A 3-year follow-up of temporomandibular disorders in rheumatoid arthritis and ankylosing spondylitis

Åke Tegelberg and Sigvard Kopp
Department of Stomatognathic Physiology, Central County Hospital, Västerås, and Department of Clinical Oral Physiology, Center for Clinical Oral Science, Karolinska Institutet, Stockholm, Sweden

Tegelberg Å, Kopp S. A 3-year follow-up of temporomandibular disorders in rheumatoid arthritis and ankylosing spondylitis. Acta Odontol Scand 1996;54:14–18. Oslo. ISSN 0001–6357.

Sixteen individuals with rheumatoid arthritis (RA) and 19 individuals with ankylosing spondylitis (AS) participated in this 3-year follow-up study. The individuals in each disease group were allocated to an experimental group (E group) and a comparison group (C group). They were investigated by questionnaire, clinical examination of the stomatognathic system, and laboratory tests. The individuals of the two E groups had performed a physical training program of the stomatognathic system during 3 weeks. After 3 years most of the patients in the E groups reported an unaltered or decreased severity of symptoms and signs from the stomatognathic system compared with the initial status. The clinical dysfunction score according to Helkimo (CDS) was lower in the RA group, and the mouth opening capacity was larger than before training. In the AS group there was no long-term change in the CDS but an increase of mouth opening capacity. The general inflammatory disease process in the RA group showed an increased activity during this follow-up period as assessed by erythrocyte sedimentation rate. This study suggests that local physical training of the stomatognathic system has a positive effect in individuals with RA. □ *Arthritis; clinical trial; erythrocyte sedimentation rate; orofacial pain; rheumatic disease*

Å. Tegelberg, Department of Stomatognathic Physiology, Central County Hospital, S-721 89 Västerås, Sweden

In the management of the patient with rheumatic disease, the main treatment goals are relief of pain and maintenance of function. One important part of treatment is therefore physiotherapy. Physiotherapy is not primarily aimed towards one particular disease but more towards the consequences of disease—that is, the functional impairment.

In several studies of temporomandibular joint (TMJ) involvement in rheumatoid arthritis (RA) (1–4) and in ankylosing spondylitis (AS) (5, 6) the patients showed more symptoms and signs of temporomandibular disorder (TMD) than healthy individuals. One important clinical sign was reduced mouth opening, which is essential in the functional status of the stomatognathic system (7). The symptoms and signs of TMD in individuals with inflammatory joint disease may originate from either the joint component or the masticatory muscles or a combination of these two sources. The mandibular mobility depends on the condition of both of these components.

Individuals with RA have been reported to have muscle weakness and low physical muscle performance capacity (8–11), and physical training in RA has been shown to result in obvious improvement in the long term without any negative influence on the articular status (12). A physical training program for the stomatognathic system has been widely used for many years (13), but there is no scientific report of its long-term effect in inflammatory joint disease of the TMJ.

This study is a follow-up of an earlier investigation of the short-term effect of physical training (14), and the aim was to evaluate the long-term development of the status of the stomatognathic system and the effect of a physical training program on mandibular mobility, subjective symptoms, and clinical signs of TMD and the influence of the erythrocyte sedimentation rate (ESR) of the blood as a background factor.

Patients and methods

From the referrals to the Rheumatism Hospital in Strängnäs, Sweden, 28 individuals with rheumatoid arthritis (RA group) according to the ARA criteria (definite or classical) (15) and 32 individuals with ankylosing spondylitis (AS group) according to the Rome criteria, 1963 were selected for this study. The individuals were randomly allocated to two groups, one experimental group (E group), which performed physical exercises, and one comparison group (C group) in each joint disease category. At the long-term follow-up the patients were distributed as shown in Table 1. Among the RA individuals the mean age was 52 years in the E group and 58 years in the C group. The corresponding figure for both of the AS groups was 46 years. At the long-term follow-up 35 of the initial group of individuals attended the examination. The long-term follow-up, which was performed 3 years after the short-term follow-up, included a questionnaire, a clinical examination including the clinical dysfunction score of Helkimo (16), and measurement of the ESR. All examinations were performed by one and the same

Table 1. Distribution of individuals by disease groups. Numbers of individuals and reasons for not attending the follow-up

