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Chronic Headache and Dysfunction of the Temporo-Mandibular Joint.

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During the past few decades, the etiology of chronic headache has been discussed from many different aspects in a number of theses and other publications. It is, however, surprising to find, in the purely medical literature, how little attention has been paid to the stomato-gnathic system and its significance in this connection. It has nevertheless been well known, thanks to Costen's investigations (1936), that changes of odontogenic origin in the temporo-mandibular joints may give rise to a number of symptoms in the head region, among others a stubborn headache of neuralgic type. The clinical features and pathology of these arthroses of the temporo-mandibular joints have often been the subject of discussion in odontologic literature (see references). The particular combination to be discussed in this paper, chronic headache and odontogenic temporo-mandibular joint dysfunction, has, however, received little attention, only a few odd publications, mentioning very few cases, having taken it up in recent years (Ekensten; Myrhaug; Lindén). The investigation described in the present paper was therefore started with a view to obtaining information on the occurrence of chronic headache due directly or indirectly to odontogenic factors. Especial interest was given to the relationship of temporo-mandibular joints and jaw muscles in this connection; other aspects studied were the incidence of this type of headache, and results obtained from orthopedic treatment of the temporo-mandibular joint dysfunction.

Preliminary results have already been published by us (Berlin, Dessner, Åberg, 1954; Dessner, 1954).

Clinical features.

Regarding the anatomical and physiological conditions necessary to the closer understanding of the clinical features the reader is referred to the common textbooks.

As has already been mentioned, there occur in dysfunction of the temporo-mandibular joint a number of signs and symptoms which have been investigated and classified by Costen, and the whole complex of symptoms has been named Costen's syndrome after this author. These signs and symptoms have been divided into local signs, arising from the mandibular joints, and peripheral symptoms, from other organs and tissues of the head. Costen sums up his syndrome in 14 points. The symptoms of greatest significance to the present discussion is headache, which is most distressing to the patient and which causes him to seek medical aid.

If the local signs are very evident, the diagnosis need not cause any great difficulty. However, it is usually the peripheral discomfort that dominates the picture. The patient complains of a persistent, oppressive aching pain. As a rule, this is concentrated to the crown and the temples, the forehead and temples, but sometimes also to the back of the head; it is often described also as dull pain over the root of the nose and behind the eyes. The patient often complains of fatigue and headache on waking up. In a few cases, neuralgia-like pains over the sinus region and mandible, and in the throat, are mentioned. It is usually found, also, that in connection with opening and chewing movements the mandibular joints creak, cause pain and tenderness, and display changes in mobility. During opening and closing movements, it is seen that one of the condyles gets stuck, as it were, the lower jaw deviates towards the same side and then, after having passed the obstacle, glides back into its normal path. Crepitation and creaking arise owing to unevenness of the articular surfaces, usually due to changes in the articular disc. They may, however, also arise as the result of luxation due to the slackened capsule, creaking occurring when the mandibular head slides over the eminentia articularis and assumes a position of subluxation. The restricted mobility also originates from disc degeneration, which may produce an obstruction in the joint and hinder normal joint movements.

Roentgen examination of the temporo-mandibular joints is of the greatest value as a complement to the clinical investigation; it provides, in the majority of cases, the roentgenologic equivalent to the clinical picture. A roentgenologic investigation into the position of the condyloid processes ought to throw light on the habitual centric position, the relaxed rest position, and the position in maximum opening. Such an investigation will usually reveal a displacement of one or both condyles upwards and backwards in the glenoid fossa when the teeth are clenched in the habitual centric position, and a more or less marked discrepancy between this position and the relaxed rest position. With the jaws opened to the maximum, the subarthrosis or dysarthrosis positions can be established. In addition, it is also possible to find anatomic changes in the form of degeneration of the meniscus, condyles and articular tubercles. These roentgenologic changes are, however, usually found only in the more advanced stages. Thus, it is not uncommon to encounter cases of clinically established temporo-mandibular joint arthrosis without roentgenologically verifiable anatomic changes, while the topographic displacements may be recorded at a much earlier stage.

