

TENNIS ELBOW

MARTIN SINGER, F.R.C.S., *Cape Town*

Tennis elbow was first described by Runge in 1873 in an article on writer's cramp, from which he distinguished it. He described one patient, in whom rest and electrical treatment had not produced a cure, with the result that he proceeded to cauterize the skin over the tender area. He rested the elbow for 6 weeks until the ulcer healed—the patient was fine after this and was still cured when reviewed a year later.

The name 'lawn tennis arm' was given to it in 1882 and from about the turn of the century the continental writers have used the terms 'epicondylalgie', and 'epicondylitis'. Both names are unsatisfactory, since only a minority of the patients suffering from this condition play tennis and

'epicondylitis', *per se*, is meaningless.

Tennis elbow occurs most commonly in middle age; Garden¹ found that the vast majority of his patients presented between 30 and 50 years of age. Cyriax² stated that the condition is self-limiting and seldom persists for more than 12 months under the age of 60, and 2 years if the patient is older, and moreover, once recovery occurs, it does not relapse. Although in the main, this is correct, the pain on occasion continues for longer than a year in the common age group, and, even if symptoms are relieved, the pain can and does recur. The pain is often of more than nuisance value in that any movement involving resisted radial extension of the wrist initiates or aggravates

it. Thus housewives find great difficulty in doing their household chores and workmen, such as fitters, carpenters and riveters, may be forced to discontinue their jobs.

CLINICAL ASPECTS

A 'clinical entity' is any well-documented condition, not necessarily of known aetiology, in which the signs fit a well-recognized pattern, and in which the natural history and evolution are known. Such an entity is tennis elbow.

The syndrome is characterized by pain and tenderness over the lateral aspect of the elbow and by an intensification of the pain on resisted radial extension of the wrist.

Although it is customary to attribute the onset to the playing of games, e.g. tennis or squash, or doing hedge-clipping or week-end carpentry, there are obviously other factors at work since only certain individuals indulging in these activities are afflicted. There is no particular predilection for males or females and the pain often radiates into the extensor group of muscles and may reach as far as, but usually not beyond, the wrist. It is rare for the pain to extend proximally into the upper arm. From time to time patients may suffer from the supraspinatus syndrome and tennis elbow simultaneously, or the one condition may precede the other by a variable period of time.

Patients may be unable to lift a kettle or turn a tap or wring washing without considerable pain and discomfort.

When such patients are examined the elbow is not swollen, but invariably there is an area of acute tenderness that can be localized accurately. The most common site of tenderness is just in front of the lateral epicondyle and the next most frequent site is over the radial head and sometimes the tender area appears to be between these 2 points.

Pain is aggravated or triggered off by pronating the forearm fully and extending the wrist against resistance with the fist clenched and elbow extended. In the vast majority of cases there is a full range of movements of the elbow joint; occasionally the elbow lacks up to 10° of extension¹³ and these cases were likened by Mills³ to the elastic resistance encountered in a knee with a locked semilunar cartilage, and due to part of the orbicular ligament slipping between the head of the radius and the capitulum.

The radiographs show no abnormality and this distinguishes tennis elbow from those patients with severe pain over the outer aspect of the elbow caused by a plaque of heteropic calcification seen on the radiograph as located in close proximity to the lateral epicondyle. Tennis elbow should also be distinguished from pain over the outer aspect of the elbow after direct trauma.

ANATOMY AND PATHOLOGY

The lateral ligament of the elbow joint is attached proximally to the lower part of the lateral epicondyle of the humerus, and distally it sweeps forwards blending with the capsule and is attached to the orbicular ligament; some of its posterior fibres pass over the orbicular ligament to be inserted into the lateral margin of the ulna (Fig. 1).¹¹ The *extensor carpi radialis brevis* is the only muscle of the superficial extensor group which takes origin from the lateral ligament; a cross-section through the elbow joint indicates the intimate relationship that the *extensor carpi*

radialis brevis has with the lateral ligament, joint capsule and orbicular ligament; in fact over the outer aspect of the joint it is impossible virtually to separate the first 3 entities during an operation.

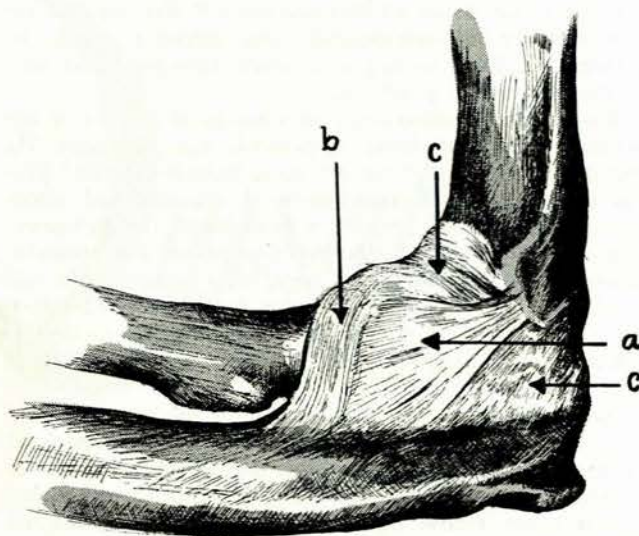


Fig. 1. Anatomy of elbow-joint. a=Lateral ligament of elbow joint. b=Orbicular ligament. c=Joint capsule.

