two groups of male patients were selected in this study being already affected by TMJ osteoarthritis. The patients of the first group (20 patients) had an inadequately supported occlusion i.e. three or more functional molars were missing, improperly restored or badly decayed. The patients in the second group (20 patients) had an adequately supported occlusion, clinical and radiographic surveys were carried out. It was found that the incidence of both the clinical and radiographic findings of TMJ osteoarthritis were higher in the first group, for whom the occlusion has then been restored by properly constructed removable prosthetic appliances. One year after restoration of occlusal support the patients were re-examined. Most of the clinical findings improved especially crepitation, muscle tenderness and pain. The radiographic findings did not show significant improvement except for restoration of the joint space. It was concluded that the inadequately supported occlusion is associated with TMJ osteoarthritis and that restoring the relation and function of the TMJ avoid the excessive load that may result in its degeneration. Conservative treatments such as counseling, behavioral modification, physical therapy and pharmacotherapy should be applied in association with the treatments which lead to correction of occlusion.

Introduction

The TMJ is a complex joint which can afford the functional load imposed on it. However, in an inadequately supported occlusion where three or more functional molars are missing, improperly restored or badly decayed, a balanced and harmonious function in the masticatory system is not available and patient will attempt to adapt to the occlusal abnormalities by altering the mandibular posture and hence the masticatory functional pattern with a subsequent misuse of the TMJ.¹⁻⁴ When the load exceeds the functional capacity of the joint, degenerative rather than physiologic changes result.⁵⁻⁷

Osteoarthritis is a common disease that affects the TMJ with degenerative changes and deterioration of the articular surfaces, possibly with a subchondral remodeling process.⁸⁻¹³

The exact etiology of osteoarthritis is not very clear inspite that many systemic and local factors are blamed for the disease.⁶ The cardinal features of TMJ osteoarthritis are both clinical and radiographic.¹⁴⁻²⁰

This study was carried out to investigate the effect of inadequately supported occlusion on the incidence of TMJ osteoarthritis and also to investigate the reversibility of the cardinal features of the disease after restoring the occlusion by construction of the appropriate prosthetic appliance.

Material and Methods

Material:

The study included 40 male patients at an age range 46-63 years (mean 54.5 years) and who were already diagnosed as being affected by TMJ osteoarthritis since six months up to one year. The patients selected fulfilled at least two of the following criteria:

1. TMJ sounds (crepitation) which were heard and reported by the patient or detected by palpation or auscultation of the joint.
2. Tenderness of the joint region.
3. Pain on movement of the jaw.
4. Deviation of the jaw on mouth opening.
5. Limitation of jaw movement with inability of teeth separation.

The dental status of the patient was recorded and the patients were classified into two groups:

Group I: patients with inadequately supported occlusion where three or more functional molars were missing, improperly restored or badly decayed.

Group II: 20 patients with adequately supported occlusion where the molars were present and sound or with proper restoration.

Methods:

1. Clinical examination: The patients were thoroughly examined for presence of the signs and symptoms of TMJ osteoarthritis.

2. Radiographic examination: A panoramic examination was performed using a panoramic machine (Orthopantomograph OP100, Instrumentarium Imaging, Helsinki, Finland).
3. Partial denture construction: For patients in group I, removable partial dentures (RPD) were designed and constructed according to the needs of each case in order to restore a functionally adequate occlusion. The patients were re-examined both clinically and radiographically after a period of one year.
4. Quantitative determination of the TMJ space was carried out according to a standardized planimetric method¹⁷ to detect changes in the TMJ space based on a standard parameter for normal joint space.

Results:

The results of this are summarized in tables 1 – 4 and figures 1 – 7.

The incidence of both the clinical and radiographic findings (tables 1-2 and figures 1-2) was relatively higher in the patients with inadequately supported occlusion, though there was no statistical difference among the groups.

Tables 3 - 4 and figures 3 – 4 present a comparison between the clinical and radiographic findings in patients of group I before restoration of occlusal support with RPD and one year after that.