If it can be established at the examination that the mechanical conditions for the development of temporo-mandibular joint arthrosis, in the form of a traumatic

occlusion or a closed bite, are also at hand, then a diagnosis of odontogenic mandibular arthrosis with secondary headache should be seriously considered. Causal dental orthopedic treatment along the lines to be discussed further on should thus be tried.

The discomfort suffered by these patients is often of long standing and usually causes them to become mentally worried, sleepless and irritable. Owing to the fact that so little is known as yet regarding the connection between temporo-mandibular joint dysfunction and chronic headache, it is a common occurrence for patients to seek medical attention for many years without a correct diagnosis being made.

As regards the diagnosis, it is naturally not always possible, in a patient with concurrent headache and signs of arthrosis in the temporo-mandibular joints, to prove with certainty that there is a connection between the two signs, unless, of course, a dental orthopedic correction has given a positive result. In uncertain cases, a treatment of this kind can be very useful as a diagnostic test. If no appreciable improvement in the symptoms has taken place after 6—8 weeks, then stomato-gnathic dysfunction is very probably not the cause of the trouble.

Treatment.

The therapy should be fundamentally conservative and of a dental orthopedic nature. The first measure in handling odontogenic temporo-mandibular joint arthrosis should be to treat the causal mechanical anomalies by a temporary reconstruction of the bite based on the findings from a thorough preliminary examination. A final reconstruction of the bite may be undertaken later in order to ensure a continuation of the good results. In many cases, however, it is sufficient for the patient to use removable splints for some times, and then to wear them only at night, or only on a recurrence of the symptoms.

The treatment method for Costen's syndrome discussed here sometimes produces a dramatic improvement as early as within a few days. In general, however, it is more customary for the symptoms to subside gradually over a period of several weeks. A decided change for the better or a total disappearance of the discomfort is usually noted within 3—4 weeks, in a few cases a longer time elapses. As was mentioned before, if no effect from the treatment has been noted within a couple of months the diagnosis should be reconsidered. It has previously been the practice to try more radical measures, such as discectomy or condylectomy, in cases of marked temporo-mandibular joint arthrosis with severe or almost unbearable pain. These interventions have not shown very encouraging results, however, and in the cases of Costen's syndrome now to be described it can be said that such measures were extremely seldom indicated. Furthermore, according to Hjortsjö's observations, the result of an excision of this type seems to be that the joint becomes transformed into a purely non-physiologic type of joint, an »accentuated grinding joint» which causes greatly increased wear and tear on the articular surfaces.

The material.

Over a period of $2^1/_2$ years we have assembled cases of mandibular joint dysfunction with chronic headache from the district served by a medium-sized hospital. The diagnosis was established as correctly as possible on the basis of the typical anamnesis with headache of long standing and symptoms with the particular localisation mentioned further back. The headache had in most cases manifested itself a few years after extensive extractions of molar teeth, and often after the application of a prosthesis or other constructions, where insufficient care had been taken to produce a physiologic articulation entailing correct intermaxillary relations and muscular balance. It is a common occurrence, also, to encounter patients who have worn their prosthesis for decades, as a result of which successive resorption of the alveolar processes has brought about greatly altered relations between the jaws. Internal medical, neurologic and otologic examinations as well as an ophthalmiatric examination in suitable cases, were carried out in order to exclude as far as possible all other factors likely to be the cause of the headache. A clinical investigation, paying special attention to the temporomandibular joints and the bite, was then carried out, and in cases where Costen's syndrome was suspected the patient was sent to the hospital's odontologic unit for examination. A roentgen examination was carried out in a great many of the cases with a view to detecting anatomic or topographic changes in the temporomandibular joints.

In the material presented here, we have included only those cases in which we were able to diagnose Costen's syndrome with a high degree of certainty at the preliminary investigation, on the basis of anamnestic, clinical and roentgenologic data. The whole of this material has recently been re-checked (January—March 1955). A total of 134 cases were diagnosed. Of these 29 patients (21 women, 8 men) refused treatment for various reasons. Our material thus comprises 105 patients who underwent treatment along the lines indicated and who have since been followed up (92 women, 13 men).