	Short-term evaluation	3-year follow-up	Deceased	Refused examination	No answers on two postal requests
RA					
E group	15	9	2	3	1
C group	13	7	1	3	2
AS					
E group	13	10	0	2	1
C group	19	9	0	6	4
Total	60	35	3	14	8

RA = rheumatoid arthritis; AS = ankylosing spondylitis; E group = experimental group; C group = comparison group.

examiner. The self-administered physical training program was a modification of exercises for the stomatognathic system described previously (17, 18). The exercises (opening, laterotrusion, and protrusion) were first performed without resistance and then against resistance, to engage the highest possible number of muscular motor units. The individuals were encouraged to perform the exercises twice a day during a period of 3 weeks and then according to their own judgement.

Statistics

Differences between before treatment and the follow-ups were tested for statistical significance with the t test for dependent variables. The level of statistical significance (p value) is shown if $p < 0.05$.

Results

Rheumatoid arthritis

Only one individual continued with physical training of the stomatognathic system on a regular basis after the experimental period. The individuals' own report of the severity of TMD is shown in Table 2. The subjective chewing ability was reported to be improved by three of nine individuals in the E group at the long-term follow-up. The mean clinical dysfunction score (CDS) calculated at the follow-up was still decreased compared with the pretreatment CDS for both groups (Fig. 1). There was an increase from four to five individuals in the E group and a decrease from four to three in the C group in the highest classes (II or III) of the clinical dysfunction index at the long-term follow-up as compared with the short-term follow-up.

The mean value of the maximum mouth opening capacity was 3 mm higher at the long-term follow-up than before the treatment period (Fig. 2). The mean numbers of tender muscles at the three examinations are shown in Fig. 3.

The individuals' own estimation of the severity of the general joint disease indicated a deteriorating situation for five of nine individuals in the E group compared with the situation at the short-term evaluation, and for four of seven individuals in the C group.

The mean value of ESR had increased from 24 mm (range, 1–54 mm) in the E group and 20 mm (range, 6–53 mm) in the C group at the short-term follow-up to 34 mm (range, 6–85 mm) and 23 mm (range, 11–38 mm), respectively, at this long-term follow-up. At both the short- and long-term follow-ups six of nine in the E group and three of seven in the C group presented pathologic values above 20 mm. The follow-up ESR did not correlate with the pretreatment value of CDS, the individuals' own estimation of the severity of the general joint disease, or the treatment results.

Ankylosing spondylitis

None of the individuals had continued with regular physical training of the stomatognathic system after the experimental period. The individuals' own report of TMD is shown in Table 2. Two of the nine individuals in the E group reported at the long-term follow-up that their chewing ability was still improved.

The mean clinical dysfunction score at the three examinations are shown in Fig. 1. At the short- and long-term follow-up three of the nine individuals in the E group and three and five respectively, in the C group scored in the highest classes, II and III, of the clinical dysfunction index.

The mean value of the maximum mouth opening capacity is shown in Fig. 2, and the mean numbers of tender muscles at the three examinations are shown in Fig. 3.

The individuals' own report of the severity of their general joint disease was estimated to be worse in 5 of the 9 individuals in the E group and in 7 of the 10 individuals in the C group between the short-term and the present long-term follow-up.

The mean ESR value before intervention was 12 mm,

Table 2. Their own report of the severity of temporomandibular disorders (TMD) by individuals with rheumatoid arthritis (RA) and ankylosing spondylitis (AS)

	RA		AS	
	E, $n = 9$	C, $n = 7$	E, $n = 9$	C, $n = 10$
Present TMD severity				
Mild	6	7	6	9
Moderate/severe	3	–	3	1
Comparison of TMD severity between short-term and long-term follow-up				
Symptom-free	–	3	1	3
Improved	3	1	2	2
Unaltered	4	2	3	2
Impaired	2	1	3	2
Pain on TM function	4	2	1	1
Difficulties on wide mouth opening	5	2	4	3
Stiffness/tiredness on mouth opening/chewing	6	3	3	1

E = experimental group and C = comparison group.

and at the long-term follow-up 13 mm (range, 2–30 mm) in the E group and 21 mm and 19 mm (range, 3–50 mm), respectively, in the C group. Most of the individuals showed similar and non-pathologic values at the short- and long-term follow-up. The pretreatment ESR value did not correlate with the corresponding value of CDS or the treatment results.

