MDJ

Rheumatoid Arthritis of the Temporomandibular Joint, A Clinical and Radiographical Study

Dr.Ahmed Abdulla Haeder,
Dr. Hajer Ibrahem Abdulla,
Dr. Niaz Jawad AL- Barznjy,
Dr. Shahen Ali Ahmed

Abstract

To determine the extent of temporomandibular joint (TMJ) involvement in patients with rheumatoid arthritis compared with a matched control group. And to evaluate the correlation between clinical findings and radiographical findings.

The studied sample comprised 50 patients with rheumatoid arthritis, age ranged from 18 to 72 years with the mean age of 40.98 (± 13.67.The control group consisted of 63 subjects age–matched non rheumatic patients: Each patient was informed about the purpose of the investigation and that it would include questionnaire, clinical and radiographical examinations. The radiographic examination was done by using double TMJ lateral panoramic technique.

It was found that 64% of RA patients complained of two or more clinical signs and symptoms compared with 44% of the control group ,the difference was statistically significant (P< 0.05), the most important clinical findings were pain on palpation and on opening and closing, crepitation, limitation of jaw opening and morning stiffness, difference were statistically significant (P< 0.05). Among the clinically involved subjects in study RA group 28 subjects (56%) had bilateral involvement, 3 subjects (6%) had right side involved and 1 subject (2%) had only left side involvement. The radiographic involvement of TMJ was found in 16 subjects (32.0 %) of the study group compared with 1subject (1.6 %) of the control group. There is a highly statistically significant difference between the study group and the control group (P< 0.05); the most common radiographical finding was erosion. Complete condylar destruction was found in 1 patient which resulted in anterior open bite. Among involved cases 11 subjects (22%) had bilateral involvement, 5 subjects (10%) had unilateral involvement (3subjects (6%) had left side involved and, 2 (4 %) subjects had only right side involved. There was no correlation between clinical and radiographic find ings. There was correlation between the extent of radiographical findings and duration of Rheumatoid Arthritis p value (P< 0.05).The clinical and radiographic findings were more common in RA group than in control individual. The clinical and radiographic findings are not always bilateral in TMJs of patients with rheumatoid arthritis.

Key words: TMJ disorders, TMJ arthritis, Rheumatoid arthritis.

Introduction

The temporomandibular joint (TMJ) may be affected by several inflammatory joint diseases, and the disorders that involve the TMJ are not different from those that involve other joints in the body [1,2]. Rheumatoid arthritis (RA) is one of these diseases. The TMJ is commonly affected in patients with RA, and in patients with other forms of arthritic diseases [3].

Rheumatoid Arthritis (RA) is a chronic multisystem disease of unknown cause. The onset is most frequent during the fourth and the fifth decades of life. Although there are a variety of systemic manifestations, the characteristic feature of RA is persistent inflammatory synovitis, usually involving peripheral joints in a symmetrical distribution, the disease characterized by periods of exacerbations and remissions, eventually leading to irreversible joint destruction and deformity. The clinical manifestations are joint pain, joint swelling, heat, joint tenderness and limitation of movement [4].

Rheumatoid Arthritis is not limited to erosive synovitis only, but may also show extra-articular manifestations. The rheumatoid process often starts as an inflammatory reaction in the synovial membrane, i.e. synovitis, which later may lead to destruction of cartilage and bone tissue in all joints of the body including the TMJ [5,6]. The reported frequency of clinical TMJ involvement in patients with RA has varied from 2% to 98%, depending on the diagnostic criteria, the population studied and means of assessment of the TMJ [7].

The most significant complication of oral and maxillofacial complex in RA is TMJ involvement, this may present as bilateral preauricular pain, tenderness, swelling, stiffness, and decreased mobility of TMJ or it may be asymptomatic [8]. Ankylosis of the TMJ can occur as a consequence of RA. Rarely, it is possible for the patient to develop an anterior open bite deformity caused by destruction of the condyles and the loss of condylar and posterior occlusal face height [9].

The changes seen radiologically are usually cortical erosion or flattening of condylar head, reduced joint space and cortical cystic destruction. The incidences of TMJ lesions found are increased with the duration of RA, and there is a positive correlation between the severity of RA and the severity of involvement in TMJ [10].TMJ involvement in RA needs palliative treatment such as inter-occlusal splints, physical therapy, medication and mouth opening exercise, they were helpful in reducing pain and maintaining jaw function [11].

The examination of the temporomandibular joint is often neglected during the clinical evaluation of RA patients, even though TMJ involvement has been described for a number of rheumatic diseases. TMJ involvement in RA patients is frequently overlooked by rheumatologists or by the patients themselves, especially when treatment is focused on other joints for upper extremity function or weight-bearing [12].

Materials and Methods

The studied sample comprised 50 of both genders patients with rheumatoid arthritis, age ranged from 18 to 72 years with the mean age of 40.98 (± 13.67). Patients were visiting the clinic of rheumatologic consultation unit in Hawler teaching hospital during the period between (10-1 -2008 till 10 -7 -2008). Those patients had no other systemic disease, which affect the x-ray findings .All patients had RA diagnosed according to the criteria of the American

Rheumatism Association [13], which are as follows:

1-Morning stiffness (> 1 hour) 2-Arthritis in three or more joints (observed by physician). 3- Arthritis in the hands (in the wrist, metacarpophalengeal or proximal interphalangeal joint). 4- Symmetrical arthritis (on both sides of the body).5-Rheumatoid nodules (observed by physician).6- Rheumatoid factor present. 7- Radiographic changes.

A patient said to have RA if he / she satisfied at least 4 of these 7 criteria, criteria 1 through 4 must have been present for at least 6 weeks. All patients were on treatment. The duration of the disease varied between 1 to 40 years with the mean duration 4.09 years (±7.1). The control group was randomly selected from those patients attending the oral diagnosis department in the (SDPC) in Hawler city; it included 63 subjects with age that matched non rheumatic patients: they had no systemic diseases which may affect the radiographic findings (history of trauma, osteoporosis, osteoarthritis, congenital abnormalities or history of any rheumatic disease).

