Local Corticosteroid Injection Therapy

TH Bourne

"More harm is done because you do not look, than from not knowing what is in the book"

Summary
The advent of injectable insoluble corticosteroids in 1952 allowed steroid injected at tender spots to remain long enough to destroy affected tissue and allow regrowth of normal fibres. Injection of small doses of triamcinolone and lignocaine directly into trigger points has proved a success in relieving chronic pain associated with localised fibromyalgic lesions in 70% of the author's personal series of 840 patients. Each steroid injection given in this series has been recorded with a diagram of its exact position. This has shown that recurrence of pain is very rarely associated with recurrence of tenderness at the injected trigger point, and that injection of other tender points nearby is likely to prove effective.

Intra-articular corticosteroid injection is reported as providing poor pain relief in arthritic disease except when there is seepage out of the joint space into the synovium and periarticular ligaments, but intra-synovial injection gives consistent local symptomatic relief.

Key words
Corticosteroid injection, Fibromyalgia, Trigger points.

Introduction
Every medical practitioner has seen patients suffering from chronic pain despite their clinical examination and all investigations having proved negative. In many cases palpation of the soft tissues at the site indicated by the patient leads to a finding of trigger points and treatment with pain-killing tablets or physiotherapy, but not the cure which the patient was seeking. Some of these patients with persistent pain and minimal physical signs are referred for psychiatric opinion. Localised fibromyalgia is a condition which has tended to be under-diagnosed and under-treated.

In 1946, when I started in general practice, tennis elbow was treated with analgesic tablets and injections of local anaesthetic. In 1950 soluble cortisone mixed with local anaesthetic began to be used, with short-lived pain relief. In 1952 insoluble fluocortisone became available, with greatly improved results. I reasoned that muscle, ligament, and tendon lesions similar to those of tennis elbow occur all over the body and might also respond to local injections of fluocortisone and local anaesthetic. After that I routinely treated chronic pain associated with localised tender lesions by local injections of corticosteroid and lignocaine.

From 1952 to 1989 I recorded the case histories of 840 patients (1-3) seen in my National Health Service (NHS) general practice, at my clinic in a Remploy factory for the disabled, or in out-patient clinics at Oldchurch (Romford) and Hammersmith Hospitals. All were suffering from chronic pain associated with localised fibromyalgic lesions. The sites affected were widely distributed in subcutaneous soft tissues from the scalp to the toes. There was an overall 70% success in relieving or curing pain; those patients who were not helped by local injection treatment were treated by other methods, as were those averse to injections. In every case each injection was recorded on a careful sketch of the part affected. Familiarity with the illustrations in Gray's Anatomy has helped in my recording, and I have used rubber stamp outlines for some parts of the body.

I have also treated many patients for acute pain following recent injury or strain in various parts of the musculo-skeletal system. It is difficult to judge the effect of injection in these cases, since many patients recover without treatment after a few days rest. However, as medical advisor to a senior amateur football club and at international fencing tournaments, I have injected a mixture of triamcinolone and lignocaine to small lesions enabling athletes to continue participation in their events. Additionally, patients suffering from acute disabling lesions have been able to continue to work after treatment. In general I have found that there is no need for a patient to rest after local injection therapy.

Fibromyalgic lesions are often found to be unresponsive to routine treatment with oral analgesics and physiotherapy, but in the light of the side effects seen when large doses of oral cortisone were used for rheumatoid arthritis in the 1950's, there has been a widespread fear of corticosteroid injection and reassurance may be difficult. My

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observations were enhanced by the fact that the patients in our five-man general practice were free to consult any partner at any time; the shared clinical records enabled me to follow up patients who had been treated with local injections and other methods for many years. The patients at the Replorey factory were examined at routine medicals every six months over 39 years. Patients treated at Oldchurch Hospital were monitored in a controlled, single-blind trial and followed up for six months by postal enquiry. Many patients had local injection treatments over the years for fibromyositis lesions in various different and unrelated parts of the body.

The NHS contract offers general practitioners financial inducement to carry out minor surgical procedures, and local injection treatment qualifies as minor surgery. Injections of small amounts of corticosteroid for localised musculo-fibrous pain does not preclude the use of other methods of treatment or the use of concomitant unrelated disease.

