

Textbook of
**Orthopaedic
Medicine**



Volume One
Diagnosis of
Soft Tissue Lesions

JAMES CYRIAX

7th Edition

Baillière Tindall

TEXTBOOK OF Orthopaedic Medicine

VOLUME ONE

Diagnosis of Soft Tissue Lesions

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Preface

Orthopaedic medicine was born in 1929. Then, as an orthopaedic house surgeon, I saw a large number of patients whose radiographs revealed a variety of bony disorders. In these, a firm diagnosis was reached and crisp treatment was the rule. But I also saw many more in whom the X-ray appearances were negative or equivocal; about diagnosis and treatment in these cases there reigned a disturbing vagueness. After some months it dawned on me that no satisfactory method appeared to exist for testing the function of the radiotranslucent moving tissues. Realizing that here lay the crux of the clinician's dilemma, I set out to develop just such a system. This took me twelve years, though I can now explain the basic theory in as many minutes. I was then faced with scores of hitherto unrecognized disorders, for which treatment had to be found. It was not until twenty years ago that enough knowledge had been amassed for me to reach regularly a proper assessment in cases within the orthopaedic medical sphere.

The previous neglect of so large a section of human ills is remarkable, in that one of the commonest symptoms, ranking second only to neuroses and respiratory infections as a major cause of industrial disablement, is pain felt at a moving part of the body. Not all such symptoms stem from a local disorder, but a great many do, and everybody suffers from this kind of trouble at intervals throughout life. Thus, joints are sprained or become arthritic; muscles, tendons and ligaments are strained; bursae become inflamed. Nerve trunks, nerve roots and dura mater are liable to compression. Joints, especially spinal joints, are prone to internal derangement. These disorders of the moving parts of the body, so long neglected, deserve accurate diagnosis. Many require treatment by non-surgical orthopaedic measures, e.g. induction of local anaesthesia (which is also important diagnostically), infiltration with steroids, manipulation, traction or massage.

Who is to cater for this huge mass of patients? They wander from doctor to doctor, from one hospital department to another—finally visiting all sorts of lay healers—in the vain hope of finding the right man. Most of their disorders are not 'rheumatic' (although often misnamed so by the patient), since they are seldom concerned with rheumatic fever or rheumatoid arthritis, and they do not often call for surgery. Hence they are not the primary concern of the rheumatologist or the orthopaedic surgeon.

Orthopaedic medical disorders are the only major cause of human suffering and industrial sickness for which the National Health Service makes scarcely any provision. In consequence, many patients linger on in pain and off work (and, if

they are athletes or sportsmen, off games) for indefinite periods, not for lack of the relevant medical knowledge, but for lack of doctors trained in the relevant discipline. This neglect has led to the eruption of numerous laymen into the void we have left gaping. Their number and success, together with the esteem in which the public holds them, serve to indicate the large numbers of people who have been compelled finally to look outside the ranks of the medical profession for relief, and have found it in lay hands.

But the picture has another side, for treatment without prior diagnosis entails great waste of time and money. Recourse to laymen, though it has its successes, involves many patients in repeated visits for futile treatment. Disorders easy to put right by the alternative measures of orthopaedic medicine are given routine manipulation in vain by enthusiastic laymen who, for lack of proper medical training, cannot know when or when not to apply their ministrations. This indefensible system is common knowledge; doctors and patients alike are aware that they must take their chance with unqualified people on their own initiative and at their own expense—all this at a time when the State has assumed responsibility for every type of medical care.

The hiatus must be closed on financial no less than on humanitarian grounds. If the Health Service can save itself money *and* help patients at the same time, there seems little reason for delay. In 1868 Sir James Paget gave a lecture on 'Cases that Bonesetters Cure', and his message was reinforced by Penny's criticisms on doctors' neglect in a paper 'On Bonesetting', published in the *British Medical Journal* in 1888. Yet the sad deficiency that they drew attention to persists little altered today. For the last forty years I have taken this hiatus seriously and the fruits of the work done have been set out in successive editions of this book.