Materials

1-X –ray machine the panoramic x-ray machine used in the study was Dimax 3 digital X-ray machine manufactured by planmeca Oy, Helsinki, Finland, 2005.**2-** Metric ruler for measurement of interincisal distance, deviation on maximal opening, and vertical anterior open bite.3- Computer unit type LG, including Printer type hp laser printer.4Magnifying lens.5-Dental chair unit serona. **6-**Stethoscope for examination of TMJ sounds.

Methods

The information obtained from the patients through an interview, clinical examination, and radiographic interpretation for RA patients and controls group.

The interview: The name, age, duration of RA, medication, morning stiffness, family history of RA, presence of other systemic disease and its medication, the information were obtained through a personal interview.

Clinical examination

All patients were subjected to routine clinical examination of TMJ, this examination included (according to Helenius *et al*, 2005).

- **TMJ pain on palpation*:*** The tip of index finger was placed over the lateral aspects of both joints area and slight pressure was applied, pain or tenderness was recorded in a static position or during opening and closing of the mouth. The same procedure was repeated to examine the posterior aspect of TMJ via external auditory meatus using the small fingers .Pain on movement or tenderness was recorded whenever palpation resulted in reflex or the patient reported a subjective discomfort.
- **Pain on movement of the mandible:** The person is asked to perform the following movements: opening and closing, right and left laterotrusions and protrusion, any pain felt by the subject during these mandibular movements was recorded.
- **TMJ sound:** Clicking and crepitation were recorded for both sides. This was achieved by placing a stethoscope over the TMJ area in front of the tragus of the ear, the individual was instructed to open and close his \her mouth during the procedure.
- **Examination of the degree of limitation by measuring the maximal interincisal distance***:* The patient was instructed to open his or her mouth as wide as possible, then a metric ruler was used to measure the distance between the edge of lower incisors

opposing the edge of upper incisors in one vertical line (maximal inter- incisor distance should not be less than 40mm in normal situations)

- **Deviation on maximal opening:** This was measured by marking vertical line across the labial surface of upper and lower incisors in intercuspal position, the subject was then instructed to open as wide as possible, and with the aid of ruler held vertically as a guide, any horizontal deviation of more than 2mm between the two labeled lines was recorded
- **Anterior open bite:** The vertical distance between the maxillary and mandibular incisor edges was measured with the aid of a ruler, the largest open bite was recorded (Staley, 2001)[14].

Radiographic examination

Each subject was radiographed in two positions, in the open and the closed mouth by means of digital panoramic x ray machine , promax x -ray with Dimax3, using lateral panoramic images in a standardarized patient position according to manufacturer instructions, taken for the right and left sides [4] .

Then we used the chin support for this exposure, inserted the chin support into the adapter, insert the adapter into the holes in the patient support table. The patient steped forward and grasped the handle of the machine and pressed their lips against the chin support, the patient's nose was rested on top of the support and their mouth must be closed, their teeth must be together first , the patient's head was positioned so that the midsagittal plane coincides with the midsagittal plane light beam, patient was looking straight ahead as the light may appear to be correctly positioned but the patient 's head should be turned slightly to one side. Position the patient head so that the Frankfort plane is tilted down 5degrees using the Frankfort plane light as a reference line. For the second exposure the patients opened their mouth as wide as possible, make sure that the patient's upper lip is still touching the chin support, (according to the manufacturer Manual of the DiMax X –ray machine, 2005).

We scored radiography by using arbitrary scale adopted by (Helenius *et al*, 2005) which consists of the followings categories :Score 0 (no erosion), well defined cortical outline of the condyle ,score 1 (very slight erosion), presence of a cortical destruction and irregular margin of the condyle ,score 2 (erosion of the top of the condyle) ,score 3 (half of the condyle is eroded),score 4 (the condyle completely eroded), or a flattened condyle.During analysis scores from 0 to 2 were classed as reflecting mild changes and scores from 3 to 4 as reflecting marked erosion.

Inter-examiner reading

All radiographs were read by researcher on the 10 randomly selected radiographs and were compared with that carried out by another specialist, the right and the left areas were evaluated separately. The comparison of reading for (right and left side) carried out by the researcher with those carried out by the specialist revealed no statistical difference ($p>0.05$).

Intra-examiner reading

To determine the examiner reliability 10 randomly selected radiographs from the same sample were reread by the researcher after 1 month. The comparison of readings for (right and left side) showed no statistical difference ($p>0.05$). These inter and intra examiner observations were used to assess the significance of observation bias.

Figure (1.1) Examples of TMJ erosions for the 4 Score. Very slight erosion in condyle (1). B, Erosion of top of condyle (2). C, Half of condyle eroded (3). D, Condyle completely

eroded (4) as presented by arbitrary scale [3].

Statistical analysis

The data were analyzed using SPSS (statistical package for social sciences) version fifteen; statistical analysis includes both descriptive and inferential statistics for analyzing the data obtained from the study to explain the results;

- Descriptive statistic ;which include statistical table with percentages and graphical presentation to clarify the result
- Inferential statistic these were used to accept or reject the null hypothesis and this include t –test and chi square test

For all these test p value less than 0.05 is considered as significant while P value more than 0.05 is regarded as not significant .

Results

Study ample: In our sample 9 subjects (18.0%) 0f the study group were males and 41 subjects (82%) were females. While in the control group there were 26 subjects (41.3%) males and 37subjects (58%) females

Clinical findings of the study group compared with the control group

It was found that 64% of RA patients complained of two or more clinical sign and symptom compared with 44% of the control group, the difference was statistically significant (P< 0.05). Among the clinically involved subjects in study RA group 28 subjects (56%) had bilateral involvement, 3 subjects (6%) had right side involved and 1 subject (2%) had only left side involvement. As shown in (table 1.1)

- **Pain on palpation of TMJ: TMJ** pain on palpation on the right side was found in37subjects (74%) in the study group and in 28 subjects (44.4 %) in the control group. This result revealed a highly significant statistical difference between the study group and the control group (P< 0.05).There was a highly significant statistical difference between the study group and the control group (P < 0.05) in the left TMJ pain on palpation. There were 35subjects (70.0%) in the study group and 22 subjects (34.9 %) in the control group.
- **Pain in TMJ during opening and closing:** TMJ pain on opening and closing on the right side was found in 34 subjects (68.0%) in the study group and 24 subjects (38.1 %) in the control group .This result revealed a highly significant statistical difference between the study group and the control group (P< 0. 05). There was a highly significant statistical difference between the study group and the control group (P<0.05) in left TMJ pain on opening and closing, there were 31subjects (62 %) in the study group and 20 subjects (31 .1%) in the control group.
- **TMJ click:** TMJ click on right side was found in 19subjects (38.0%) in the study group and in 26 subjects (41.3%) in the control group .This result revealed no significant difference between the study group and the control group (P> 0.05).There was no significant difference between the study group and the control group (P> 0.05). On the left TMJ there were 14 subjects (28.0%) in the study group and 17 subjects (27.0 %) in the control group with a click.
- **TMJ crepitus:** TMJ crepitus on the right side was noticed in 11 subjects (22.0%) among the study group and none in the control group. This result revealed a highly significant statistical difference between the study group and the

control group (P< 0.05).There was a highly significant statistical difference between the study group and the control (P<0.05). TMJ crepitus on the left side was found in 8 subjects (16.0%) in the study group and non in the control group.

