

THE ETIOLOGY AND CONSERVATIVE TREATMENT OF HUMERAL EPICONDYLITIS

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ABSTRACT. The etiology of humeral epicondylitis and three different conservative methods of treatment were prospectively studied during two years in patients visiting a large occupational health center. Eighty-eight workers, 50 male and 38 female, out of 7 600 suffered from humeral epicondylitis. The annual incidence was 59 per 10 000 workers. The mean age was 43 years. The main cause (61.4%) of tennis elbow was over-exertion of the finger and wrist extensors in trained workers. Forty-seven patients were treated with local corticosteroid and anesthetic injections (beta-methasone + lidocain), 20 patients with methylprednisolone injections and 21 patients with wrist immobilization in combination with indomethacin. The result of therapy was excellent or good in 82% of the cases after six months and in 90% after one year. No significant differences ($p > 0.1$) in results were observed between patients treated with different therapies. Two patients (2.3%) were operated on after conservative treatment had failed.

Key words: Epicondylitis, etiology, conservative treatment, tennis elbow

Humeral epicondylitis is generally caused by over-exertion of the forearm or a trauma to the cubital region (2, 4). The disease is more and more often recognized as occupational (12). Conservative treatment usually has a favourable effect on epicondylitis. Many different conservative methods have been described, but the results have seldom been compared. The treatment has usually consisted of various corticosteroid injections and splint therapy in combination with medication (3, 6, 8, 13).

The purpose of this study was to analyse the etiology of humeral epicondylitis and to compare prospectively three different conservative treatments in a series of patients visiting a large occupational health center.

Etiology

Humeral epicondylitis is caused by many factors. The etiology and the pathophysiology vary, but the main symptom is the same in all cases—pain in a

humeral epicondyle. An occupational factor is often mentioned as one of the most common causes of the disease (Table I). Acute strain of the cubital region or repeated microtrauma cause tennis elbow in athletes (11). Moreover, a neurogenic (5, 15) or psychogenic factor (14) has been mentioned among the causes of tennis elbow, or the disorder has been interpreted as a secondary symptom of rheumatic disease (9, 10).

The pathophysiology of humeral epicondylitis has been very much discussed. It seems probable that the nutrition of the connective tissue plays a

Table I. *The etiology of humeral epicondylitis*

Etiology	No. of patients	%
1. Secondary to trauma	17	19.3
a. Direct blow to the cubital region	14	
b. Repeated microtrauma (mostly strain)	3	
2. Unaccustomed movements engaging the forearm in a forced and monotonous way	17	19.3
3. Spontaneous occurrence in persons used to repeated movements engaging the forearm	54	61.4
a. Repeated monotonous movements at work	48	
b. Isometric over-exertion of the forearm	6	
4. Other causes		
a. Neurological causes		
– Cervical radiculitis (C5–C6)		
– Nerve entrapment (n. interosseus posterioris)		
b. Secondary symptoms of rheumatic disease		
c. Psychogenic causes		
– Secondary symptom of anxiety and depression		
Total	88	100.0

Table II. *Type of occupation*

Occupation	Females	Males	Total
<i>Occupational epicondylitis</i>			
Metal workers	1	18	19
Packers	13	—	13
Shop assistants	6	1	7
Industrial cleaners	3	—	3
Office employees	3	—	3
Shoemakers	1	2	3
Miscellaneous	4	12	16
Total	31	33	64
<i>Epicondylitis due to hobby</i>			
Office employees	6	11	17
Miscellaneous	1	6	7
Total	7	17	24

decisive part. The epicondyle being surrounded by only some soft tissue, the blood supply is primarily poor. The muscle fibers are well supplied with blood, but the fibers of the tendons attached to the periosteum of the epicondyle are relatively avascular. The muscle heals rapidly, while the tendon improves slowly owing to the paucity of nutrition (11). The degenerative changes occurring with increasing age contribute to the impairment of nutrition in this region and ischemic pain develops when a continuously monotonous movement at work over-strains precisely the points of insertion of certain muscles.