In every series of cases with *temporo-mandibular joint arthrosis* previously published a considerable sex difference is noticeable, the incidence being much higher among women. As a rule, the proportion between men and women has been in the ratio of 1 to 3 or 1 to 4. With regard to the combination of temporomandibular joint dysfunction and chronic headache no statistics as to sex distribution have been published. In our material (134 cases) the ratio of men to women was 1 : 5.

Results.

The age distribution at the onset of the disease will be seen in figure 1. In most cases the patients stated that the headache developed by degrees and usually, as already mentioned, a few years after extensive alterations of various kinds in the bite. A glance at the figure reveals that the commonest age for the onset is between 30 and 50 years (*circa* 50 per cent).

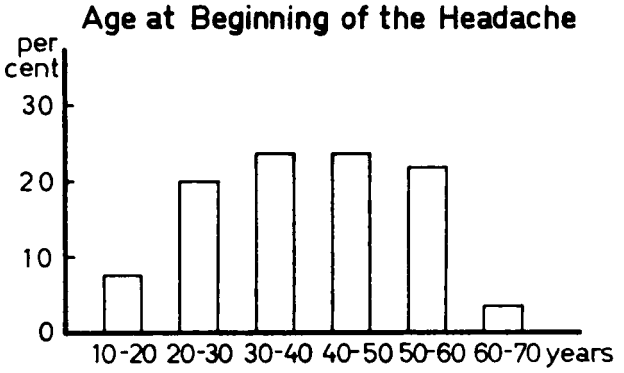

Fig. 1.

Table 1.

Duration of Headache.

Duration	Male	Female	Total
< 1/2 year	2	14	16
1/2—1 »	1	14	15
1—5 years	3	29	32
5—10 »	3	19	22
10—20 »	3	12	15
> 20 »	1	4	5
Total	13	92	105

Table 1 shows that no less than 70 per cent of the patients had had chronic headache for more than one year, and that 40 per cent had had their headache for over five years.

Table 2.

Observation Time.

Months	Number
3—6.....	23
7—12.....	35
13—18.....	39
19—24.....	3
> 24.....	5
Total	105

The material was also classified according to the duration of the observation time following the termination of the orthopedic treatment. The number of cases in the different time groups appears in table 2. The majority of the patients were under observation from 7—18 months.

Table 3.

Results	Number	Percentage
Cured	60	57 } 83
Considerably improved	28	26 }
Slightly improved	6	6
Not improved	11	11

From table 3 it will be seen that of the 105 patients in the series, 57 per cent had recovered completely after a longer or shorter period, usually after about 3—6 weeks, and 26 per cent were *considerably improved*, being only occasionally troubled by headache. Six per cent of the patients were considered to be slightly improved, and 11 per cent showed *no improvement*.

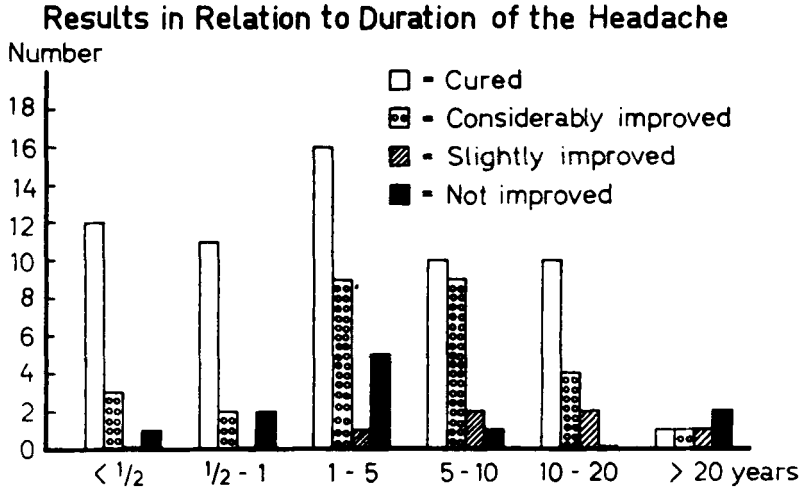

Fig. 2.