- **Deviation to the right side and the left side: The** mandibular deviation to the right side was found in 6 subjects (12 .0%) among the study group and in 1 subject (1.6%) among the control group. The result revealed a highly significant statistical difference between the study group and the control group (P< 0.05).There was a highly significant statistical difference between the study group and the control group (P<0.05), as far as the mandibular deviation to the left side it was found in 7 subjects (14.0%) in the study group and in 1 subject (1.6%) in the control group.
- **Limitation of jaw opening**: Limitation of jaw opening was found in 21subjects (42.0%) among the study group and in 4 subjects (6.3 %) among the control group .The result revealed a highly significant statistical difference between the study group and the control group (P< 0. 05).
- **Swelling :**Swelling was not found in any subjects in both groups of the study
- **Anterior open bite and morning stiffness:**The anterior open bite was found in 3 subjects (6.0%) of the study group and in none of the control group. The result reveals no significant differences between the study and the control groups (P>0.05).

  It was evident from the same table that there was a highly significant statistical difference between the study group and control group (P<0.05) as far as the morning stiffness was concerned 39 subjects (78.0%) of the study group and none of the control group had morning stiffness.

The Radiographical Involvement of the TMJ

Table (1.2) shows that the total radiographic involvement of TMJ was noticed in 16 subjects (32.0 %) of the study group compared with 1subject (1.6 %) of the control group. There is a highly statistically significant difference between the study group and the control group (P< 0.05).Among those involved cases 11 subjects (22%) had bilateral involvement, 5 subjects (10%) had unilateral involvement, 3subjects (6%) had left side involved and, 2 (4 %) subjects had only right side involved. In those involved patients in RA group 11 patients (22%) had clinical and radiographical involvement, and 5 patients (10%) patients had only radiographical involvement.

Correlation between Clinical and Radiographic Findings in the Study Group

A-on the right side

Table (1.3) Shows that in the study group the number of patients with a radiographically involved joints and having pain on palpation on the right side were 10, (27.0%).The number of Patients with no radiographical involvement and having pain on palpation on the right side were 27, (73.0%).The result revealed no significant statistical differences (P> 0.05).

The number of patients with radiographically involved joints and having pain on opening and closing on the right side were 9 (26.5%), on the other hand the number of patients who were not having a radiographically involved joint and having pain on opening and closing on the right side

was 25, (73.5%).The results revealed no significant statistical differences (P> 0.05).

The number of patients with a TMJ radiographical involvement and having click on the right side was 4, (21.1%).While patients who were not radiographically involved and having click on the right side count15, (78.9%). The result revealed no significant statistical differences (P> 0.05).

The patients number who were radiographically involved and having crepitus on the right side was 5, (45.5%).The patients who are not radiographically involved and having crepitus on the right side counts 6, (54.5%).The result revealed no significant statistical differences (P> 0.05).

The number of patients with a TMJ radiographical involvement and having deviation to the right side was 3 (50.0%).While patients who were not radiographically involved and having deviation to the right side were 3 (50.0%).The result revealed no significant statistical differences (P> 0.05).

B-on the left side:

Table (1.4) shows that among the study group , the patients with radiographically involved joints and having pain on palpation on the left side were10, (28.0%).Patients with no radiographically involved joints and having pain on palpation on the left side were 25, (71.4 %).The result revealed no significant statistical differences (P> 0.05) .Patients with radiographically involved joints and having pain on opening and closing on the left side were 10, (32.3%), those patients with no radiographically involved joints and having pain on opening and closing on the left side were 21, (67.7 %).The result revealed no significant statistical differences (P> 0.05). The patients with radiographically involved joints and having click on the left side were 4, (28.6%). Patients with no radiographical TMJ involvement and having click on the left side were 10, (71.4%). The result revealed no significant statistical differences (P> 0.0 5).The patients whose joints were radiographically involved and having crepitus on the left side were 6, (75.0%). Patients with no radiographical involved and having crepitus on the left side were 2, (25.0%).The result revealed statistical significant differences (P < 0.05).The number of patients with a TMJ radiographical involvement and having deviation to the left side was 4 (57.5%).While patients who were not radiographically involved and having deviation to the left side were 3 (42.9%).The result revealed no significant statistical differences (P> 0.05).

Table (1.5) shows the mean of duration of the disease in years in radiographically involved patients were 12.81years and it was 7.58 years in those who were not radiographically involved .The result revealed a significant statistical difference (P < 0.05) It was evident from the same table that the mean of age of radiographically involved patients were 40.62 years, while it was 41.1 years in patients who were radiographically not involved. The result reveals no statistical significant difference (P> 0.05)

Discussion

The RA group was taken consecutively from outpatients attending the department of rheumatology seeking medical treatment. It is therefore obvious that the RA patients had more severe disease than can be found in unselected population of RA. The RA

and control groups are similar with regard to age.

In the present study women are more affected by RA than men (82.0%).This finding is in agreement with those found by Lipsky ,(2006);Tehlirian and Bathno, (2008)[15] Who stated that females are 2.5 times more than males to develop the disease this might be due to female sex hormones.

In this study the age of the patients with RA ranges between 18 and 72 years the mean age of 40 .98 years which agree with that of Kaipiainen (2004)[16] who found that the disease can affect individuals at any age. According to Koh *et al* (1999)[17]; Laurindo *et al* (2002)[18], RA prevalence peak is between 35 and 50 years of age, and the age of onset varies between 25 and 55 years.