Garden¹ pointed out that the most constant feature of the syndrome is the production of pain during extension of the wrist. This observation had been further analysed by Cyriax,² who noted that resisted extension of the wrist in radial deviation hurts, but not in ulnar deviation; in addition, with the fingers actively flexed so that the *extensor digitorum communis* is thrown out of action, extension of the wrist is still painful. Extension of the wrist in radial deviation is performed by *extensor carpi radialis longus* and *brevis*. Cyriax concluded that as the tenderness in this condition was most frequently situated in the region of the lateral epicondyle the fault lay with the *extensor carpi radialis brevis* which takes origin mainly from this epicondyle, and not with the longus, which arises more proximally along the lateral epicondylar ridge.

Inflammation of an adventitious bursa has been blamed by some as a cause for this condition; Osgood⁴ described it as lying between the conjoined extensor tendon and the radio-humeral joint. However, most surgeons have failed to find this bursa after many careful searches, and Trethowan⁵ claimed that these bursae were all normal synovial extensions of the joint upwards and outwards.

Trethowan⁵ first described the presence of hyperaemic hypertrophy of the synovial fringe between the radial head and capitulum in 8 patients suffering from 'protracted' tennis elbow, and his patients with this lesion had localized tenderness over the radiohumeral joint laterally, often a minor flexion contracture of elbow, and pain on passive extension of the joint or on resisted supination of the forearm. According to Trethowan this lesion is a traumatic synovitis of the elbow joint due to repeated slight injuries and failure of the patient to rest the elbow in the earliest stages. It is possible that sometimes this may occur secondary to ill-conceived violent deep friction or manipulation. It is also possible that the small degree of lack of extension

seen occasionally is the result of a clinically undetectable sympathetic effusion into the elbow joint.

Many authorities believe that a tear between the common extensor origin and the periosteum of the lateral epicondyle is the cause of this condition.¹² No one has yet demonstrated this convincingly and indeed it would be extremely difficult to display a small 'teno-periosteal' tear or the subsequent 'painful scar'.

Bosworth⁶ first introduced the concept of a lesion in the orbicular ligament being responsible for the pain. He stated that sections of the orbicular ligament showed hyaline degeneration, disorganization of structure and reduction of the number of nuclei in fresh cases. These observations indicate that degenerative changes in the orbicular ligament may constitute the underlying pathology in this condition. This is supported by the fact that tennis elbow commonly occurs in middle age, and from time to time is associated with supraspinatus tendonitis, a known degenerative condition.

Garden concluded that contraction of the *extensor carpi radialis brevis*, which is the only muscle of the superficial extensor group arising from the lateral ligament that is inserted into the orbicular ligament, is the factor producing pain in tennis elbow. Based on this hypothesis he devised the operation of Z-elongation of the *extensor carpi radialis brevis* tendon above the level of its synovial sheath.

TREATMENT

Conservative

There are numerous conservative measures. Occasionally simple, sudden forced adduction of the elbow joint,¹⁴ or Mills' manoeuvre will produce dramatic improvement. Mills preferred to do this under general anaesthesia and performed the manoeuvre by placing the thumb of one hand firmly over the tender spot, and he then fully pronated the forearm with wrist and fingers flexed; at the same time the elbow was forced sharply into hyperextension. On the whole, deep friction and various forms of heat do not give satisfactory results, apart from the former being extremely painful.

Hydrocortisone accurately injected into the most tender area, in combination with a local anaesthetic such as 2 ml. of 'leostesin' 2% and 1,000 units of hyaluronidase provides the most satisfactory results. Only a very small amount of hydrocortisone is required—0.25 ml.—and 1 or 2 weekly injections or at the most 3 injections, either alone or occasionally followed by a short course of renatin ionization, will satisfy the vast majority of patients. Porretta and Jones⁷ in 1958, in a series of 128 elbows in 119 patients, used procaine and hydrocortisone and found that only 7.3% failed to improve but about 20% eventually required surgical treatment. Using the technique of injection described above, only 3.3% required surgical intervention. This includes a small percentage who require a further injection after a varying number of months of freedom from symptoms.

OPERATIVE TREATMENT

Garden's¹ operation (1961) of Z-elongation of the *extensor carpi radialis brevis* has the appeal of simplicity and rationality. In addition he has reported excellent results in a series of 50 patients. No patient failed to benefit from the operation and most obtained full and lasting relief.