It is a point of some interest to study the effect of the headache's duration on the treatment results. To elucidate this, figure 2 was constructed. The duration of the symptoms obviously had no appreciable effect on the result.

Our investigation revealed that Costen's syndrome is common as an explanation of chronic headache, and that it should be borne in mind in all cases of protracted headache. It was also found that causal therapy gave a positive result in the vast majority of the cases. This makes it seem highly probable that this form of treatment as such is of definite importance to a satisfactory result. The possibility that iatrogenic factors and the introduction of a new and unusual form of treatment might have had a suggestive influence and jeopardized the interpretation of the results can hardly be said to hold good here. Many of these patients had sought different physicians and hospitals over a long period. It seems unlikely that none of the previously tried forms of treatment or physicians should have influenced suggestible patients to feel better or even cured. This did not,

in fact, occur in any instance, other than for a very short time, after which the patients again experienced their previous cephalalgia. Furthermore, the patients often expressed extreme scepticism when the new treatment was suggested to them. A positive result under such conditions refutes a suggestive effect. Another distinctly noticeable feature is that, in a large number of the cases, the improvement was first experienced 3—4 weeks after the termination of the treatment.

Discussion.

Our material consisted of patients with chronic headache and temporo-mandibular joint dysfunction. The concurrent presence of bite defects or traumatic occlusion suggests that the changes in the joints were odontogenic in origin. Cases are, however, often encountered in which the arrangement of the teeth and the bite are obviously pathologic but in which it is not possible to demonstrate typical signs of arthrosis in the temporo-mandibular joints, only an uneven path of movement. Tenderness over the masticatory muscles may be established, and one is also told, in response to questioning, that these patients, during troublesome work, or in their sleep, keep their jaws closely pressed together, or grind and gnash their teeth more or less rhythmically (bruxism). This is a sign of an increased tonus and functional disturbance in the masticatory muscles. It is conceivable that a relatively constant hypertonicity, due to an abnormal muscular pattern, is the factor causing the headache in patients with Costen's syndrome. »Jaw clenching» as a cause of headache has also been mentioned by Antoni. In the cases of closed bite or traumatic occlusion the altered muscular conditions can be readily explained by the dislocation of the mandibular joint condyles previously mentioned. As a result, the lateral pterygoid and temporal muscles, in particular, become abnormally stretched, and the muscles respond in the usual way with an increase in tonus. Electromyographic examinations by, among other authors, Moyers, Pruzansky, Perry and Harris show very plainly that there is an alteration in the mucle tonus and a disorganization of the muscular co-ordination in the stomato-gnathic system in cases of temporo-mandibular joint dysfunction. Perry and Harris have demonstrated that, in normal persons, the temporal and masseter muscles on both sides for the most part react synchronously when the jaws are in full action but that the former begins to contract immediately before the latter. In patients with mandibular joint dysfunction, on the other hand, the conditions are the reverse; the temporal muscle and the masseter on both sides do not reach this simultaneous maximum activity and the masseter manifests its contraction before the temporal muscle.

It has been suggested by earlier investigators that the reason for the pain in Costen's syndrome might be that sensitive structures in the space between the displaced condyle and the external auditory canal are being pinched. The auriculotemporal nerve has been especially mentioned in this connection. This interpretation obviously must be incorrect, as Sicher, among other authors, has pointed out. This author, as well as Ramfjord, has been one of the most enthusiastic ad-