PATIENTS AND METHODS

The series consists of the new patients with tennis elbow visiting a large occupational health center during a two-year period (June 1, 1977–May 31, 1979). All these cases were diagnosed and treated by the author. During the years of the study the average number of workers admitted to the health center was 7600. Of these, 43% were female and 57% male. The mean age of the workers was 37 years. The patients were thoroughly questioned about their history of illness, work and hobbies. The places where they worked were visited. The etiology of the disease was established on the basis of history, clinical examination and acquaintance with the place of work.

During the years of the study new epicondylitis developed in 88 patients, 38 (43%) of whom were female and 50 (57%) male. The annual incidence was 59 cases per 10 000 workers. The mean age of patients was 43 years (range 22–64 years). The right humerus was involved in 58 (66%) cases, the left in 30 (34%). The epicondylitis was lateral in 74 (84%) cases and medial in 14 (16%). Four patients were left-handed. The disease was judged as occupational in 64 (73%) cases, while in 24 (27%) cases a spare time activity was the cause.

Without exception the work of the patients suffering from occupational epicondylitis meant over-straining of forearm muscles (Table II). A pinching–squeezing grip (47/64) and repetitive rotation of forearm (53/64) were often involved at some phase of the work. There was a highly significant difference ($p < 0.001$) in the daily number of working movements between the cases of occupational epicondylitis and other cases. The working tools used by the patients with occupational epicondylitis, or the loads they had to move, weighed between one and 20 kg in the majority of cases (43/64). In epicondylitis with a different etiology this was rarely the case (4/24) ($p < 0.001$). Heavy continuous turning of nuts had caused the disease in 10 cases. Three metal-sheet workers employed in motor-car repair had contracted the disease by static exertion of the assistant hand held against the dented sheets as a counter-weight while beating them straight with the dominant hand. A female telephone operator developed epicondylitis from continuously lifting and holding the receiver. Her symptoms improved when she was furnished with a headphone. In the case of a male metal fuser epicondylitis was due to daily placing 250–300 metal bars weighing 7–13 kg into the smelting furnace using the pincers–squeeze finger grip. The condition improved when the patient was transferred to storehouse work. Later this working moment was automated.

All patients had performed the same kind of work for over one year, the majority (50/64) for over five years, before they became ill. In the group of occupational epicondylitis 35 patients were paid by the hour and 20 patients were paid by the piece. Nine persons did assembly line work. Among office employees epicondylitis was due to some spare time occupation. The most common causes were squash, tennis, bowling and various free time activities such as lopping or sawing.

The diagnoses were based on the history of illness and

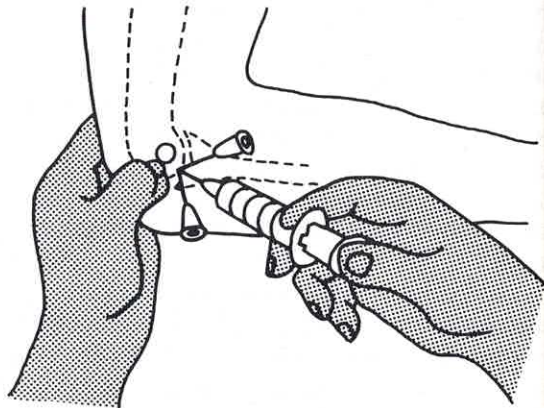


Fig. 1. Technique of injection: The patient keeps his elbow free and slightly flexed. The highest point of the epicondyle is palpated and 0.5 cm distally from this a needle (G 24) is lightly pricked into the insertion area of the muscles and the substance is injected into three different points of the painful area.

