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Tennis elbow

Lateral elbow pain syndrome

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KURPPA, K., WARIS, P. and ROKKANEN, P. Tennis elbow: Lateral elbow pain syndrome. *Scand. j. work environ. & health* 5 (1979): suppl. 3, 15—18. A review of the etiology, occurrence and pathogenesis of "tennis elbow" is presented.

Key words: epicondylitis, etiology, occurrence, pathogenesis, tennis elbow.

"Tennis elbow" or "lateral epicondylitis" is a name used for a painful condition at or about the lateral epicondyle of the humerus. Characteristically symptoms are experienced when the wrist and finger extensors are actively used while the elbow is in extension.

Thus far no agreement has been reached as to the appropriate name for this condition because its pathogenesis is still obscure. Only a minority of the patients are actually tennis players (6, 8), and the term "epicondylitis" is equally unsatisfactory because the pain may be located at various points in the elbow rather than at the lateral epicondyle. Bowden (4) suggested that the proper term for tennis elbow might be "lateral elbow syndrome."

ETIOLOGY AND OCCURRENCE

Most authors seem to agree that the main cause of tennis elbow is overexertion of the finger and wrist extensors which orig-

inate at or about the lateral epicondyle of the humerus. The movements of the hand implied by the etiology include either repeated dorsiflexions or alternating pronation and supination. The stress effect is intensified if the elbow is in extension and strength is demanded during performance.

Goldie (8) reported on a series of 113 patients who were operated on because of tennis elbow symptoms. Overexertion appeared as a common factor in these patients (table 1). The author stated that the majority of the patients developed tennis

Table 1. Causes of tennis elbow reported by Goldie (8).

Cause	Patients
Unaccustomed movements engaging the forearm extensors in a forced and monotonous way	33
Spontaneous occurrence in persons used to repeated movements engaging the forearm extensors	50
Secondary to trauma (direct blow or indirect strain)	29
Unknown	1
Total	113

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elbow after some form of overexertion connected with a certain new pattern of movements introduced at work. The condition was also seen in patients who had used their arm in the same activity for many years, and the symptoms had appeared insidiously.

Lambrecht (12) described an increase in the number of tennis elbow patients in the Federal Republic of Germany after the Second World War. He pointed out that those afflicted were often people who had been employed to do strenuous work to which they were unaccustomed. The right elbow was affected much more often than the left. Other authors have also paid attention to the fact that the "working" hand is more often affected (3, 8, 13).

Direct trauma to the lateral epicondyle area is thought to be of less importance than overexertion. Goldie (8) reported that in 26 % of his patients the disease was due to trauma, either a direct blow to the epicondyle or a sudden indirect strain, as by a pull or forceful elbow extension. Bosworth (3) stated that in 55 % of his 27 operative patients blunt trauma was a precipitating cause.

In an epidemiologic survey which included the annual incidence and prevalence of tennis elbow in a Swedish population, Allander (1) was able to include some 15,000 subjects between the ages of 34 and 74 years. The prevalence of tennis elbow was found to be some 1 to 3 % for both sexes, with the exception of women aged 42—46 years, for whom the prevalence was reported to be a surprising 10 %. Such a high prevalence is a bit difficult to understand in the light of the given incidence figures (less than 1 %) and the fact that the average duration of tennis elbow does not exceed a few months.

One very interesting feature of Allander's study was that both the incidence and prevalence of tennis elbow tended to decrease with age, while, as expected, the annual incidence and prevalence of arthrosis of, e.g., the hip and knee increased. Therefore the mechanisms for arthrosis and tennis elbow appear to differ and might depict the influence of occupational or other environmental factors in the pathogenesis of tennis elbow. Also the remission rate for tennis elbow increased with age, and therefore environmental

causes are more implicated than progressive degenerative changes.

Although Allander (1) reported that tennis elbow was more prevalent in middle-aged females than males, most publications have described contrary findings. Male to female ratios of 5:1 or 4:1 have been reported (8). These controversial results, as well as others with a female predominance, need not be surprising because they come from uncontrolled studies. Nor does the population survey of Allander prove that females are more susceptible to tennis elbow because there was no analysis of the possible occupational differences between the sexes.

It is generally accepted that tennis elbow is more prevalent between the ages of about 40 and 50 years (1, 8, 12). Only odd cases have been found in patients in their 20s, and tennis elbow among patients younger than 20 is rare.

PATHOGENESIS

A multitude of pathological entities have been set forth for tennis elbow. Some authors have suggested that this disease incorporates numerous pathologies of different etiologies. Fig. 1 illustrates the structures at the lateral elbow region which have been linked with the pathogenesis of tennis elbow.

The most popular explanation for tennis elbow is still the one described originally by Cyriax (7). According to this theory there are macroscopic and microscopic tears between the common extensor tendon and the periosteum of the lateral humeral epicondyle; these tears are caused by repeated stress and strain. Coonrad and Hooper (6) used a tourniquet while operating on 39 tennis elbow patients and found a tear of the tendon cuff in 28 patients and scar tissue replacement of the tendon cuff in 9 of the 11 without an actual tear.

However, Goldie (8) reported no gross tears in the tendons of the patients on whom he had operated.