I have rarely used injection of corticosteroid into joint cavities, as I have seen few cases of painful joints without localised tenderness of ligaments or synovia at the site of pain. Swollen synovial membrane may occur at sites inaccessible to palpation, often with swelling due to synovial effusion. Patients at my clinics with pain but no local tenderness were referred to a rheumatologist, but many who had failed to benefit from injections preferred to take analgesics rather than attend hospital for intra-articular injections; some were referred for arthroplasty.

Other treatments are mostly concerned with alleviation of pain by drugs or by stimulating the body to produce neurotransmitter substances, such as endogenous opioids, which counteract pain for limited periods by action on nociceptive transmission pathways. Many of these treatments are variations either on ancient techniques of anaesthesia and counter-irritation, such as massage, point stimulation and application of heat to the skin, or on psychological approaches such as hypnotherapy or faith healing. If a patient feels better, even temporarily, these treatments are worthwhile; after all, this is the object of any therapy; none the less, attention is needed to ensure that there is no risk of harmful consequences and that the cost financially or in terms of inconvenience is not excessive. Treatment of pain by rest is often prescribed: arm and leg splints may be helpful when pain is severe and exacerbated by movement. Non-steroidal anti-inflammatory drugs are generally given, but may have unpleasant side-effects. The practitioner offering local injection therapy must be experienced in other methods of treatment, since about 25% of patients treated with local corticosteroid injection get only partial relief and a further 25% get none.

Historical aspects
In 1938 Steindler and Luck used procaine injections for the treatment of primary and secondary myofibrositis; this gave only temporary relief. In 1942 Travell, Rintzler and Hermann used procaine injections daily or weekly with strong sustained pressure over the tender point. They reported success only in cases of less than two months duration, and noted poor results in chronic pain. Travell then used ethyl chloride spray for hours at a time in addition to the procaine injections and recorded a 10% success rate, as did Correll in 1950. Ethyl chloride spray was popularly used on lame horses to improve their value before sales at country fairs, and on footballers to enable them to return to play after injury. However, it was realised that there was danger of fire and explosion from ethyl chloride, so in 1957 Travell introduced harmless fluoromethane spray for this purpose. Solo and Kuiturf found tender trigger spots which were painless until pressed upon, a fact that had been known to martial arts experts for centuries. In 1946 Kelly said that fibrositis is an inflammation of fibrous tissues that does not proceed to suppuration; he injected procaine. Brendstrup found an increased concentration of muco-polysaccharides, a higher water and chloride content, mast cell infiltration and oedema in the fibrocytic lesions; he injected lignocaine. His observations were confirmed by Glyn, who advocated treatment with corticosteroid in 1971 in his presidential address before the Royal Society of Medicine; he used soluble cortisone, the drawbacks of which are discussed later.

Dixon and Graber reported local injection therapy in rheumatic disease, comparing this favourably against placebo. Corticosteroid injection to the tender spots gives a success rate of between 30 and 40%. Methyl prednisolone has been accepted as safe for intra-lesional use by the Association of British Pharmaceutical Industries; triamcinolone is licenced for intra-articular and intra-lesional use.

General practice management of chronic pain
The general practitioner is in a special position to offer support and reassurance to the chronic pain patient and his family, and also has the onus of treating any coexistent illness while the patient is receiving long-term care.

A new patient with chronic pain is a challenge to the practitioner, who may attempt to revise the diagnosis and prescribe a new and effective treatment. The pain-ridden patient who is seen for the first time is concerned to be reassured that he has no serious or fatal disease, and hopes to be cured of his pain no matter how long he has suffered. When every effort has been made to diagnose and treat specific ailments, attention should be concentrated on the exact site of the patient's pain in the hope of finding a tender fibromyositic or trigger spot. Local injection treatment to such a spot may give relief from pain. This applies especially to pain in scar tissue after injury or operation.

Treatable fibromyalgic lesions are found in all parts of the body. For this reason search should be made...
for such lesions in every case of pain, whether or not associated with demonstrable bone, joint, or visceral disease.

Recording the results of treatment is bedevilled by the fact that pain at any given site is prone to cyclic remission. For instance, it has been shown that attacks of arthritis often occur during spring and autumn. Treatment begun during these attacks will have an apparently beneficial effect. Every general practitioner has seen a patient achieve a splendid remission of pain following prescription of the doctor's favourite painkiller, only to be daunted by the patient's confession that he did not take the tablets.