vocates of the muscular theory to account for these pains. As any textbook of anatomy will show, the auriculo-temporal nerve runs not behind the condyle but around the condylar neck, and obviously will not be subjected to pressure when the condyle slides backwards and upwards. Other investigators (*e. g.* Myrhaug) have suggested that the pain in Costen's syndrome might be explained as »referred pain». In our opinion, however, the *unphysiologic tension and hypertonicity* in the pterygoid muscles and the other masticatory muscles is the essential cause of the headache. The aim should be to reinstate the physiologic conditions by orthopedic treatment, thus achieving a balanced articulation and a normal intermaxillary relation. The condyles will then be gradually directed into their physiologic positions. The tension and strain in the masticatory muscles subsides, and as a result of the reduction in stress the tonic contraction in these muscles loosens. In general, it must be presumed that the incorrect pressure and the effect of the strain on the masticatory muscles will disturb the harmonious interplay between the individual members of the muscle chain involved in the stomatognathic system and give rise to a more or less chronic state of pain. We consider, therefore, that headache, in temporo-mandibular joint dysfunction, is an »overloading» disease of the type that has been arousing considerable interest during recent years. The symptoms are, in our opinion, liberated by the previously described disturbances in the jaw muscles. In this connection, we may mention the resemblance in causative mechanism to lumbago, in which incorrect orthopedic conditions in the feet, hips or back cause the functioning of a coherent chain of muscle to get out of balance, so that a state of cramp-like contraction arises and the lumbago pains set in.

As we are dealing, in Costen's syndrome, with muscle groups which have been for a long time under the influence of unphysiologic forces and in a constant state of static muscular activity, it is not to be wondered at that some time must elapse before the muscles adjust themselves to altered tonic conditions in their new, more acceptable position. Under these circumstances, it cannot be expected that physiologically perfect conditions will become established immediately after the correction of the bite; it takes time for muscles and joints, capsules and ligaments to become accustomed to the new positions.

It is self-evident that many persons who have clinical and roentgenologic signs of temporo-mandibular joint arthrosis, and still more who, because of malocclusion have the anatomic pre-requisites for the development of such joint anomalies, do not have headache. On the other hand, some of these persons *with* headache might, obviously, be suffering from it for some quite different reason than Costen's syndrome. Therefore, in cases where there is reason to suspect the existence of other provoking mechanisms, it is necessary to make as thorough an examination as possible in order to exclude other explanations of the headache.

The figures presented in this paper indicate that a suggestive effect in response to the orthopedic treatment is unlikely except in very rare cases, and there is reason to believe that these isolated patients soon have a recurrence of their headache when the effect has worn off. The explanation of the originating mechanism that seems most plausible to us is also based on logic and has analogies

in other parts of the organism. Among the other cases in which a diagnosis of Costen's syndrome seems reasonable but in which unsatisfactory treatment results indicate that other factors must be sought to account for the headache, the diagnosis need not in itself be incorrect. The cause of the headache may often be complicated, but in these cases it is usually possible by correction of the bite to bring about at least some relief, or to obtain a statement to the effect that the headache has changed its character. Even if we were to be more strict with the diagnosis of Costen's syndrome, and demand that in addition to temporo-mandibular joint dysfunction and bite defects a positive result from the corrective treatment must also have been achieved, the fact nevertheless remains that it is common to encounter headache cases that fulfill all these requirements for the diagnosis. There is therefore reason to wonder whether odontogenic temporo-mandibular joint dysfunction is not in general a common cause of chronic headache pains. In any case, when the cause of headache is being sought for in the future, one should not content oneself with purely symptomatic treatment until after the possibility of Costen's syndrome being the causative factor has been definitely refuted.

Electromyographic recording of the activity, correlation and tonus of the masticatory muscles, such as has been used during recent years by the previously mentioned workers, may increase our possibilities for studying this problem. An investigation of this type into the physiologic reactions of the mandible's elevators has already been carried out by Carlsöö. It is hoped that we shall soon have the technical resources to make an electromyographic investigation into a series of cases of Costen's syndrome before and after a corrective intervention on the bite.

Summary.

In the present investigation a report is given on 105 cases (92 women and 13 men) of chronic headache in connection with temporo-mandibular joint dysfunction. All had suffered from headache for a considerable time, from 5 to more than 20 years in 42 cases.