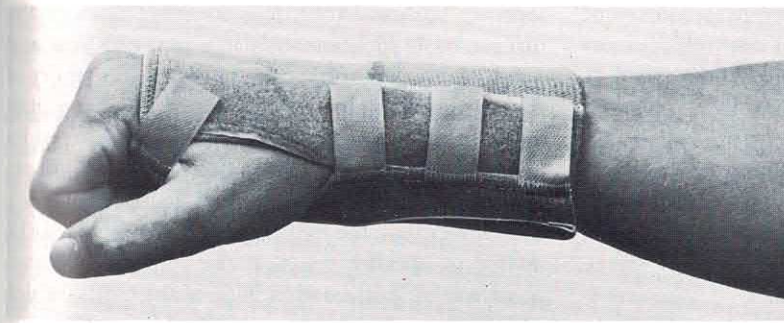


Fig. 2. Splint therapy: A wrist splint (Futuro®) permitting free movement of the fingers was used. Indomethacin was given to the patients during the splint therapy 25 mg three times a day.

clinical examination (4, 9). Roentgen examination of the cubital region was performed in 12 cases. In six of these calcified deposits were detected around the epicondyle. On the basis of the clinical examination 41 (47%) cases were classified as mild and 47 (53%) as relatively severe. In the former, pain at the epicondyle on palpation was the only symptom while in the latter the grip power of the hand was noticeably decreased.

During the first year of the study treatment was initiated in every second case by local corticosteroid anesthetic injection (betamethasone 1 ml + lidocain 1 ml, Fig. 1), in the remainder of patients by application of a wrist splint in combination with indomethacin medication (Fig. 2). Corticosteroid anesthetic injection therapy was given to 22 patients, splint-indomethacin therapy to 21 patients.

If the patient was unable to work or had not appreciably improved after three corticosteroid anesthetic injections at intervals of 2-3 weeks or after splint immobilization treatment for three weeks, the treatment was considered unsuccessful and was changed. Physical therapy such as ultrasound was then instituted.

The effects of two different corticosteroid therapies were compared during the second year of the study. During the first half-year all patients received methylprednisolone injections (1 ml Depo-Medrol®), during the second half-year all patients were given combination of betamethasone and lidocain (1 ml Celestone-Chronodose® + 1 ml Lidocain®). Twenty patients were treated by methylprednisolone, 25 by betamethasone-lidocain. The treatment was changed to physical therapy if no improvement was noticed after three injections.

RESULTS

The course was checked during the treatment. Subsequently the patients were seen by the author six months and one year from the institution of therapy. At follow-up the patients were interviewed about their symptoms, a clinical examination was performed and the improvement was estimated (Table III).

The result of treatment was considered good if there was slight pain at the epicondyle on palpation, fair if local pain was considerable and the grip power of the hand was decreased. In cases judged as poor the grip power of the hand was clearly decreased, severe pain was experienced on palpation and the epicondyle was swollen.

After six months the result was excellent or good in 82% of the patients. All patients were able to work. Four patients had taken a new job. Out of 18 proposed cases, insurance companies accepted six as occupational disease and three as accidents at work. After one year no significant difference ($p > 0.1$) was observed between the different therapies. The average time of absence from work was 14.4 days in the total series. The betamethasone therapy was exchanged six times for

Table III. One-year results of treatment

Treatment	No.	Results								Average duration of absence from work (days)
		Excellent		Good		Fair		Poor		
		No.	%	No.	%	No.	%	No.	%	
Bethametasone + lidocain	47	36	77	7	15	3	6	1	2	16.4
Methylprednisolone	20	14	70	3	15	2	10	1	5	12.2
Splint + indomethacin	21	16	76	3	14	2	10	-		12.2
Total	88	66	75	13	15	7	8	2	2	14.4

another treatment (12.7%), the methylprednisolone therapy two times (10%) and the splint indomethacin combination four times (19%) ($p > 0.1$). Betamethasone-lidocain injections were given on average 1.9 times and methylprednisolone 2.0 times. The duration of splint therapy was on average 2.2 weeks. The average duration of illness was six months, the duration of treatment three months.

Conservative treatment failed in two cases. These patients were operated on.

DISCUSSION

The present investigation confirms the view that humeral epicondylitis is due to over-exertion of the forearm or a trauma. Continuously monotonous over-exertion of the forearm was the cause in over 60% of the present cases. A sudden repetitive movement at work and trauma were less significant. Other etiologies mentioned in the literature have been called in question (7). The disease is most common in workers of middle-age, which supports the view that degeneration of the connective tissue in combination with over-exertion plays a significant role in the pathophysiology of the disease.