Many so-called incurable chronic pains should be recognisable and curable. Only patients inflicted with inoperable cancer and certain spinal, bony, and visceral diseases are suffering from incurable pain. Even in these cases there may be concomitant pain due to myofibrositis or scar pain. Thus when a practitioner is asked to care for a patient with terminal cancer he may be informed that surgery, radiotherapy, and/or chemotherapy have already been used, but he should still seek to exclude treatable soft tissue lesions; in particular a patient with terminal cancer may have concurrent pain in operation scars or infection in a cavity.

The general practitioner treats pain, anxiety, and insomnia from the outset, using the drugs with which he is familiar. The British National Formulary (4) offers a plethora of alternatives to the drugs of first choice. This embarrasses de richness serves to emphasise that, in a way, drugs play a secondary role in the treatment of pain. Having decided on a drug regimen for the patient, the doctor may consider other aspects of management. Many patients never lose hope of a revision of diagnosis. Physical examination of the site of pain is reassuring to all concerned, and the possibility of finding unrelated treatable lesions adds interest. The doctor is well repaid if he chats to the patient, and supports the efforts of the family and nurse to create a pleasant and relaxed atmosphere. A promise to revisit is an insurance against anxiety and alarm if the doctor is called in later when there has been deterioration. The importance of creating a calm, confident and trusting mood has been stressed as being more important than control of pain by drugs: agitation, despair and a feeling of isolation lower the pain threshold.

The practitioner should adopt a tolerant attitude toward concurrent alternative or placebo treatment. In many instances there is a physiological as well as a psychological response to these procedures. Failure to benefit renders the chosen treatment self-limiting, and patients may use some of these therapies for themselves at home, with the advantage that treatment can be as frequent as required.

Localisation of tender painful lesions

After routine history-taking, general examination, and palpation of the site of localised pain, I would pinpoint the lesion with a palpator: a rubber-tipped skin pencil or ball point pen which is also used as a skin marker. The palpating tip is made from a wedge-shaped pencil-top eraser by cutting away the sharp end and rubbing the corners off (Figure 1). Since the index finger is about 1.5cm wide, it is not suitable for pinpointing small lesions such as those occurring on the posterior-lateral aspects of the interphalangeal and metacarpo-phalangeal joints; however, finger pressure is perfectly adequate for the identification of trigger points in most larger muscles. In some locations, such as the lumbar region and buttocks, deep pressure requires the use of the thumb, which is too wide for accurate palpation. Failure to palpate accurately may lead to misdiagnosis or misplacement of the needle.

The patient is first asked to point to the affected place and a mark is made at the site indicated; then, after routine palpation with the palm and fingertips to exclude cysts or tumours and locate the site of pain, the palpator is used to find the site of maximum tenderness. For lesions on the trunk or limbs the examiner palpates at intervals of 1cm starting from a point 5cm above the centre mark (Figure 2) until the patient experiences tenderness, when a second mark is made (the north spot). The prodding is repeated from a point 5cm below the original place indicated by the patient, then from points to the right and left of the central spot. Starting from the north spot the examiner proceeds along a line towards the central mark at 1cm intervals until the patient feels maximum tenderness. This place is then marked. The search is repeated from east, south and west. The patient is asked to close his eyes while the prodding is repeated, with the examiner counting aloud with each prod, and then to say at which number he felt the most tenderness. The process is repeated from several points of the compass until an area of hyperaesthesia is marked out. Palpation is directed towards the centre from several points of the compass until the most tender spot is pinpointed and marked with a
circle. By pinching the flesh at increasing depths the examiner can estimate the probable depth of the lesion. There may be a localised tender lesion or an area of hyperaesthesia with a central or paracentral most tender spot. The findings are recorded on a sketch of the affected part for the patient's records. The site of the lesion may be confirmed by noting the site of maximum pain during injection of the lesion.

Figure 3 is a composite sketch of the sites of 239 tender lesions found in a series of 109 patients complaining of pain in the back. The injections at the sacro-iliac joints have been separated, although in reality many were at or near the same sites in this region. In individual patients the sites of recurrence were seldom the same as the original lesion.