The additions for the seventh edition include a review of the literature up to the end of 1977. Many of the facts that I had established clinically over the last thirty years have now been corroborated by recent and more objective studies. These are set out. Considerable trouble has been taken to establish when an observation was first made, so that research workers can be guided to the original record. It is remarkable how many discoveries, thought to be recent, were in fact first published during the nineteenth century. Chiropractice is discussed somewhat more fully than in previous editions. It is clear that those who practise it are seeking to enlarge their sphere of action in the USA and Canada. A review of their assertions and advertising literature has therefore been added so that the medical profession becomes aware of the encroachment.

Orthopaedic medicine and orthopaedic surgery must not be thought of as in any way opposed. It is the very reverse: they complement each other. The existence of a physician within the orthopaedic team relieves surgeons of much non-surgical work for which few have much liking and none much time. Moreover, the decision on whether or not to operate may rest on the likely outcome of non-surgical measures. Who is better placed to assess that prob-

ability than the consultant practising the conservative approach? I know that this collaboration works smoothly and well; for this was the situation during my many years as orthopaedic physician at St Thomas's Hospital. An orthopaedic team comprising surgeon and physician covers the whole field within one department and ensures that each patient comes under the care of the appropriate expert; as 'Evarts pointed out in 1975 in his chairman's address to the Orthopaedic Section of the American Medical Association. In England, sixty-nine years ago, orthopaedic surgery was branching off from general surgery to the accompaniment of some scoffing. Robert Jones was appointed to the first lectureship in orthopaedic surgery in 1909 but E. H. Arnold became 'instructor in orthopaedic surgery' at Yale University ten years before that. Just as it seemed redundant to a past generation to make a separate speciality of bone and joint surgery, so will the suggestion of a medical colleague to deal with the non-surgical aspects of the locomotor disorders meet with some resistance. Yet this division already exists in several other sections of medicine, e.g. neurologist and neurosurgeon, gastroenterologist and abdominal surgeon. The birth of a separate province will not be without pangs, though in fact it relieves surgeons of so much unwelcome non-surgical work. Resistance to new ideas is to be expected; it delays but does not affect the eventual outcome, since the needs of the sick have always proved paramount in the end. Already the cost to industry and the insurance companies of avoidable invalidism, added to the sum of overt public frustration, is leading to mounting pressure for the creation of the relevant speciality. It is only a question of time now before hospitals realize that they cannot afford to do without a consultant in orthopaedic medicine. Indeed, Conesa in Spain has given us a statistical survey on the huge savings to the community that accrue when the methods of orthopaedic medicine are incorporated into rehabilitation.

It has been my life's work to devise, and as far as possible to perfect, a method of clinical examination which leads to accurate diagnosis in locomotor disorders, enabling the physician to ignore the ubiquitous misleading phenomena of referred pain and referred tenderness. It consists of assessing in turn the function of each moving tissue, the positive and negative responses to selective tension forming a pattern. This pattern is then interpreted on the basis of applied anatomy. Logical conclusions of incontestable validity are drawn (but have roused much controversy). Since doctors receive little or no undergraduate tuition in how to examine the soft moving parts, they have been apt to look askance at such simple deductions, regarding them as more clear-cut than such obscure clinical material warrants. However, now that the basic research has been carried out, the stage is set for immediate impact on contemporary medical thought, diagnosis (since it is purely clinical and requires none of the apparatus that only hospitals possess) coming within the scope of every interested medical practitioner. At present the number of doctors and physiotherapists trained in this discipline remain so small that the methods of orthopaedic medicine are available to only a tiny fraction of all patients who need them.

Since displacements within the spinal joints are so common, and one aspect of orthopaedic medicine involves their reduction, I have become known as that odd and scarcely respectable phenomenon: a doctor who manipulates and, worse still, teaches these techniques (together with the indications and contra-indications) to physiotherapists. Nothing annoys me more; for, though true up to a point, it is a gross error in emphasis. I am a medical man who has spent his graduate days in elaborating clinical methods of examining the non-osseous moving parts (radiography takes care of the bones themselves). Based on these new concepts, I have gone on to as exact assessment as possible of the position, nature, size and stage of each soft tissue lesion. This has led to the discovery of scores of hitherto undescribed conditions within the sphere of orthopaedic medicine and of some outside it, e.g. irritation of the external aspect of the median nerve at the wrist (1942), and intermittent claudication in the buttock (1954). It has also led to a good deal of iconoclasm, 'sacroiliac strain' being debunked in 1941 and 'fibrositis' in 1948. The discal pathology of lumbago, regarded as a muscular affliction since 1904, was set out in 1945, together with the concept of pain arising from the dura mater. All these theories have been confirmed since by workers all over the world.