Discussion

Long-term studies of training effects in individuals with inflammatory joint diseases and standardization of physiotherapy are rare, probably due to difficulties in performance. The individuals participating in this study were selected from patients referred to the Rheumatism Hospital for a treatment period of in general 6 weeks. After the treatment period the patients returned home to different parts of Sweden. At this long-term evaluation several individuals were not willing to attend for various reasons, such as increased disability, other complicating diseases, or long distance to travel. This fact may have influenced the results. Physiotherapy is regularly used as an important part of rheumatologic treatment. With

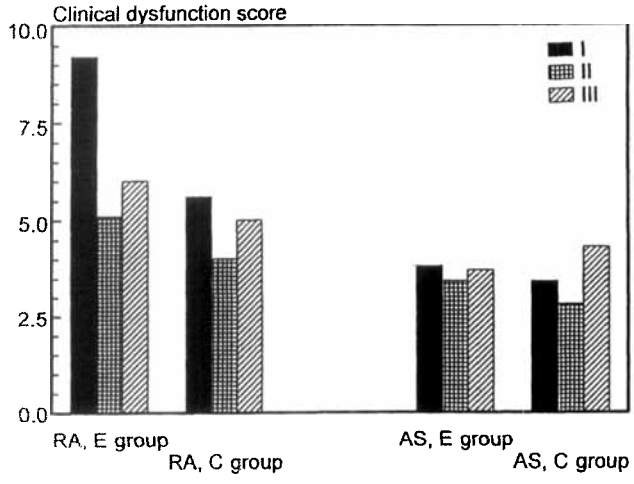

Fig. 1. Mean clinical dysfunction score according to Helkimo at three examinations (I, II, III) in individuals with rheumatoid arthritis (RA) and ankylosing spondylitis (AS). E = experimental group; C = comparison group; I = pretreatment values; II = short-term follow-up; III = long-term follow-up.

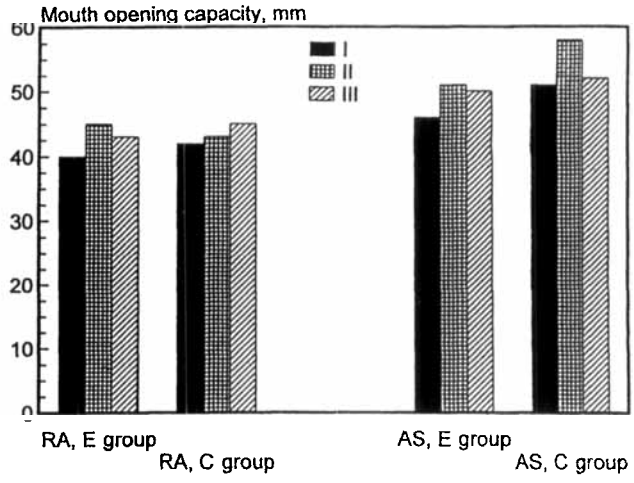

Fig. 2. Mean maximum mouth opening capacity at three examinations (I, II, III) in individuals with rheumatoid arthritis (RA) and ankylosing spondylitis (AS). E = experimental group; C = comparison group; I = pretreatment values; II = short-term follow-up; III = long-term follow-up.

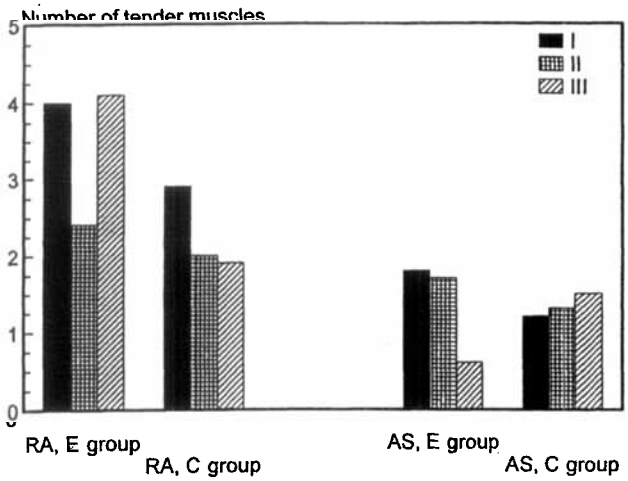

Fig. 3. Mean number of tender muscles at three examinations (I, II, III) in individuals with rheumatoid arthritis (RA) and ankylosing spondylitis (AS). E = experimental group; C = comparison group; I = pretreatment values; II = short-term follow-up; III = long-term follow-up.

regard to the stomatognathic system, this therapy aims to provide stimulation of the muscles within painfree limits, improve the strength of the muscle, improve the blood circulation, and, thereby, to wash away metabolites released in the muscles due to hyperfunction/tension (19).