Clinical Findings

In the present study it was found that 64% of RA had two or more signs and symptoms this in agreement with (Okeson, 1996).Our findings fall between the range of numbers (61%- 67.6 %) obtained by other studies done by Goupille *et al*, (1990)[19] ; Yamakawae *et al*, (2002)[20](, Movahedian *et al*, (2006)[21] . It is lower when compared with those of Könönen *et al*, (1992)[22]; Lin *et al*, (2007)[23] they were 79%, 85.7% respectively. These differences may be due to variations in the type and thoroughness of the examination and differences in composition of the material (for example, differences in general rheumatoid status, duration of RA, acute or chronic phase of the systemic disease).Also may be due to variation in form of wording, and number of items included in the questionnaires or due to differences in nature of population studied geographically, culturally and socially. In this study significant difference in clinical findings of TMJ were shown between RA group and control group. This significance indicates that the TMJs of RA patients may be commonly affected by the diseases.

TMJ tenderness on palpation was the most prevalent sign among RA group which is higher than that found in control group. These findings are in agreement with the observation of Tegelberg and Kopp (1987)[24]; Movahedian *et al*; (2006) . The predominance of TMJ tenderness in RA in this study may suggest that the cause of tenderness related to TMJ involvement by RA; as tenderness of the other body joints during palpation is one of the important characteristic features of involvement by RA *(*Lipsky, 2006; Nuki *et al*, 2006)[25]. Statistically significant difference between the two groups was found in this study regarding the frequency of patients with painful jaw in opening. This result is in agreement with the findings of Puchner and Krennmair(2004); Helenius *et al* ,(2006)[26].One explanation for this difference is that pain on movement of the joint is an important sign in RA *(*Lipsky, 2006); Nuki *et al*,2006), so it was more common in RA patients. Pain in rheumatoid TMJ occurs due to increase in pressure within the joint capsule as the pannus extrudes itself into the inter bony spaces but before any significant bone resorption has taken place. It has been suggested that compression of retrodiscal tissue (in the bilaminar zone) may be the cause of such pain. Other suggested causes are inflammatory change secondary to internal derangement, stretching of the joint capsule and synovitis. Inflammation could explain the high prevalence of TMJ symptoms in our patients as the control subjects exhibited much lower prevalence of various symptoms.Clinical findings in this study were higher in the RA group than in the control group. Feeling of stiffness of the jaws on awakening and pain in the region of TMJ were significantly higher in RA group than in control group. This result is in agreement with that of Larheim,

(1993)[27]; Helenius *et al*, (2006) who reported that stiffness of the jaw and tiredness on chewing are common symptoms in patient with TMJs involved by RA, suggesting an inflammatory involvement of the TMJ by the general joint disease, since joint pain and morning stiffness are significant characteristic features in RA (Lipsky, 2006; Nuki *el al*, 2006).

Soft tissue swelling over the TMJ has not been found in any case in the present in this study. This may be related to the fact that swelling usually occurs in the acute phase, so the patient may be unaware for their TMJ swelling as it is overshadowed by many painful and swollen joints elsewhere in the body. This observation confirms that swelling over TMJ area is a rare clinical finding in RA patients (Tegelberg and Kopp, 1987; Larheim, 1993).

In this study maximum mouth opening capacity was considered restricted when it was less than 40mm. The mouth opening was restricted in 42. % in the study group and 6.3% of the control group, the difference was statistically significant. This result is in agreement with that of Helenius *et al*, (2005)*;* Helenius *et al*, (2006), but in disagreement with the findings of Franks (1967)[28] and Ogus , (1975)[29]; who observed non significant differences between RA group and control group as far as jaw opening is concerned. They thought that restricted mouth opening is only a problem in the acute phase of the disease. The discrepancy with those previous studies can partly be explained by difference in diagnostic criteria for assessment of limitation. Mouth opening restriction in RA of TMJ can result from intra-articular fibrous adhesions or due to displacement of the disc (Könönen *et al*, 1992). In addition to that the restriction might also be due to pain and tenderness in the masticatory muscles or combination of muscular and articular causes.

The present study found that the deviation of mandible to the right side and to the left side was higher in RA group than in control group this result is in agreement with that reported by Lin *et at*, (2007) who reported that the mandibular deviation was higher in RA group than in control group, and the result is in disagreement with that found by Helenius *et al*, (2005) who reported that the mandibular deviation did not differ between RA group and control group. In the present study our findings may be due to pain or tissue destruction caused by the chronic inflammatory process that accompanies RA.

The significantly higher prevalence of clicking in the control group compared with RA group, which was found in the present study, is in agreement with previous investigations by Könönen *et al*, (1992); Yamakawae *et al*, (2002), while the study of Chalmers and Blair, (1973)[30] reported clicking predominance in RA group .This difference may be due to the way of clinical examination and examiner experiences and the high clicking in the control group may be due to functional disturbance.

In the current study, crepitation was found to be noticeably often in the RA group than in the control group. This finding is in agreement with that of Movahedian *et al*, (2006); Helenius *et al* (2006) who reported that crepitation was the most frequent sign. Also Könönen *et al*; (1992); Benson and Otis, (1994)[31] found that the crepitation was more often seen in RA group than in control group, since RA results in bone destruction of the joint.

Anterior open bite was found in 3 subjects of the study group and non of the control group but only one of subjects had anterior open bite with a score of 4 in radiographic investigation (complete destruction of the head of the condyle; flat condyle) this result is in agreement with Suenaga *et al* ,(2000)[32] ; Lin *et at*

,(2007) ,the anterior open bite has been reported as a clinical sign in RA. This clinical sign developed as a result of progressive loss of mandibular rami height secondary to destruction of the condylar surface and hence the inability to bring incisors into occlusion. In the other 2 patients in our study the anterior open bite is due to orthodontic problem.

The Radiographic TMJ Involvement and Severity Score.

In this study radiographic involvement of the TMJ was found in (32.0%) in the study group compared with (1.6%) in the control group. This finding is in agreement with that of Meriel *et al*, (1960); which was 31%, and higher than that reported by Helenius *et al* ,(2005) which was (17%); and Bayar *et al* (2002)[33] which was ,(13.3%). Other studies gave even a higher prevalence ranging from 66 % to 88% Ogus, (1975);Wenneberg *et al* (1990)[34]; Goupille *et al*(1990); Sostmann *et al* (1990)[35]; Gynther *et al*(1996)[36]. These differences with previous studies may be attributed to variation in radiographic technique used, differences in the radiographic features included in the studies, and differences in composition of populations studied.