Isometric exertion of the forearm has so far not attracted much attention as a factor causing epicondylitis, although it seems obvious that this phenomenon is of importance particularly when the assistant hand is involved. This series includes six cases due to isometric muscular tension. The weight of the working tools and loads being handled plays a part in the development of the disease. Light pieces are managed using only the muscles of the hand, while the handling of heavy burdens makes a demand on the powerful musculature of the upper arm, shoulders and back. Objects weighing a few kilograms can be handled in rapid repetitive work using only the forearm musculature. Epicondylitis is a considerable risk when a worker over 30 years old has to handle objects weighing some kilograms in rapid succession using the pincers-squeeze grip while rotating the forearm. In the prophylaxis of epicondylitis the weight of the working tools and loads to be moved is a major concern. If a reduction in weight is not possible, the working pace has to be slowed down or systematic pausing has to be introduced in order to allow the musculature time for relaxation.

It has been stated in the literature that humeral epicondylitis has a marked tendency towards spon-

taneous healing. According to many authors the disease heals spontaneously in a year or a year and a half (2, 4). Unfortunately, however, no report of the rate of spontaneous recoveries has been published. Of the present patients 97.7% improved by conservative treatment, only two were operated on. The percentage (2.3%) of operated patients is a little lower than the figures previously reported (1). At follow-up after one year the response to treatment was at least good in 90% of the cases, which proves that the methods used had been effective. Day and his colleagues noted a good response to treatment in only 20-24% of cases when treating epicondylitis with nothing but injections of common salt or an anesthetic (3). At follow-up no significant difference was found in the present study between the different treatments with regard to the duration of sick-leaves, number of visits, response to treatment or change to another treatment. The methods used must therefore be considered equal on the basis of long-time results, which are essential in the treatment of epicondylitis.

Local injection of corticosteroid is an important method of treating tennis elbow. In a double blind test Day showed that the results of corticosteroid injection (methylprednisolone) were highly significantly more favourable than the results with injection of common salt or an anesthetic. These two treatments gave equal, very poor results (3). Methylprednisolone, hydrocortisone, triamkinilone and betamethasone have been used as corticosteroids and all have given good results (3, 4, 8). The doses of corticosteroid have varied between 0.1 and 1.0 ml, the latter being most commonly used. A local anesthetic has often been added in order to diminish the irritation that the injection causes in about one third of patients during the first 2-3 days (8, 13). However, the local anesthetic adds to the quantity of substance injected and thus increases the pressure on the tissue. The addition of a local anesthetic does not seem indicated, since pain after injection was experienced by both the anesthetized and the not anesthetized patients in the present series. After-injection pain can be minimized by using an atraumatic technique of injection and by being particularly careful to avoid damage to the periosteum. The number of injections should not exceed three or four (10), because the response to repeated injections weakens and the risk of complications increases. If a satisfactory response fails to occur, the treatment has to be exchanged for

another therapy, for instance a splint or physical therapy.

A wrist splint in combination with an antiflogistic drug is an effective treatment of tennis elbow, especially in acute cases. The usefulness of this therapy is reduced by disturbance of the hand function due to the splint and by possible side-effects of the drug. During splint therapy the pain usually disappears in two weeks, so that the use of a splint for more than three weeks is not indicated. A splint is not worth while trying in mild chronic cases, because the patient usually lacks sufficient motivation to use the splint regularly.

Summarizing this investigation it may be established that the most common cause of humeral epicondylitis is occupational and consists of either continuous or acute over-exertion of the forearm. The long-time results with corticosteroid injection and with splint therapy in combination with medication are statistically equal. No statistically significant difference was observed between the responses to different corticosteroids (betamethasone + lidocain and methylprednisolone). Of the present patients 97.7% improved by conservative treatment and only 2.3% were operated on.

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