**Differential diagnosis**

Figure 4 illustrates the clinical differential diagnosis for every tender lesion in a section of the thoracic region. **Figure 5** illustrates the anatomical differential diagnosis which must be considered in every case in a section of the sacral region. There is more to back pain than a slipped disc. Tender lesions should be sought at the sites indicated by the patient. These considerations apply similarly to all parts of the musculo-skeletal system.
Trapped nerves
The skin is served by sensory nerves which emerge through the deep fascia and are responsible for the transmission of touch and pain sensations from a circumscribed area of skin. Thus, when a nerve is constricted at the deep fascia, the overlying skin is tender. The shape of the area of skin served by cutaneous nerves differs in the limbs and trunk: since the skin stretches distally with growth of a limb, it is not surprising that the areas served by cutaneous nerves of the thigh are oval in shape, and that the most tender spot is found at the junction of the upper and middle thirds of the oval; the tender areas at the back of the trunk are more or less circular. Tenderness of tissues unconnected with cutaneous nerves of the skin is usually deep to small circular areas of the skin superficial to the lesion, or localised to small sections of superficial scar tissue. Trapped nerves are most likely to be found in the abdomen and thighs.

Scar pain
Prolonged post-operative pain is a source of disappointment to surgeon and patient alike. Palpation often reveals a tender scar in the tissues disturbed by the operation; these observations apply equally to scars following accidental injury. Scar pain, even in deep tissues, can be successfully treated: the operation site is pinched between finger and thumb at progressively deeper levels until maximum pain is felt. Where the lesion does not involve muscle, but is located in white fibrous tissue, it should be possible to localise the lesion to a small area, and to treat it with a small volume of a mixture of corticosteroid and lignocaine. Figure 6 illustrates the relative incidence of localised tender lesions, excluding back pain, in various parts of the body in a series of 188 patients.

Treatment of fibromyositic lesions
After a localised fibromyositic lesion has been diagnosed and concomitant diseases such as septic arthritis, neoplastic disease, and bacterial infection have been considered, the patient should be informed of the possible cure of pain by injection of a mixture of corticosteroid and local anaesthetic, which I believe to be the treatment of choice in general practice for chronic pain due to localised fibromyositic lesions. Since there usually is no urgency, the patient is given an explanatory leaflet (Table 1), and advised to discuss the treatment with his family if he so wishes. He may decide to accept treatment at once. If seen by referral the patient may decide to discuss the treatment with his medical advisor, and when necessary a letter is sent to the doctor asking permission to treat the patient with local injections of corticosteroid. In my experience as medical advisor to a remploy factory for disabled persons, and clinical assistant in charge of a back pain clinic, general practitioners and consultants were agreeable to the treatment in all cases, except in one patient where oral corticosteroids were considered to have induced attacks of hypomania.

Table 1
ADVICE FOR PATIENTS
The patient should be presented with a leaflet containing the following information concerning treatment of localised musculo-skeletal pain with injections of triamcinolone acetonide.

1. The injection consists of small amounts of corticosteroid mixed with a short-acting local anaesthetic.
2. Each tender spot needs a separate injection.
3. One injection is usually sufficient to cure each tender place. Other nearby places may need separate injections at weekly intervals.
4. There may be discomfort for a day or two after the local anaesthetic wears off. Analgesic tablets may be taken during this period.
5. If the injections are successful, other treatment for pain can be stopped.
6. The injections may cause a temporary increase of sugar in the urine in diabetics, but these effects are harmless.
7. The injections may return after months or years. Injection treatment can then be repeated.

Figure 6. Chart showing sites of 278 injections for non-backache tender lesions in 188 patients, showing the number of injections at each anatomical site.
Method

After checking that the patient has not fainted after previous injections, especially after administration of local anaesthetic for dental treatment, the patient is warned that the needle might cause pain. Where there is a history of fainting, the patient may lie on a couch during treatment. Some clinicians inject local anaesthetic before the corticosteroid, but this method may lessen the accuracy of the injection of triamcinolone.

One ml of a suspension of triamcinolone acetonide is mixed with 1–2 ml lignocaine solution and shaken thoroughly (Table 2). The amounts can be varied depending on the size of the lesion and the number of lesions to be treated. For the treatment of one fibromyositis lesion, 0.25 to 0.5 ml of the suspension is normally sufficient. The smallest needle possible is used, depending on the depth of the lesion, with a fresh needle for each injection. The pain of the needle piercing the skin may be as severe as the pain caused by injecting fluid into the lesion.