The difference in erosions of the condyle was statistically significant. This is in agreement with previous studies of Wenneberg *et al*, (1990); Renton,(1998) who stated that erosive changes in joints are generally considered to be caused by inflammatory reactions in and around the joints. The commonly found cortical erosions of the condyle of TMJ in RA patients are therefore most likely caused by general inflammatory joint disease. According to Ogus, (1975), when the rheumatoid process affecting the TMJ in the acute stage, it will enlarge the joint space by synovial effusion, attacking the fibro-cartilage of the articular surface, and producing erosions of the underlying bone. This causes pain, stiffness, and severe limitation of movement. The process may then enter a healing phase where the symptoms subside and the articular surface becomes remodeled and flattened.

In the present investigation, only one subjects of complete destruction of the condyle was found in RA group while none was found in control group. The most interesting aspect of this subject was the history of a progressive anterior open bite. This open bite may be due to remodeling occurring during the course of RA. Marbach and Spiera, (1967)[37]; Bush and Dolwick, (1995)[38] attributed the anterior open bite in RA to destruction of the anterior; superior aspects of the mandibular condyle with disruption of the internal pterygoid function and flexion contraction of the muscles of mastication

This study also revealed that 11 (22%) patients had bilateral radiographical involvement and 5 patients had unilateral involvement (10%).i.e. the involvement is not always bilateral .This finding is in agreement with Puncher and Krennmair, (2004) who indicated that 11.8% demonstrated a change on one side and 26.4% a change on both sides, our study is in disagreement with that reported by Goupille *et al*, (1993) who reported that bone changes were bilateral in RA, the erosions and cysts of the mandibular condyle and their bilateral nature are the most specific features of RA on TMJ.

Also in the present study the clinical and radiographic finding of TMJ in RA was not bilateral which is in agreement with the study done by Puncher and Krennmair ,(2004); Lin *et al*(2007) and the results of our study are in disagreement with that of Blasberg and Greenberg ,(2003)[39];Field and Longnnan, (2003)who stated that the TMJs are usually bilaterally involved in RA .Also the results are in disagreement Lipsky,(2006) Tehlirianand and Bathno, (2008) who

mentioned that the involvement in RA is usually in symmetrical fashion.

This difference in symmetrical involvement of TMJ compared to other joint is probably due to additional factors such as Para functional habit, unilateral chewing and history of trauma .Clearly a unilateral chewing habit constitutes an uneven distribution of function between the right and left joints. We suggest a study of these factors in an other investigation.

Also in the present study not all patients with radiographic involvement of the TMJ by RA had clinical involvement, this could be explained by difference in aggressiveness of the disease from one patient to an other also the use of analgesic and other medications might mask the clinical signs and symptoms.

Correlation between Clinical and Radiographic Findings

In this study no correlation was found between clinical and radiographic findings (pain on palpation, pain on jaw movement, click and, deviation of mandible on opening to the right and left sides, limitation of jaw opening, anterior open bite) .The results of this study are in agreement with that of Goupille *et al* ,(1990) Goupille, *et al* **(**1993)[40], they reported that the clinical dysfunction score did not correlate with the tomographic TMJ score in patients with (RA) and the results are in disagreement with those reported; by Helenius *et al*, (2005); and Helenius *et al*, (2006). This result may be largely due to the absence of radiographic abnormalities during the acute symptomatic phase, different imaging technique and clinical examination method.

Crepitus on the left side only was correlated with radiographic finding of the left TMJ this finding is in agreement with that of Helenius *et al* ,(2006) who reported that the crepitus indicated structural damage of the TMJ, Akerman *et al*, (1988)[41] reported that most joints with crepitus exhibited radiolographic erosion ,and the result is in disagreement with that reported by Franks, (1967) ;Goupille *et al* ,(1990) Goupille, *et al* **,(**1993) who reported that crepitus appears to be of considerable significance, when it is present irreversible degenerative change are likely to have taken place, but structural changes may occur without crepitus as a result, perhaps, of remodeling of the articular surfaces without cartilage loss and fragmentation, this may be the cause of that crepitus on the right side was not correlated to the radiographic findings of the right TMJ.

In the present study it is found that the radiographic involvement is correlated positively with the duration of RA. The radiographic scores (severity) are correlated also positively with duration of the disease RA; Scott *et al*, (2000)[42]; Voog *et al*, (2003).

While this study is in disagreement with the studies of Karten (1972); Lin *et al*, (2007) which showed that the TMJ damage in RA is proportional to the duration of active inflammation rather than the total duration of arthritis.

In the current study no correlation was found between age of the patient with RA and radiographic findings, these findings are in agreement with that reported by Voog *et al*, (2003). These results are in disagreement with that reported by Gynther *et al*, (1996), who stated that the erosions were more severe in young RA patients, which may indicate a more aggressive form of the disease.

Conclusions

The clinical findings (signs and symptoms) of TMJ are present in more than half of the RA patients .The radiographic findings in TMJ are

found in one third of RA patients .They are more prevalent and more severe in RA patients than controls. The radiographic changes in the TMJ were correlated with duration of the RA .The radiographic score (severity) was correlated with the duration of RA. There is no correlation or association between clinical findings and radiographic findings .The TMJ changes in RA are the results of the disease and not merely an accentuation of degenerative processes .In TMJ, RA is not always bilateral like other joints of the body.

References

1- Carlsson GE, Kopp S, Oberg T. (1979): Arthritis and allied disease of the temporomandibular joint. Chap 10 in: Temporomandibular joint function and dysfunction. Eds, Zarb GA,

2- Laskin DM. (1992): Temporomandibular disorders: diagnosis Etiology. Chap 19 in: The temporomandibular joint: A biological Basis for clinical practice. Eds, Sarnat BG, Laskin DM. W.B. Saunders Company. pP: 316-28

3- Helenius J. ML., Hallikainen, D. Helenius I, Meurman J .H, M, Könönen Leirisalo-Repo. M and Lindqvist. C, (2005): Clinical and radiographic findings of the temporomandibular joint in Patients with various rheumatic diseases. A case-control study .Oral Surg Oral Med Oral Pathol Oral Radiol Endod; 99:455-63.