Table (1): The incidence of the clinical findings in groups I and II.

Clinical signs & symptoms	Group I		Group II	
	Number of cases	%	Number of cases	%
Crepitation	14	70	10	50
Tenderness	16	80	12	60
Pain on movement	11	55	7	35
Deviation on opening	14	70	12	60
Aching	7	35	4	20

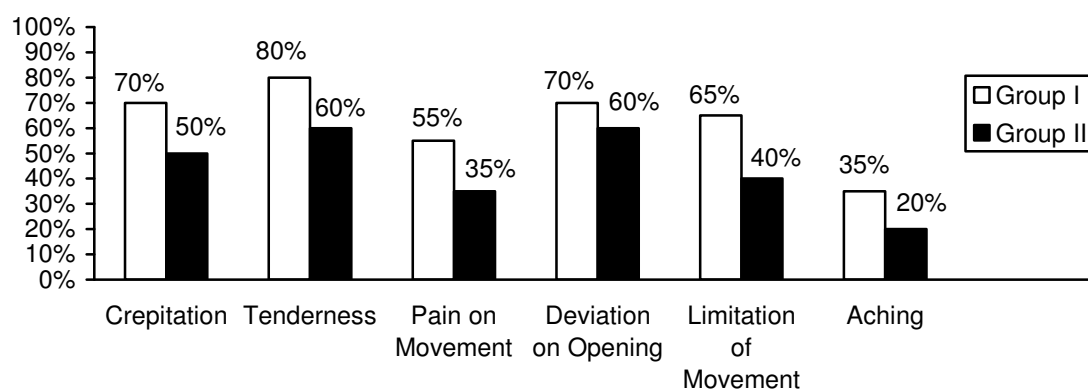


Fig. (1): The incidence of the clinical findings in groups I and II.

Table (2): The incidence of radiographic signs of TMJ osteoarthritis in groups I and II.

Radiographic signs	Group I		Group II	
	Number of cases	%	Number of cases	%
Facet formation	9	45	5	25
Reduced joint space	10	50	8	40
Flattening of the condyle	5	25	4	20
Subcortical sclerosis	2	10	3	15

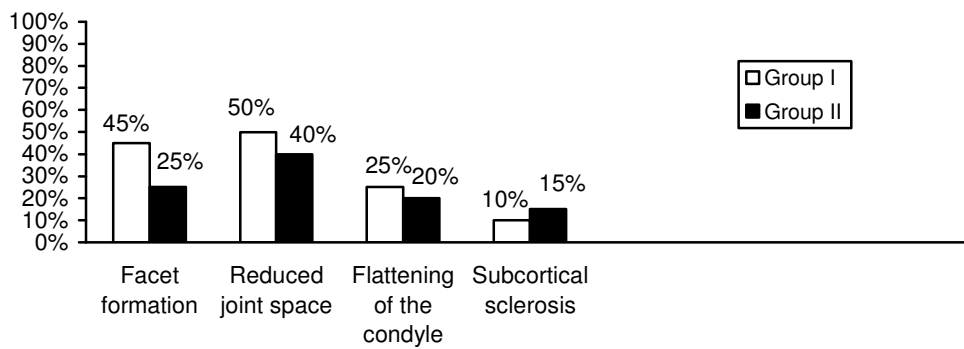


Fig. (2) The incidence of radiographic signs of TMJ osteoarthritis in groups I and II.

Table (3): The incidence of the clinical findings in patients of group I before restoration of occlusal support with RPD and one year after that.