Logical extension of these clinical findings has led me to adapt, and where feasible improve upon, methods of treatment already in existence, but previously based either on empiricism or on false hypotheses. When no treatment existed, or the disorder had never been recognized, mere palliation was abandoned and methods of treatment were investigated in the light of our new-found diagnostic precision until, as far as possible, an effective measure was discovered. All successful manoeuvres were taught to our physiotherapists; for they were there to treat the patients, especially by the use of their hands. This is nothing new; the first record of the appointment of a teacher of bonesetting is contained in a ukase issued by the Tzar of Russia in 1655. Such delegation proved very satisfactory, since it enabled me to get on with my diagnostic work and carried the further advantage of affording physiotherapists a rewarding series of dramatic successes. On the one hand they were sent patients who had been found suitable for such procedures by a medical man; on the other patients were no longer asked to attend for ephemeral palliation that even today goes by the name of 'orthodox treatment'. (How could it ever be orthodox to treat a displacement by heat and exercises?) Neither was the patient left to the vagaries of fortune nor to the hits and misses of lay manipulators. Naturally, this policy enhanced students' interest in this part of their work. The good reputation that manipulation by laymen enjoys from some people now began to be transferred to manual methods obtainable within the Health Service, with a corresponding increase in the esteem in which physiotherapists were held. Nevertheless manipulation, emotionally charged treatment though it is, has always provided only a minor part of the work, constituting merely one remedy called for by the major compulsion—an accurate diagnosis. Manipulation is easily learnt; diagnosis is a lifetime's study.

I did not invent massage, which has existed since time immemorial as an extension of the urge to rub a sore spot. Indeed, the first mention of a professor of physiotherapy dates from AD 585 when one was appointed under the Sui dynasty in China. I merely devised the method of giving deep massage penetrating to the lesion. I insisted that the structure at fault should alone be treated, avoiding areas of normal tissue in the neighbourhood that happened to be the site of referred pain and tenderness. This turned out very fortunately; for, when the Medical Research Council allowed me hydrocortisone in 1952, the way to identify each lesion and the posture that made it easiest to palpate had already been established. It was thus merely a question of substituting the needle for the physiotherapist's finger. I did not invent manipulation or traction, both of which were practised by Hippocrates; a scamnum (bench for traction and reduction) made to his design and four hundred years old stands today in the Wellcome Historical Museum in London and a Turkish manuscript dated 1465 depicting spinal traction is preserved at the Louvre in Paris. My endeavour has been to codify the application of these measures, placing equal emphasis on 'when not' as on 'when', in an attempt to fit each into its due place in therapeutics.

In particular, I have tried to steer manipulation away from the lay notion of a panacea—the chief factor delaying its acceptance today. My only important discovery, on which the whole of this work rests, is the method of systematic examination of the moving parts by selective tension. By this means, precise diagnoses can be achieved in disorders of the radiotranslucent moving tissues. If in years to come I am to be remembered as an original worker at all, it is with this fundamental study that I should like posterity to link my name.

January 1978

JAMES CYRIAX

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I

General Concepts

The disorders with which this book deals are universal. It is a rare individual indeed who does not suffer one or more lesions of his moving parts in the course of his life. Although diagnosis is considered difficult or impossible, it is in fact the reverse; it is merely a matter of applied anatomy. The function of every moving part has been established for years and clinical testing is no more than an informed, anatomical exercise. Function is assessed indirectly, like a series of simultaneous equations, and the pattern of movements—painful, painless; full range, limited range—elicited and interpreted in the light of the known behaviour of these tissues. Care is taken to avoid prejudice towards any particular hypothesis on the disorder likely to be present or on the causation of disease. The physical signs are paramount throughout. I have spent my life working out how best to ascertain the physical signs in soft tissue lesions and how to interpret the pattern thus brought to light. This devotion to physical signs is essential to the orthopaedic physician, for none of his patients dies in hospital and he is therefore denied the salutary discipline of the post-mortem room. Nor are X-rays of appreciable value when the radiotranslucent tissues are at fault, and in general other objective tests, e.g. on the blood, are of little assistance. Hence, he must take great trouble to be right, for contrary evidence is not often available to bring an error to his notice. Constant self-criticism is thus the hallmark of the orthopaedic physician, who has, with due humility, to approach the truth contained—better, perhaps, to say concealed—within each patient.