Muscular weakness and muscular atrophy are early and prominent features of all stages of RA (20). The cause of the muscle pain and dysfunction is probably multifactorial and not entirely understood. The muscle dysfunction cannot be explained only by reduced joint mobility or joint pain and is probably also a result of direct involvement of muscle fibers in the inflammatory process (21).

The statistically significant improvements shown in the short-term follow-up after 3 weeks of physical training (14) were not found at this long-term follow-up. The clinical signs of the stomatognathic system had returned nearly to pretreatment level except for the RA individuals subjected to physiotherapy, who still had a reduced clinical dysfunction score. Most of the individuals in the E group reported an unchanged chewing ability 3 years after performance of the training program. This result raises questions about how frequent the patients need to perform physical exercises to prevent pain and to maintain functional capability in the stomatognathic system.

Individuals with RA frequently have reduced temperatures on the skin surface over the superficial masseter muscle (22) and over and in the TMJ (23, 24). These findings indicate that impaired blood circulation of the masseter muscle and the TMJ is an important local feature of RA. This temperature reduction seems to appear early in the disease and tends to normalize with time and pain reduction (22, 25). Similar circulatory findings have been made in the knee joint (26). The cause of the temperature reduction is not fully understood, but vasoconstriction due to release of neuropeptide Y from sympathetic nerves may play a part (25). Other factors, such as atrophy, microcirculatory failure, and increased muscle tension, have also been suggested. There is also a correlation between temperature reduction and tenderness to palpation of the muscles (22, 24), which suggests that pain triggers sympathetic activity, vasoconstriction, and impaired microcirculation. The clinical long-term effect of physical therapy in RA individuals observed in this study—that is, the reduced CDS and the increased functional capacity of the stomatognathic system—may partly be due to a normalization of the circulatory condition of the masticatory muscles and TMJs, as indicated in previous studies, and may not be entirely related to the physiotherapy.

The ESR values of both groups indicate that most of the patients are in a chronic phase of the disease with small fluctuations around a low basic level of inflammatory activity. However, the individuals reported a general impairment of their condition in both groups. The pretreatment value of ESR did not seem to have a prognostic significance for the treatment outcome of either RA or AS.

Most of the individuals in the E groups reported their TMD as unchanged or improved at the follow-up, which indicates that physical training over 3 weeks is not likely to produce deterioration in the joint and muscle status in the chronic phase of disease. This is in agreement with studies of general physical training in individuals with RA (10). Increased physical activity or regular physical training therefore generally does not seem to be contraindicated in these diseases during non-acute phases (12, 27). Further studies of the long-term effect of physiotherapy in individuals with TMD are necessary to assess the result of more regular training to reduce pain and to keep an acceptable function of the stomatognathic system in chronic joint diseases.

This study suggests that there is a long-term positive effect of local physical training of the stomatognathic system in individuals with RA.

Acknowledgements.—This study has been supported by grants from the Swedish Association against Rheumatism and King Gustav's 80-year fund.

References

1. Uotila E. The temporomandibular joint in adult rheumatoid arthritis. A clinical and roentgenological study. Acta Odontol Scand 1963–64; Suppl 39:9–62.
2. Ericson S, Lundberg M. Alterations in the temporomandibular joint at various stages of rheumatoid arthritis. Acta Rheum Scand 1967;13:257–74.
3. Franks AST. Temporomandibular joint in adult rheumatoid