Clinical signs & symptoms	Before restoration of occlusal support		One year after restoration of occlusal support	
	Number of cases	%	Number of cases	%
Crepitation	14	70	7	35
Tenderness	16	80	9	45
Pain on movement	11	55	4	20
Deviation on opening	14	70	11	55
Limitation of movement	13	65	8	40
Aching	7	35	2	10

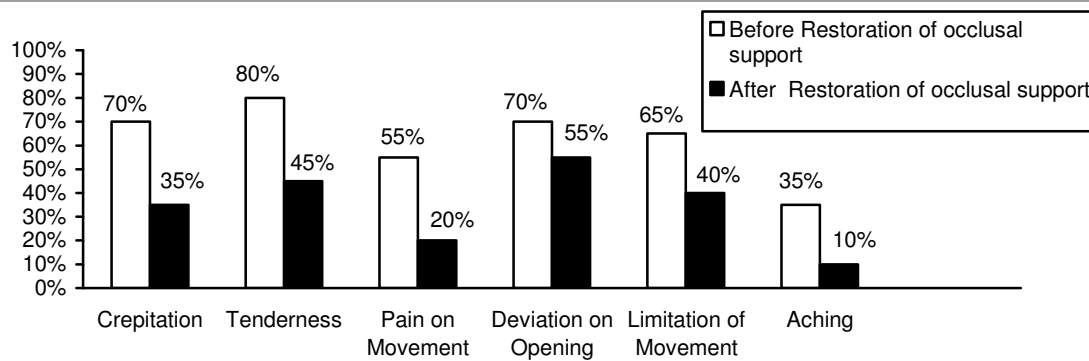


Fig. (3): The incidence of the clinical findings in patients of group I, and one year after restoration of occlusal support.

Table (4): The incidence of radiographic signs in patients of group I and one year after restoration of occlusal support.

Radiographic signs	Before restoration of occlusal support		One year after restoration of occlusal support	
	Number of cases	%	Number of cases	%
Facet formation	9	45	8	40
Reduced joint space	10	50	6	30
Flattening of the condyle	5	25	5	25
Subcortical sclerosis	2	10	2	10

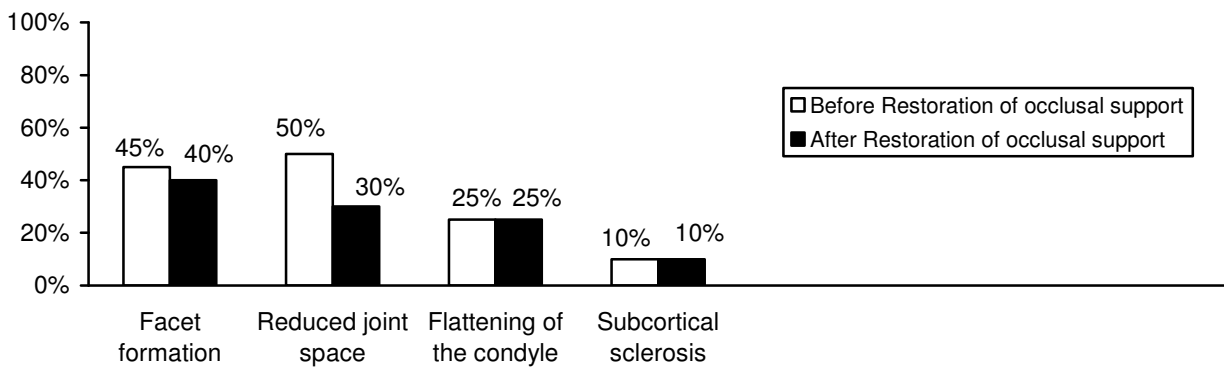


Fig. (4): The incidence of radiographic signs in patients of group I one year after restoration of occlusal support

The statistical analysis revealed the following:

1. The clinical findings: There was an improvement in some of the clinical signs and symptoms of TMJ osteoarthritis in group I patients presented as a statistically significant differences in crepitation, tenderness, aching and pain on movement before and one year after restoration of occlusal support ($X^2 = 4.912, 5.227, 4.800, \text{ and } 5.227$ respectively, $P < 0.05$). However, there was no

statistically significant difference in the limitation of movement and deviation on opening ($X^2 = 2.506$ and 0.960 respectively, $P > 0.05$).