All pains have a source; the diagnosis names it. In visceral disease, abnormality is often difficult and sometimes impossible to demonstrate. With the moving parts the situation is reversed; function is obvious and easy to test clinically. A joint moves within certain known limits; a voluntary muscle contracts and relaxes to known effect. The examination of these structures thus presents little difficulty and interpretation of the findings is based on uncontroversial anatomical facts. The basis of this book is therefore a painstaking search for physical signs, positive and negative, and their interpretation on agreed grounds, unarguably valid. To my never-ending surprise this extreme simplicity has proved controversial and slow to gain acceptance.

‘RHEUMATISM’

Nomenclature in medicine is important, for it is by words that we convey our meaning to others. ‘Rheumatism’ is a word often used by patients and doctors,

but with many different meanings. To the layman it implies pain that he associates with the moving parts of the body, appearing for no clear reason. To some medical men it includes every disorder of the moving parts, whatever the cause—arthritis, tendinitis, tenosynovitis, ligamentous and muscle strain, post-traumatic adhesions and internal derangement, especially at the spinal joints. Others confine the term to the collagen diseases; yet others to chorea and rheumatic fever and its cardiac sequels. Hilton (1863) had already stated that the surgeon should not 'be satisfied, as is too frequently the case, with saying "Oh, this is rheumatism" (the favourite phantom)'.

The only useful way to employ 'rheumatism' is for the chorea-rheumatic fever group of diseases. Then it refers to well-defined clinical entities and has a clear aetiological significance. But when a variety of other disorders of diverse aetiologies is grouped together under this name the result is a logical morass. By common consent, arthritis is rheumatic; osteoarthritis with a loose body, impaction of which is causing the symptoms, and neuropathic and pulmonary arthropathy are probably not; tuberculous and gouty arthritis are certainly not. Monarticular rheumatoid arthritis is rheumatic; the locally identical condition occurring in serum sickness is not, because its allergic origin is obvious. Gonococcal and Reiter's arthritis are rheumatic only so long as their urethral origin remains undetected. Tabes, localized neuritis or displaced fragments of intervertebral disc cause pain felt in muscles and joints; these conditions are regarded as rheumatic only when the true nature of the condition is overlooked. A familiar example is lumbago; until recently it was regarded to be the result of fibrositis caused by rheumatic toxins settling in the lumbar muscles; now that it is known to be caused by internal derangement of a lumbar joint it has ceased to be rheumatic. Tennis elbow and supraspinatus tendinitis were thought of as rheumatism of the elbow and shoulder only so long as the traumatic cause of these two types of tendinitis was not realized. When the aetiology of rheumatoid and spondylitic arthritis is ultimately discovered, these disorders also will cease to be caused by 'rheumatism'. The medical use of the word can then cease (apart from rheumatic fever). Thereafter 'rheumatic' would remain a useful evasion, but it would no longer carry any medical significance.

The word 'rheumatism' has another disadvantage. Since it is applied to all sorts of painful conditions, it means quite different things to different patients. Thus one patient may be deeply relieved to know that his pain is 'only rheumatism'; another is appalled, because a relation of his is crippled by 'rheumatism' in every joint.

For a detailed discussion on medical semantics, the reader is referred to Asher (1972).

Primary Fibrositis

In this condition, pain and tenderness are experienced in the trunk. Since the trunk is covered by muscles, the patient complains of pain felt in the tissue he knows to lie there, i.e. the muscle. This provides no evidence that the pain arises