Another major theory concerning the pathogenesis of tennis elbow originates from the aforementioned extensive study by Goldie (8). He reported the presence of a subtendinous space containing areolar

tissue at the site of tennis elbow symptoms. Goldie reported that in all his tennis elbow patients this subtendinous space was filled with granulation tissue which, with tuftlike expansion, invaded the aponeurosis. Free nerve endings were located in this granulation tissue, the removal of which caused complete recovery from the symptoms. Goldie also reported a hyper-vascularization of the aponeurosis and the subtendinous space with marked edema. The subtendinous space is not developed in youth and appears just before the age of 20. This rate of development is in accord with the view that tennis elbow patients are usually middle-aged, and patients under 20 years of age are rare. However, Boyd and McLeod (5) operated on 37 patients and reported that granulation tissue was not recognized in the subtendinous space of their patients.

The concept of neuritis of the radial nerve as a cause of tennis elbow symptoms was introduced by Kaplan (11). A more specific form of entrapment neuropathy of the deep branch of the radial nerve was suggested as a cause of tennis elbow by Roles and Maudsley (15). They noted constriction of the radial nerve by adhesions to the capsule of the radiohumeral joint and the short, radial extensor muscle of the wrist and by the fibrous edge of the supinator muscle, the so-called arcade of Frohse. The clinical symptoms seen were those of the classical tennis elbow with an additional motor weakness of the extensors.

Although most of the paralysis cases of the posterior interosseus nerve are thought to be caused by overexertion of the arm, thus resembling the hypothetical etiology of tennis elbow, the syndrome should be considered a specific entity (2, 10). In his recent study, Werner (16) estimated the share of posterior interosseus nerve entrapment to be around 5 % among tennis elbow patients.

It has been claimed that cervical spondylosis could be a cause of tennis elbow. However, in most of the studies in which this etiology is implicated, the diagnostic criteria have been inconsistent. A clinical examination can distinguish pain in the elbow arising from the neck from pain due to tennis elbow. The elbow pain

evoked by wrist movements cannot originate from the neck.

Goldie (8) studied autopsy material and reported that between the ages of 20 and 50 years the histological picture of tendon remained stable with no signs of degenerative changes. He concluded that nothing in his study supported the assumption that tennis elbow should appear within a certain age period due to "normally" occurring structural changes of the tissues around the lateral epicondyle.

There is some evidence supporting the hypothesis that certain individuals could be more susceptible to tennis elbow than others. Boyd and McLeod (5) reported that 38 % of their 871 tennis elbow patients also had pain in other locations because of, e.g., calcification of the rotator cuff, bicipital tendinitis, de Quervain's disease, or carpal tunnel syndrome. Murray-Leslie and Wright (14) found that patients with carpal tunnel syndrome had a tennis elbow prevalence of 33 % as compared to the 7 % prevalence of controls. They hypothesized that similar connective tissue changes might occur in the common extensor origin at the elbow and in the contents of the carpal tunnel. On the

Fig. 1. Lateral elbow region — A diagram. [1. humerus (humeral bone), 2. biceps muscle of the arm, 3. brachial muscle, 4. triceps muscle of the arm, 5. radial ligament of cubital articulation (l. collaterale radiale), 6. supinator muscle, 7. anular ligament of the radius, 8. brachioradial muscle, 9. superficial branch of the radial nerve, 10. long radial extensor muscle of the wrist, 11. short radial extensor muscle of the wrist, 12. radius (radial bone), 13. extensor muscles of the fingers, 14. ulnar extensor muscle of the wrist, 15. deep branch of the radial nerve, 16. ulna (ulnar bone), 17. ulnar flexor muscle of the wrist]

other hand, it is possible that the pathogenesis and symptomatology of these rheumatic disorders are influenced by factors of exertion and thus lead to a clustering of these diagnoses among the same patients.

DISCUSSION

Hadler (9) recently stated that for generations medicine has assumed that many of the musculoskeletal diseases encountered in industry are use-associated. A critical review demonstrates that the literature supporting these assumptions is almost entirely anecdotal. Unfortunately, the situation is also the same with regard to tennis elbow.

Tennis elbow is not a rare condition, but there seems to be little reliable data on its occurrence rates in various occupational groups. Neither have the incidence and prevalence rates in the general population been sufficiently investigated. Conclusions concerning its etiology have been drawn almost without exception without a proper reference group comparison.

A number of uncontrolled clinical studies of tennis elbow patients have been published. Although these have produced useful data of the syndrome, they have not been able to shed much light on the etiology of the condition. Since clinical material is selected in that only patients who seek attention are included, it could be biased as to the occupational background of the patients. Predominantly those patients whose livelihood or continuation of a hobby, such as tennis playing, depends on the perfect function of the upper extremities would be included, irrespective of the real occurrence of the condition. If the condition occurred spontaneously and was primarily influenced by individual susceptibility, as suspected by some experts, an undetermined patient population could exist which is under-represented in clinical studies.

The results of the vast population study of Allander (1) favor the concept that the pathogenesis of tennis elbow, unlike that of arthrosis, is greatly influenced by factors other than ageing. These other

factors could easily include occupational or other environmental stress effects upon the elbow region. Scientific data supporting this opinion is insufficient, however.

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