Postoperative tests using dynamometer and spring balance tests indicated no significant reduction in the power of wrist extension or grip. Hohmann⁸ described an operation in 1933 whereby the upper part of the common extensor origin, chiefly the *extensor carpi radialis brevis*, is exposed and divided transversely right across: 14 cases were cured within a week. Good results have also been reported after erasing the extensor origin, which results in fibrosis and lengthening, Bosworth's (1955) resection,⁶ or displacement downwards of the orbicular ligament and Boyd's modification.¹⁰ Bosworth's series is small—5 cases—and he makes no mention of limitation of movements (if any) of the elbow joint postoperatively. These operations like Kaplan's (1959)⁹ denervation of the lateral capsule and the lateral epicondyle all have one feature in common—a direct assault in one form or another on the elbow joint, an unusually sensitive joint and most capricious in its response to trauma, surgical or otherwise.

In a series of 150 tennis elbows, 5 patients (3.3%) failed to respond satisfactorily to conservative treatment and the operation of Z-elongation of the *extensor carpi radialis brevis* tendon was performed on these patients.

The operation is performed in a bloodless field under general anaesthesia. A 2½ to 3-inch long incision is made over the dorso-lateral aspect of the forearm and ends at the point where the *abductor pollicis longus* and *extensor pollicis brevis* tendons cross the radius; the incision is parallel to, and a ½-inch posterior to the *brachio-radialis* tendon. Once the deep fascia has been divided, the tendons of the *extensor carpi radialis longus* and *brevis* are seen, ensheathed by the filmy, glistening *paratenon*, the former overlapping the latter. After the *longus* has been retracted, the *brevis* is divided in a Z-shaped fashion and when the ends have separated by about ¾-1 inch, the ends are apposed with a single 3/0 catgut suture. The actual operating time is a matter of minutes only and the patient is discharged from hospital the same, or the following day.

The results in the 5 patients on whom the operation has been performed thus far have been very satisfactory.

CASE REPORTS

Case 1

Mrs. J.F.E., aged 35 years, was a housewife who had a right tennis elbow which had been present for 8 months. It had not responded to conservative treatment and she was distressed on account of her inability to play tennis. She had a full range of elbow movements; she was tender over the lateral epicondyle and had a normal radiograph. Two months after the operation of Z-elongation of the *extensor carpi radialis brevis*, she was discharged, symptom-free and with a grip of normal power.

Case 2

Mr. P.H.v.Z., aged 45 years, a welder by occupation, suffered from a right tennis elbow for 9 months. Initially 3 'hydrocortisone' 'cocktail' injections relieved him completely, but after 6 months the pain and tenderness over the lateral epicondyle recurred and did not respond to further conservative treatment. He was unable to continue welding. Two months after the operation of Z-elongation of the *extensor carpi radialis brevis* he returned to full duty with a full range of elbow and wrist movements and normal gripping power.

Case 3

Mr. P.A.M., aged 55 years, a coach-builder by occupation, was unrelieved by conservative measures for his right tennis elbow after 3 months, and was extremely unhappy about not being able to return to work. He had a full range of elbow

movements and was very tender over the lateral epicondyle. He had the *extensor carpi radialis brevis* tendon lengthened. He returned to duty with a normal grip and a full range of elbow and wrist movements.

Case 4

Mrs. S.M., aged 26 years, housewife, had symptoms of right tennis elbow for 10 months. Two injections of 'depo-medrol', the second given 3 months after the first, afforded her complete relief, but her symptoms recurred after a further 4 months and the third injection did not help her at all. Her chief complaint was an inability to lift household articles without pain. She had a full range of movements and marked tenderness over the lateral epicondyle; pronation against mild resistance produced much pain. Her *extensor carpi radialis brevis* tendon was lengthened by $\frac{1}{2}$ inch.

Although the patient was able to resume all her household duties 2 weeks after the operation, she had residual tenderness over the lateral epicondyle. Perhaps in this instance the tendon was lengthened insufficiently. This tenderness disappeared after a further 6 weeks.

Case 5

Mr. C.C.McD., aged 32, clerk, developed tennis elbow after a game of badminton. A single 'hydrocortone' 'cocktail' injection relieved him completely. Five months later after playing badminton he had a recurrence of symptoms with tenderness over the lateral epicondyle and full range of movement. He had 2 further injections, but although relieved, he was unable to play badminton without considerable discomfort. A year after the onset of his symptoms the *extensor carpi radialis brevis* tendon was lengthened by 1 inch. Three months later he was playing badminton without disturbance, and has remained

thus for 2½ years. He developed a small 'knob' under the scar; probably a fibrous tissue reaction to the catgut suture.

SUMMARY

1. The clinical features, anatomy and pathology of tennis elbow are discussed. Contraction of the *extensor carpi radialis brevis* is an important pain-producing factor in this entity, impinging directly or indirectly on the orbicular ligament which is the site of degenerative changes.

2. The vast majority of patients are treated satisfactorily by means of a hydrocortisone 'cocktail' (hydrocortisone, leostesin and hyaluronidase) injection.

3. In 5 out of 150 tennis elbows conservative treatment failed; in these, Garden's operation of Z-elongation of the *extensor carpi radialis brevis* tendon gave excellent results.

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