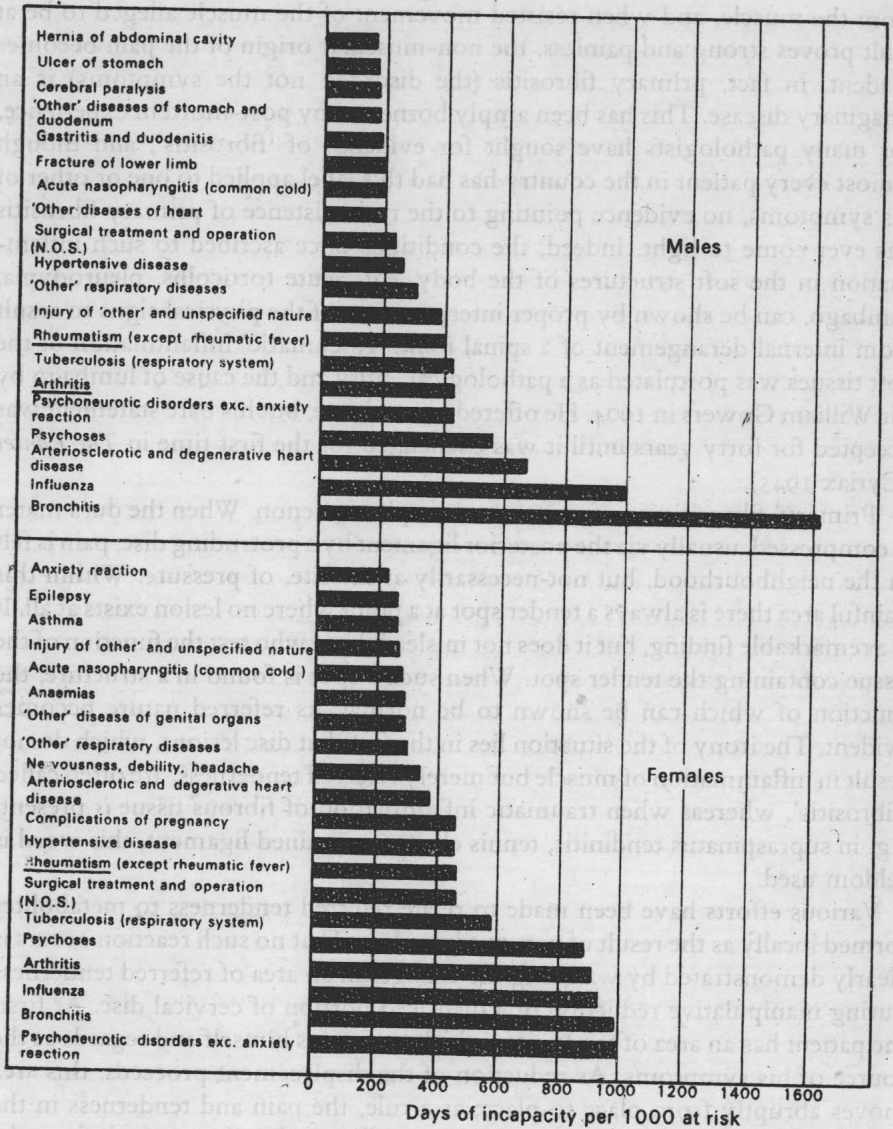


Fig. 1. Working days lost per thousand of the insured population (of equivalent 1951 age distribution) according to selected causes in Great Britain in 1961. Note that in man rheumatism and arthritis together are second only to respiratory disease, whereas in women they are the commonest cause of absence from work. The importance of back troubles has been emphasized by the Minister of Health (1976) who estimated that £100 million are lost on this account alone each year. Snider (1975) had already found that of all sums paid out in the USA for workmen's compensation, no less than 32% was for lumbar disorders. (By courtesy of the Office of Health Economics)

from the muscle, and when resisted movement of the muscle alleged to be at fault proves strong and painless, the non-muscular origin of the pain becomes evident. In fact, primary fibrositis (the disorder, not the symptoms) is an imaginary disease. This has been amply borne out by post-mortem experience, for many pathologists have sought for evidence of 'fibrositis', and though almost every patient in the country has had this label applied to one or other of his symptoms, no evidence pointing to the real existence of primary fibrositis has ever come to light. Indeed, the conditions once ascribed to such inflammation in the soft structures of the body, e.g. acute torticollis, pleurodynia, lumbago, can be shown by proper interpretation of the physical signs to result from internal derangement of a spinal joint. 'Rheumatic' inflammation of the soft tissues was postulated as a pathological entity and the cause of lumbago by Sir William Gowers in 1904. He offered no evidence, but his bare statement was accepted for forty years until it was challenged for the first time in *The Lancet* (Cyriax 1945).