4- Lipsky PE .2006 Rheumatoid arthritis .chap 5 in Harrison's of rheumatology Eds, Fauci et al ;61 th McGraw-Hill company pp 85 -90.

5- Choy EH, Panayi GS. (2001): Cytokine pathway and joint inflammation in rheumatoid arthritis. N Eng J Med 344:907 -16.

6- Feldmann .M (2001): Pathogenesis of arthritis .Recent research process.Nat.Immunole; 9:771-3.

7- Okeson JP, editor (1996): Orofacial pain: guidelines for assessment, diagnosis, and management. Chicago: Quintessence Publishing Co., Inc. . J Rheumatol; 23:1948-52

8- Little JW, Falace DA, Miller CS, Rhodus NL (1997): Dental Management of the Medically Compromised Patient. 6th ed., Philadelphia, Mosby pp.478-486.

9- Field .A, Longrman L (2003): Temporomandibular disorder chapter 16 in: Tyldesley s oral medicine. 5th ed. Oxford University Press, New York, and Pp: 198-202

10- Çeliker.R, Gökçe-Kutsal. Y, Eryilmaz M. (1995): Temporomandibular joint involvement in Rheumatoid Arthritis Relationship with Disease Activity. Scand J Rheumatol; 24:22-5.

11- Tegelberg A, Kopp S. (1996): A three-year follow up of temporomandibular disorders in rheumatoid arthritis and ankylosing spondylitis. Acta Odontol Scand; 54:14-

12- Voog U, Alstergren P, Leibur E, Kallikorm R, Kopp S. (2003): Impact of temporomandibular joint pain on activities of daily living in patients with rheumatoid arthritis. Acta Odontol Scand; 61: 278-82.

13- Arnett FC, Edworthy SM, Bloch DA, McShane DJ, Fries JF, Cooper NS. (1988): The American Rheumatism Association 1987 revised criteria for the classification of rheumatoid arthritis. Arthritis Rheum; 31: 315-24.

14- Staley.RN :(2001) Orthodontic Diagnosis a Treatment Planning chapter 9 ED; Bishara SE textbook of orthodontic W.B Saunders Company.

15- Tehlirian .CV, Bathno .JM (2008): Rhumatoid arthritis, A Clinical and Laboratory Manifestations chapter 6 Klippel JH Eds Primer on Rheumatic diseases, 13th Eds pp.114.

16- Kaipiainen-Seppänen O (2004): Epidemiology of rheumatoid arthritis in Finland. Duodecim; 120:283-7.

17- Koh ET, Yap AU, Koh CK, Chee TS, Chan SP, Boudville IC. (1999): Temporomandibular Disorders in Rheumatoid Arthritis. J Rheumatol; 26:1918-22.

18- Laurindo IMM, Pinheiro GRC, Ximenes AC, Bertolo MB, Xavier RM, Giorgi RN, Ciconelle RM, Radominski SC, Lima FAC, Batistela LM ,Alencar P.(2002):Consenso brasileiro para o diagnóstico e tratamento da Artrite Reumatóide. Rev Bras Reumatol; 42(6):358-62.

19- Goupille P, Fouquet B, Cotty P, Goga D, Mateu J, Valat JP. (1990): The temporomandibular joint in rheumatoid arthritis. Correlations between clinical and computer tomography features. J Rheumatol; 17:1285.

20- Yamakawa M, Ansai T ,Kasai S ,Ohmaru T,Takeuchi H ,Kawaguchi T, Takehara .T (2002) :Dentition status and temporomandibular joint disorders in patients with rheumatoid arthritis CranioJul;20(3) 165-71.
21- Movahedian .B, Razavi. M, Movahedian. A, Moeini. M (2006): Assessment of Manifestations of Temporomandibular Joint Involvement in Rheumatoid Arthritis Patients Journal of Isfahan Dental School, 2, No 3 (1385).
22- Könönen M, Wenneberg B, Kallenberg A (1992): Craniomandibular disorders in rheumatoid arthritis, psoriatic arthritis, and ankylosing spondylitis. A clinical study. Acta Odontol Scand; 50:281-7.
23- Lin YC, Hsu ML, Yang JS, Liang TH, Chou SL, and Lin HY, (2007): Temporomandibular Joint Disorders in Patients with Rheumatoid Arthritis. Chin Med Assoc; 70(12):527–534.
24- Tegelberg A, Kopp S. (1987): Clinical findings in the stomatognathic system for individuals with rheumatoid arthritis and osteoarthritis. Acta Odontol Scand; 45: 65-75
25- Nuki .G, Ralston. SH, Luqmani. R, (2006): Diseases of the connective tissue, joints, and bones .Chap 12 in: Davidson's practice of medicine 20th ed. Harcourt Brace and company pp: 835-48
26- Helenius L.M.J, Tervahartiala P, Helenius .I, Al-Sukhun .J, Kivisaari. L, Suuronen. R, Kautiainen .H. , Hallikainen .D, Lindqvist .C,and Leirisal .M(2006) :Clinical, radiographic and MRI findings of the temporomandibular joint in patients with different rheumatic diseases International Journal of Oral and Maxillofacial Surgery 35, Issue 11, Pages 983-989.
27- Larheim TA (1993): "Rheumatoid arthritis and relate joint diseases Chap 8 in: Diagnosis of temporomandibular joint. Eds. Katzberg RW, Westesson PL. WB Saunders Company. Pp: 303-26.
28- Franks AS. (1969): Temporomandibular joint in adult rheumatoid arthritis. A comparative evaluation of 100 cases. Ann Rheum Dis; 28(2):139- 45.
29- Ogus H. (1975): Rheumatoid arthritis of the temporomandibular joint Br J Oral Surg; 12:275-84.
30- Chalmers M, Blair GS. (1973): "Rheumatoid arthritis of the temporomandibular joint" A clinical and radiological study using circular. Q J Med; 42: 369-86.
31- Benson BW, Otis LL. (1994): Disorder of temporomandibular Joint, J Dent Clinc Nor Am.; 38(1): 169-71.
32- Suenaga S. Ogura T. Matsuda T. Noikura T. (2000): Severity of synovium and bone marrow abnormalities of the temporomandibular joint in early rheumatoid arthritis: role of gadolinium-enhanced fatsuppressed T1-weighted spin echo MRI. J Comp Assist Tomogr;24 (3):pp461-5
33- Bayar. N, Kara SA, Keles I, Koç MC, Altinok D, Orkun S. (2002):Temporomandibular joint involvement in Rheumatoid Arthritis: a radiological and Clinical Study. Journal of Craniomandibular Practice; 20 (2):105-110.
34- Wenneberg B, Könönen M, Kallenberg A. (1990): Radiographic changes in temporomandibular joint of patients with rheumatoid arthritis, psoriatic arthritis and ankylosing spondylitis.J Craniomandib Disord 4: 35-9
35- Sostmann M, Reich RH, Grapentin D, Langer HE.(1990):Clinical study on rheumatoid arthritis of thetemporomandibular joint.Dsch Zahnarztl Z;45(7) 570-4.
36- Gynther GW, Tronje G, and Holmlund AB, (1996): Radiographic changes in the temporomandibular joint in patients with generalized osteoarthritis and rheumatoid arthritis Oral Surg Oral Med Oral Pathol Oral Radiol Endod. May; 81(5):613-8.
37- Marbach JJ, Spiera H. (1967): Rheumatoid arthritis of the temporomandibular joint". Ann Rheum Dis; 26:538-42
38- Bush FM, Dolwick MF. (1995): The temporomandibular joint and related orofacial disorder.J.B. Lippicott Company, philadephia.
39- Blasberg B, Greenberg MS, (2003): Temporomandibular Disorders Chap 10 in: Burket's oral medicine. Eds, lynch MA, Brif Greenberg MS. 10th ed. J. P. Lippincott Company. pP: 272-300.
40- Goupille P, Fouquet B, Goga D, Cotty P, Valat JP. (1993): The temporomandbular joint in rheumatoid arthritis: Correlations between clinical and tomographic features. J Dent; 21:141-146.
41- Akerman. S, Kopp. S, Nile .M, Petersson. A, Rohlin .M (1988):Relationship between clinical and radiographic findings of the temporomandibular joint in rheumatoid arthritis Oral Surgery, Oral Medicine, Oral ,Pathology Volume 66, Issue 6, December, Pages 639-64.