arthritis. A comparative evaluation of 100 cases. Ann Rheum Dis 1969;28:139–45.
4. Tegelberg Å, Kopp S. Clinical findings in the stomatognathic system in individuals with rheumatoid arthritis and osteoarthrosis. Acta Odontol Scand 1987;45:65–75.
5. Davidson C, Wojtulewski JA, Bacon PA, Winstock D. Temporomandibular joint disease in ankylosing spondylitis. Ann Rheum Dis 1975;34:87–91.
6. Wenneberg B, Kopp S. Clinical findings in the stomatognathic system in ankylosing spondylitis. Scand J Dent Res 1982;90:373–81.
7. Agerberg G. On mandibular dysfunction and mobility [thesis]. Umeå: University of Umeå, 1974.
8. Nordemar R, Ekblom B, Zackrisson L, Lundqvist K. Physical training in rheumatoid arthritis: a controlled long-term study. I. Scand J Rheumatol 1981;10:17–23.
9. Ekblom B, Lövgren O, Alderin M, Fridström M, Sätterström G. Physical performance in patients with rheumatoid arthritis. Scand J Rheumatol 1974;3:121–5.
10. Ekblom B, Lövgren O, Alderin M, Fridström M, Sätterström G. Effect of short-term physical training in patients with rheumatoid arthritis. Scand J Rheumatol 1975;4:80–6.
11. Larheim TA, Flöystrand F. Temporomandibular joint abnormalities and bite force in a group of adults with rheumatoid arthritis. J Oral Rehabil 1985;12:477–82.
12. Ekblom B, Lövgren O, Alderin M, Fridström M, Sätterström G. Effect of short-term physical training on patients with rheumatoid arthritis. A six-month follow-up study. Scand J Rheumatol 1975;4:87–91.
13. Tegelberg Å. Bettfysiologisk vård inom ett landstingsområde. Attityder och behov. Tandlakartidningen 1990;82:1044–52.
14. Tegelberg Å, Kopp S. Short-term effect of physical training on temporomandibular joint disorders in individuals with rheumatoid arthritis and ankylosing spondylitis. Acta Odontol Scand 1988;46:49–56.
15. Tegelberg Å, Kopp S. Subjective symptoms from the stomatognathic system in individuals with rheumatoid arthritis and osteoarthritis. Swed Dent J 1987;11:11–22.
16. Helkimo M. Studies on function and dysfunction of the masticatory system. II. Index for anamnestic and clinical dysfunction and occlusal state. Swed Dent J 1974;67:101–21.
17. Schwartz L. Disorders of the temporomandibular joint. Philadelphia: W. B. Saunders Co, 1959:223–31.
18. Bertoft G. Rörelseterapi vid käkledens smärt-dysfunktions-syndrom. Sven Tandlak Tidskr 1965;58:587–98.
19. Zarb GA, Speck JE. The treatment of mandibular dysfunction. In: Zarb GA, Carlsson GE, editors. Temporomandibular joint, function and dysfunction. Copenhagen: Munksgaard, 1979:373–96.
20. Edström L, Nordemar R. Differential changes in type I and type II muscle fibres in rheumatoid arthritis. Scand J Rheumatol 1974;3:155–60.
21. Haslock DI, Wright V, Harriman DGF. Neuromuscular disorders in rheumatoid arthritis. A motor-point muscle biopsy study. Q J Med New Series 1970;39:335–58.
22. Tegelberg Å, Kopp S. Skin surface temperature over the temporomandibular joint and metacarpophalangeal joints in individuals with rheumatoid arthritis. Acta Odontol Scand 1987;45:329–36.
23. Tegelberg Å, Kopp S. Skin surface temperature over the masseter muscle in individuals with rheumatoid arthritis. Acta Odontol Scand 1988;46:151–8.
24. Åkerman S, Kopp S. Intra-articular and skin surface temperature of the temporomandibular joint in patients with rheumatoid arthritis. Acta Odontol Scand 1988;46:41–8.
25. Appelgren A, Appelgren B, Kopp S, Lundeberg T, Theodorsson E. Relation between the intra-articular temperature of the temporomandibular joint and the presence of neuropeptide Y-like immunoreactivity in the joint fluid. Acta Odontol Scand 1993;51:1–8.
26. Geborek P, Saxne T, Pettersson H, Wollheim FA. Synovial fluid acidosis correlates with radiological joint destruction in rheumatoid knees. J Rheumatol 1989;16:468–72.
27. Strenström CH, Lindell B, Swanberg E, Swanberg P, Harms-Ringdahl K, Nordemar R. Intensive dynamic training in water for rheumatoid arthritis functional class II—a long term study of effects. Scand J Rheumatol 1991;20:358–65.

Received for publication 28 October 1994
Accepted 19 April 1995