'Primary' fibrositis is in fact a secondary phenomenon. When the dura mater is compressed, usually via the posterior ligament by a protruding disc, pain is felt in the neighbourhood, but not necessarily at the site, of pressure. Within this painful area there is always a tender spot at a point where no lesion exists at all. It is a remarkable finding, but it does not mislead those who test the function of the tissue containing the tender spot. When such a spot is found in a structure, the function of which can be shown to be normal, its referred nature becomes evident. The irony of the situation lies in the fact that disc lesions, which do not result in inflammation of muscle but merely referred tenderness, are often called 'fibrositis', whereas when traumatic inflammation of fibrous tissue *is* present, e.g. in supraspinatus tendinitis, tennis elbow, a sprained ligament, this word is seldom used.

Various efforts have been made to relate referred tenderness to metabolites formed locally as the result of nervous impulses. That no such reaction occurs is clearly demonstrated by watching the changes in an area of referred tenderness during manipulative reduction of a displaced portion of cervical disc. At first, the patient has an area of tenderness which he fingers himself and regards as the source of his symptoms. As reduction of the displacement proceeds, this area moves abruptly from place to place; as a rule, the pain and tenderness in the lower scapula area shift closer towards the midline and move upwards from the mid-thorax towards the lower neck. The tenderness follows the pain and, after a minor shift in the displaced fragment of disc, one tender spot disappears but is replaced by another in a fresh situation. Clearly, metabolites produced locally could not move from one muscle to another in a few seconds merely because the neck was manipulated. When a full and painless range of movement has been restored to the cervical joints the final tender point disappears.

Electromyography has shown that lower motor neurone lesions lead to fasciculation in the relevant muscles. It was once thought that this might explain the referred tenderness so frequently present in spinal nerve root compression.

In sciatica the facts fit quite well, for the tenderness is usually found in the gluteal muscles (which are derived from the correct roots). But at the neck, in seventh cervical root compression, the tenderness lies in the trapezius, levator scapulae or spinatus muscles, none of which is supplied by this root. Electromyography reveals, as would be expected, that the scapular and vertebroscapular muscles are free from fasciculation in a disorder at this level; hence referred tenderness cannot be correlated with the muscular fasciculations due to partial denervation.

Secondary Fibrositis

There is no important controversy about the existence of five categories of this disorder: traumatic, rheumatoid, infectious, parasitic and myositic.

Traumatic Fibrositis

This may show itself as a painful scar. The cause may be overuse or a single strain. Perhaps the best example is a tennis elbow. A minor rupture occurs at the origin of the common extensor tendon from the lateral humeral epicondyle. Very little aching occurs at first, but, as the torn edges begin to unite and are pulled apart again each time the muscle is used, excess scar tissue is laid down in the healing breach. Within one to three weeks the elbow becomes quite painful from the development of chronic traumatic fibrositis at the site of the tear.

Scarring in an intercostal or in the gastrocnemius muscle, golfer's elbow, tendinitis at the shoulder, adherence of a ligament after a sprain, periarticular adhesions after an injury, capsular contracture after immobilization, crepitating tenosynovitis caused by overuse, olecranon bursitis after a blow, ischaemic contracture—all these and a number of similar conditions could be regarded as caused by post-traumatic fibrositis. But they are better described under their proper names.

Rheumatoid Fibrositis

Rheumatic inflammation occurs, of course, in rheumatic fever and chorea. A similar type of inflammation has been found in rheumatoid arthritis. In the USA, Curtis and Pollard (1940) carried out biopsies on skin and muscle from patients with this disease and demonstrated small foci of round cells of the chronic inflammatory type. In 1942 Freund et al. demonstrated similar nodules on the nerve sheaths. In England, Gibson et al. (1946, 1948) confirmed these findings and further proved that they were absent in patients suffering from ankylosing spondylitis. They showed that local degenerative changes affected the axons and medullary sheaths of the nerves close to these lesions and also demonstrated an increase in the interstitial connective tissue accompanied by extreme thinning of the muscle fibres. These findings were again confirmed by Morrison et al. at Harvard in 1947. Electromyographic studies (Steinberg & Parry 1961) on patients with rheumatoid arthritis showed evidence of polymyositis in 85% of such cases. These changes bore no direct relation to the degree of muscular weakness or of wasting or to the use of steroid therapy.