42- Scott DL, Pugner K, and Kaarela .K (2000): The link between joint damage and disability in rheumatoid arthritis .Rheumatology; 39:122-32.

Figure (1.1) Examples of TMJ erosions for the 4 Scores

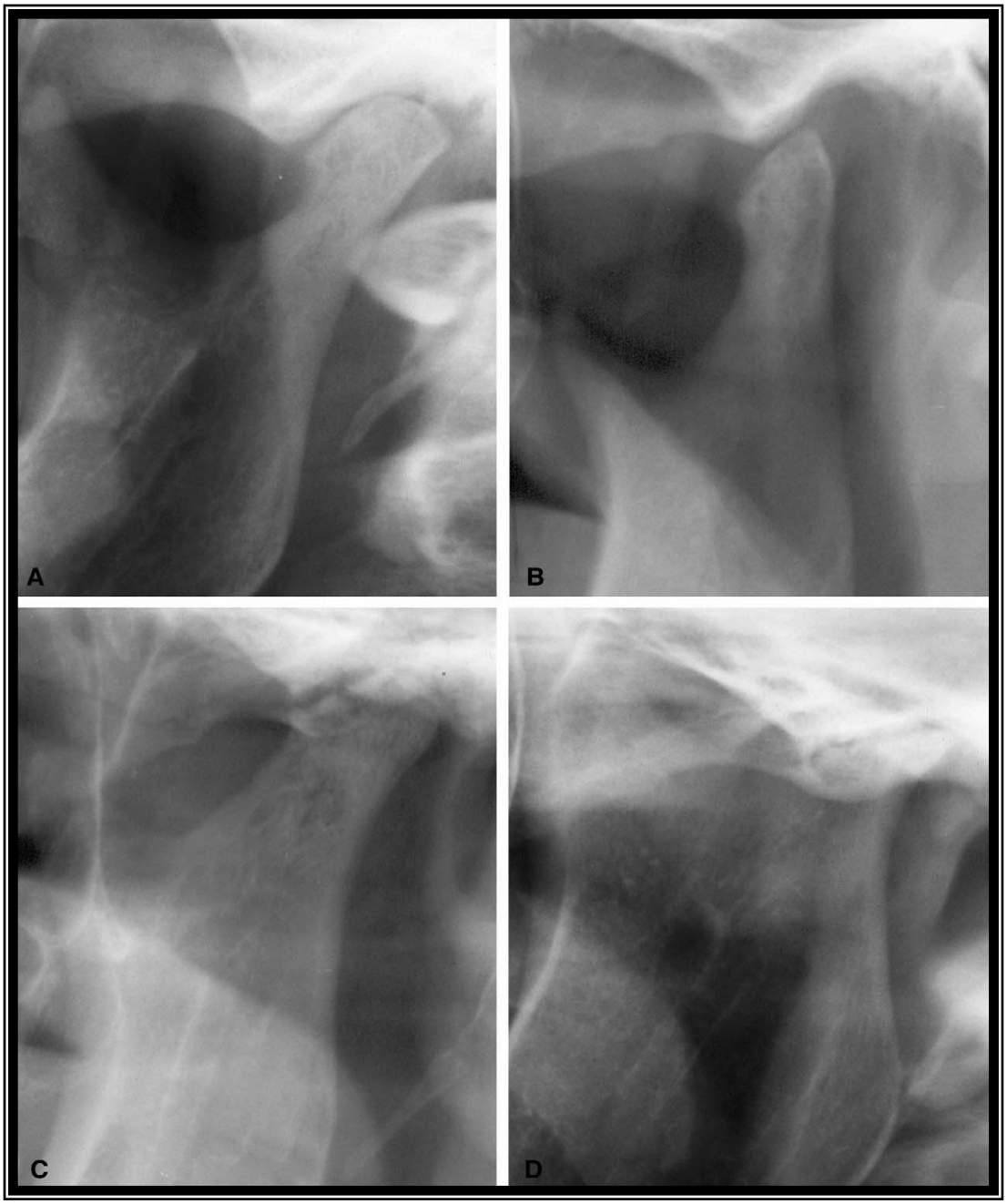


Figure (1.2) Clinical findings and cast of the patient with anterior open Bite

Table (1.1) Clinical findings of the study group compared with the control group

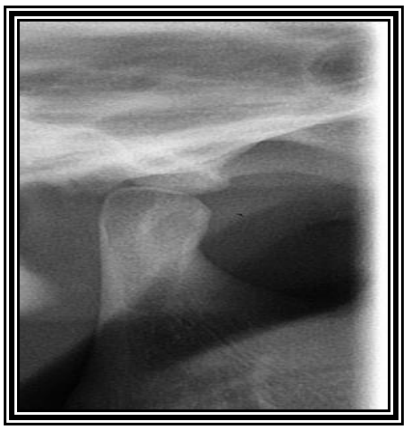
Clinical findings	Study group No=50		Control group N o=63		X^2	P
	No.	%	No.	%		
TMJ pain on palpation						
Right	37	74.0	28	44.4	9.96	0.00
Left	35	70.0	22	34.9	13.72	0.00
Pain on opening and closing						
Right	34	68.0	24	38.1	9.97	0.00
Left	31	62.0	20	31.7	10.30	0 .00
TMJ click						
Right	19	38.0	26	41.3	0.12	0.72
Left	14	28.0	17	27.0	0.01	0.90
TMJ crepitus						
Right	11	22.0	0	0.0	*	0.00
Left	8	16.0	0	0.0	*	0.00
Deviation						
Right	6	12.0	1	1.6	*	0.04
Left	7	14.0	1	1.6	*	0.02
Limitation of jaw opening						
	21	42.0	4	6.3	20.5	0.00
Anterior open bite						
	3	6.0	0	0.0	*	0.08
Morning stiffness						
	39	78.0	0	0.0	75.0	0.00

*Note: chi square test is not applicable (the expected count is less than5)

Table (1.2) Total radiographic involvement of TMJ in the study group compared with the control group

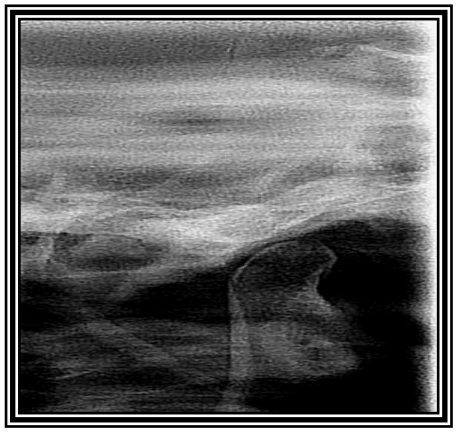
	Study group No= 50		Control group No=63		X^2	P
	No.	%	No.	%		
Radiographic involved	16	32.0	1	1.6	20.17	0.00

Figure (1.3) Radiographic A (score 0, no erosion), B (score 1 very slight erosion), C (score 2 erosion of the top of the condyle) D (score 3 half of the condyle is eroded, E (Score 4 condyles are completely eroded)