When more than one tender lesion is found, two or more sites can be injected at one session, depending on the total amount of tissue affected. This allows the use of a total of up to 10 mg of triamcinolone acetonide per week. If the injections are to be given into tiny lesions a total of 10 mg per week can be given in small divided doses, such as 1 ml. If a patient can attend only at intervals longer than a week, 20 mg in 2 ml of a solution of lignocaine in divided doses has been given with no ill effects. I do not agree with large doses of diluted corticosteroid injected over a wide area in a blunderbuss technique.

In order to ascertain the volume of musculo-fibrous tissue which is affected by 1 ml of the injected suspension of triamcinolone, experiments were performed using cuts of beef and turkey legs. It was found that 1 ml of triamcinolone suspension stained with indigo carmine infiltrated at least 2 ml of muscle and fibrous tissue.

For injection of the head, neck, shoulders and back the patient should be seated. The thigh, knee, ankle and foot are also treated with the patient seated, with the affected limb supported on a chair, or alternatively with the patient lying on a couch. The front of the chest and the abdomen are injected with the patient supine on a couch.

The patient is warned that the needle will be inserted into the centre of the painful site, and assured that the presence of pain is a useful guide to accuracy, but that the pain will last for a few seconds only because the local anaesthetic will cause numbness which should last for two or three hours. Disappearance of pain and tenderness is reassuring evidence that the injection has been correctly sited. When the anaesthetic has worn off, pain returns and may last for two or three days after which cure should be apparent.

The needle is inserted at the tenderest spot and pushed vertically through the tissues using a side-to-side motion. When the point of the needle reaches the deep fascia the needle-tip will be held fast. If there is evocation of the patient’s pain, the injection is made at this point, especially if a trapped nerve is suspected. If the patient feels pain upon the deep fascia, the needle is angled, and divided doses are injected over a wide area in a blunderbuss technique.

Lesions in deeper layers of tissue or subcutaneous fat. Residual tendon tissue will depend on the site, but it is better to inject too little of the mixture than risk infiltrating normal tissue or subcutaneous fat. Residual tender tissue can be injected at weekly intervals.

All lesions and injected sites should be noted and numbered serially on a sketch of the affected part for future reference. It is my impression after many years of follow-up, assisted by these careful drawings, that

<table>
<thead>
<tr>
<th>Method</th>
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<tbody>
<tr>
<td><strong>Assessment of Local Injection Treatment</strong></td>
</tr>
<tr>
<td><strong>Excellent result</strong>: a rapid and complete disappearance of pain from each site within 2 weeks, lasting for at least 6 months.</td>
</tr>
<tr>
<td><strong>Good result</strong>: alleviation of pain within 2 weeks, but requiring further injections during the following three months, with relief for at least 3 weeks before relapse.</td>
</tr>
<tr>
<td><strong>Failure</strong>: no benefit from injections, or refusal to continue treatment despite benefit from first injection.</td>
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**Table 2**

**MATERIALS REQUIRED FOR TRIGGER POINT INJECTIONS**

<table>
<thead>
<tr>
<th>Fluocortisones suitable for local injection therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Triamcinolone acetonide (Adocryl)</strong></td>
</tr>
<tr>
<td>10 mg suspension in 1 ml vials</td>
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<tr>
<td><strong>Triamcinolone hexacetonide (Lederpein) 20 mg in 1 ml vials</strong></td>
</tr>
<tr>
<td><strong>Methylprednisolone acetate (Depo-Medrone)</strong></td>
</tr>
<tr>
<td>40 mg in 1 ml vials</td>
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<tr>
<td><strong>Methylprednisolone acetate (Depo-Medrone)</strong></td>
</tr>
<tr>
<td>40 mg with Lidocaine (Lidokain) 10 mg in 1 ml vials</td>
</tr>
<tr>
<td>Soluble hydrocortisone is not suitable for local injection treatment, since it is rapidly absorbed into the blood stream. Multidose bottles are not advised in view of the risk of cross-infection.</td>
</tr>
</tbody>
</table>

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**Table 3**

**ASSESSMENT OF LOCAL INJECTION TREATMENT**

Excellent result: a rapid and complete disappearance of pain from each site within 2 weeks, lasting for at least 6 months.

Good result: alleviation of pain within 2 weeks, but requiring further injections during the following three months, with relief for at least 3 weeks before relapse.