2. The radiographic findings: The only significant difference was detected in the change of the joint space ($X^2 = 3.956$, $P < 0.05$). There was no statistical significant difference in the other osseous deformities namely facet formation, flattening of the condyle and subchondral sclerosis.

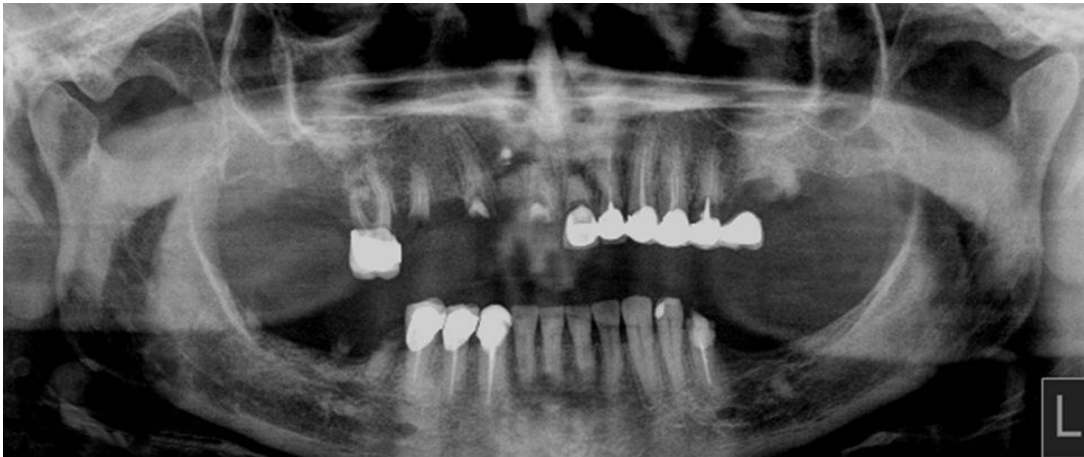


Fig. (5) Flattening of the condyle.

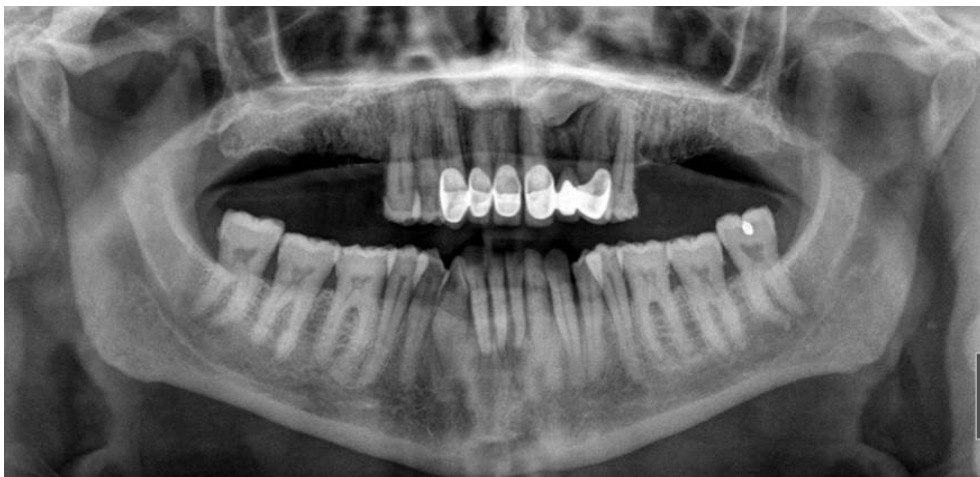


Fig. (6) Reduction of the joint space with facet formation.



Fig. (7) Subchondral sclerosis.