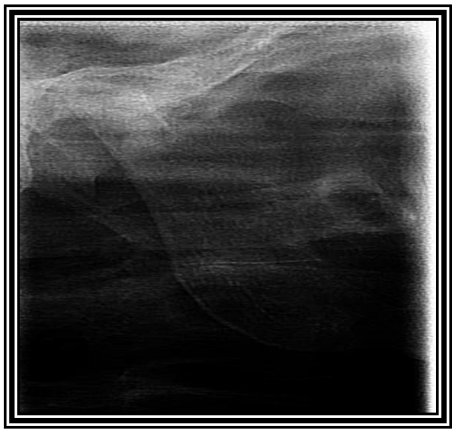


A

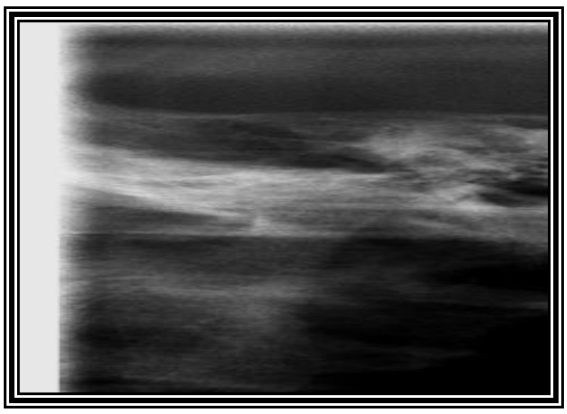
B



C



D



E

Right TMJ clinical findings	Right Radiography				X^2	p
	not involved		involved			
	No.	%	No.	%		
TMJ pain on palpation	27	73.0	10	27.0	0.07	1.00
TMJ pain on movement	25	73.5	9	26.5	0.01	1.00
TMJ click	15	78.9	4	21.1	*	0.74
TMJ crepitus	6	54.5	5	45.5	2.7	0.12
Deviation to the right	3	50.0	3	50.0	*	0.17

Table (1.3) Correlation between radiographic involvement and clinical findings on the right TMJ of the study group.
*Note: chi square test is not applicable (the expected count is less than 5)

Left TMJ Clinical finding	left Radiography				X^2	p
	not involved		involved			
	No.	%	No.	%		
TMJ pain on palpation	25	71.4	10	28.6	0.01	1.00
TMJ pain on movement	21	67.7	10	32.3	0.73	0.39
TMJ click	10	71.4	4	28.6	*	1.00
TMJ crepitus	2	25.0	6	75.0	10.4	0.00
Deviation to the left	3	42.9	4	57.5	*	0.08

Table (1.4) Correlation between radiographic involvement and clinical findings in the left TMJ of the study group.
*Note: chi square test is not applicable (the expected count is less than5)

	Duration (year)				Age (year)			
Radiographic involved in RA	**No**	**Mean ± SD**	**t**	**p**	**No**	**Mean ±SD**	**t**	**p**
yes	16	12.81±11.9	-2.15	0.03	16	40.62 ±16.96	0.12	0.90
no	34	7.58±5.38			34	41.1±12.1		

Table (1.5) Correlation between radiographic involvement duration of disease and age in the study group.