After medical, otologic and odontologic analysis, these 105 patients were subjected to bite-correcting treatment (*i. e.* selective grinding, temporary splints or dental prostheses). The patients were kept under observation from 3 to more than 24 months (82 cases were followed up for more than 6 months).

As far as the headache is concerned the results may be summarized as follows:

1. 83 % are completely free from headache or considerably improved.
2. 11 % are not improved.
3. The previous duration of the headache does not seem to be of any importance for the therapeutic result.

The causation of the headache is discussed. The tenderness of the masticatory muscles and the bruxism that also often occurs are a manifestation of a disturbance in the function of these muscles resulting in an increased muscular tonus. In the opinion of the present authors this special type of headache belongs in the group

of complaints caused by overloading and is provoked by disturbances in the masticatory musculature.

Accordingly, an adequate treatment should aim at an unloading within the stomato-gnathic system.

These cases of Costen's syndrome are common enough to be taken into consideration in every analysis of chronic headache.

References.

1. Antoni, N.: Huvudvärk, Rabén & Sjögren, Stockholm 1943. — 2. Berlin, R., Dessner, L. & Åberg, S.: Sv. Läkartidn. *59:* 11, 1954. — 3. Block, L. S.: J. A. D. A. *42:* 428, 1951. — 4. Block, L. S. & Harris, E.: J. A. D. A. *29:* 349, 1942. — 5. Boman, K.: Acta chir. scand. Suppl. 118: 1947. — 6. Brandrup-Wognsen, T.: Odont. Tidskr. *53:* 139, 1945. — 7. Brandrup-Wognsen, T.: Odont. Tidskr. *53:* 191, 1945. — 8. Carlsöö, S.: Acta odont. scand. Suppl. 11: 1952. — 9. Costen, J. B.: Ann. Otol. Rhinol. *43:* 1, 1934. — 10. Costen, J. B.: J. A. M. A. *107:* 252, 1936. — 11. Costen, J. B.: Ann. Otol. Rhinol. *53:* 655, 1944. — 12. Dessner, L.: Odont. Tidskr. *62:* 373, 1954. — 13. Ekensten, B.: Finska Tandläkarsällsk. Förhandl. *3:* 63, 1949. — 14. Gerry, R. S.: J. A. D. A. *34:* 261, 1947. — 15. Gerry, R. S.: Oral Surg. *7:* 876, 1954. — 16. Granger, E. R.: J. A. D. A. *48:* 638, 1954. — 17. Hjortsjö, C. H.: Odont. Revy *4:* 203, 1953. — 18. Lindblom, G.: I S:ta Appolonias våld, Nord. Bokhandeln, Stockholm 1946. — 19. Lindblom, G.: Svensk. Tandl. Tidskr. *44:* 459, 1951. — 20. Lindén, V.: Nord. Med. *50:* 1110, 1953. — 21. Miller, Ch. W.: J. A. D. A. *44:* 386, 1952. — 22. Moyers, R. E.: Am. J. Orthodont. *36:* 481, 1950. — 23. Myrhaug, H.: Finska Tandläkarsällsk. Förhandl. *4:* 55, 1949. — 24. Myrhaug, H.: Nord. Med. *50:* 1107, 1953. — 25. Perry, H. T. & Harris, S. C.: J. A. D. A. *48:* 665, 1954. — 26. Posselt, U.: Odont. Tidskr. *53:* 1, 1945. — 27. Posselt, U.: Acta odont. scand. Suppl. 10: 1952. — 28. Pruzansky, S.: J. A. D. A. *44:* 49, 1952. — 29. Ramfjord, S.: Personal communication. — 30. Sicher, H.: Oral Surg. *7:* 149, 1954. — 31. Sicher, H.: J. A. D. A. *48:* 620, 1954. — 32. Söderberg, F.: Acta Otolaryngol. Suppl. *95:* 85, 1950. — 33. Thompson, J. R.: J. A. D. A. *48:* 626, 1954.