Discussion

In panoramic radiography, interpretation of changes in the bony structures of the TMJ can generally be made only on the lateral slope and central parts of the condyle because of the oblique orientation of the beam with respect to the long axis of the condyle.²¹ The depiction of the articular eminence and fossa is not adequate for diagnosis of other than marked changes of shape and structure because of superimposition by the base of the skull and zygomatic arch. Only obvious erosions, sclerosis, and osteophytes of the condyle can be seen. The image layer in standard panoramic radiography reveals anatomic areas more than twice the width of the condylar head, which should be compared with the 1 to 4 mm wide layers obtained in conventional tomography. Furthermore, distortion effects not seen in conventional tomography may disturb image quality. The agreement between panoramic radiographs and lateral tomograms on osseous changes is only about 60% to 70%.^{22,}

Panoramic radiography has been advocated by many authors as a good imaging modality when evaluating the TMJ since it also gives information about the teeth and other parts of the jaws.^{22, 24-28}

When an inflammatory disorder of the TMJ is suspected, hard tissue imaging is recommended. The most appropriate examinations include tomography, although panoramic radiography and plain film radiography can be useful when more subtle abnormalities are not anticipated. If identification of gross osseous changes is the goal, then panoramic radiography may be the only TMJ imaging needed for many patients.²⁹

The results of this study showed a relation between the inadequately supported occlusion and some of the clinical signs and symptoms of osteoarthritis of the TMJ. Although the TMJ is exposed to certain functional demands during mastication, a normal biologic functional adaptation occurs in response with consequent change in the joint morphology.^{7, 15} The results of this study are in acceptance with that of Mundt et al³⁰ who reported that in men, the loss of occlusal support is significantly associated with TMJ tenderness.

When the functional demands exceed the capacity of the protective mechanism of remodeling of the TMJ, the balance between the form and function is disturbed with a consequent pathological degenerative change indicative of osteoarthritis.^{4-6, 14}

The presence of the teeth that provide adequate occlusal support is reported to relieve the pressure to which the TMJ components are subjected and consequently prevent their atrophy. When the teeth are lost or the joint is misused, the musculature exerts a greater force on the TMJ.^{7, 31, 32}

Both the clinical and radiologic signs of osteoarthritis were more incident in the patients with inadequately supported occlusion. This finding is in agreement with that obtained by Costen¹⁶ who reported that the occlusion is widely implicated as the principal factor in the establishment of TMJ dysfunction. This could be attributed to the repetitive impulses loading on the joint in spite that osteoarthritis can develop also in non-weight bearing joints.^{9, 13, 15, 18}

A high percentage of unilateral TMJ osteoarthritis was incident in this study (82.5%), a finding which is in accordance with that reported by many investigators.^{14-16, 30-32} Similarly, it was found that occlusal relationships, such as overbite or non-working side interference are contributing factors of TMD.³²

In spite that all the 40 patients in this study demonstrated radiologic manifestations of TMJ osteoarthritis on panoramic radiographs, another 18 cases were presented with clinical manifestations suggestive of the disease but without notable radiographic findings (17.30%).³ However, it has been reported that the most frequent radiographic finding in TMJ osteoarthritis is flattening of the articular surface of the condyle associated with osteoarthritis.³³

The restoration of occlusion to an adequate functional form was found to improve the condition of the joint especially as regards to the clinical findings such as crepitation, tenderness, aching and pain on movement. In concern to the radiographic findings, the only obvious improvement was in the restoration of the joint space. This could be attributed to the restoration of the occlusal function as well as the relief of muscle hyperirritability and hence the pressure exerted by the condyle on the articular disk.^{7,}

³⁴ This means that restoring the TMJ to its functional form necessitates other forms of

conservative treatment. This view was introduced by Hagag et al³⁵ who recommended that conservative treatments such as counseling, behavioral modification, physical therapy and pharmacotherapy should be applied in association with the treatments that lead to drastic changes of occlusion.

It could be concluded that osteoarthritis of the TMJ is related to the heavy demands required subsequent to tooth loss and change in the masticatory pattern. However, the restoration of occlusion to its functional form preserves the TMJ in its normal relation and function and avoids the excessive load that may result in degenerative changes of the joint. Furthermore, conservative treatments such as counseling, behavioral modification, physical therapy and pharmacotherapy should be applied in association.

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