Failure: no benefit from injections, or refusal to continue treatment despite benefit from first injection.
pain does not normally recur at a site that has been injected. Recurrence of pain may occur, but at sites adjacent to or remote from the sites previously injected. This is encouraging, for with persistence all painful lesions can thus be cured in a high percentage of cases. Assessment of results was based on examination two weeks after the final injection, with a follow-up questionnaire six months later (Table 3).

Local injection therapy is an art requiring special skill in locating and injecting small, unseen lesions. It can be acquired only by experience and practice. A physician's first attempts may fail, causing discouragement to the point of disillusion and leading to the method being abandoned. For this reason I advocate the use of larger, diluted doses when first starting to use local injections. Some physicians have continued to use large doses of dilute suspension as routine, but this is not an elegant application of the technique.

Management after injection
It has been my policy to allow full activity after treatment. Following dissolution of the injected tissues, new fibrocytes or muscle fibres grow into the treated tissues. Activity of the part encourages the new tissues to grow along the lines of force. Sporting and industrial fitness is usually maintained. However, because there are patients who are not cured by local injection therapy the practitioner must be ready to advise alternative treatments, or philosophical endurance of pain.

Fear of injections
Some patients are terrified of injections of any sort. This may be the consequence of a previous routine prophylactic injection: we all know it hurts, but some can accept the pain better than others. Certain parts of the body such as the scalp, front of neck, presternal area, temporomandibular joint and public arch seem to be especially associated with feelings of fear. In certain countries many drugs are routinely administered as injections, and patients are inured to this route of administration.

Apart from those who are frightened of injections, there are others who are anxious about the use of steroids. This is because of the side effects seen with large doses of oral steroids for the relief of rheumatoid conditions or severe asthma, of steroid creams on the skin, and of injudicious high dosage or frequent injections to soft tissue or joints, giving the impression that steroids are dangerous. Confidence, tact, patience, empathy, and a sense of humour are necessary in such cases, and alternative treatment may be indicated: a patient should not be forced into accepting an ungenial therapy without very good reason. At least it can be a source of satisfaction that the patient is made aware that a pain is not psychosomatic or due to incurable or malignant disease. The serious side effects found with non-steroidal anti-inflammatory drugs (1) have highlighted the need for a pain-relief regime with minimal side-effects.

Side effects of corticosteroid injection therapy
The doses of triamcinolone used in the treatment of fibromyositis are so small and so infrequent as to minimise adverse reactions or side effects. See the British National Formulary for accounts of side effects which must be monitored (4). The normal adult secretes 25mg of cortisone per day, that is 175mg per week. In the regime described above the patient receives from 5-10mg of triamcinolone acetonide per week, which is equivalent to 25-50mg of cortisone. This is a harmless dose compared to the large doses of oral cortisone used in the 1950s in the treatment of rheumatoid arthritis, which caused regrettable side effects and brought cortisone into public disfavour. Glycosuria and extra menstrual incidents have been seen in a few cases and some patients have reported flushes or a feeling of malaise. One patient of mine developed a small depression in the skin of the forehead, but this disappeared within three months.

Soluble cortisone is rapidly washed out of inflamed tissues before it can homogenise collagen, and therefore should not be used for treatment of fibromyositis lesions. On the other hand insoluble crystalline corticosteroids remain in the injected tissues for days, and homogenise and liquify diseased fibromyositis lesions, allowing normalisation of the injured site by proliferation and ingrowth of adjacent normal fibres.

Intra-articular corticosteroid injection
Since there are no nociceptive pain endings in bone or cartilage, clinical or radiological evidence of arthritis does not indicate that bone changes are the source of a patient's pain. Any relief experienced is due to seepage of corticosteroid out of the joint space into the synovium and periaricular ligaments. Hollander states: "After years of study I have concluded that intra-articular corticosteroid is clinically useful in local palliative therapy of the following conditions: peripheral joints inflamed or painful from rheumatoid arthritis, osteoarthritis, traumatic arthritis, acute or chronic gouty arthritis or intermittent hydrarthrosis".

Until recent years it was believed that corticosteroid injected into joint cavities destroyed articular cartilage. Wright and Halliwell advise that intra-articular injections should be given if there are signs of inflammation in only one or two painful joints. Grey et al reported that there was no difference in cartilage destruction in treated and untreated patients, because the articular cartilage of all patients is destroyed in time by the disease rather than by the corticosteroids. In contrast, Gumpel writes that "Most orthopaedic surgeons consider that intra-articular injections may be harmful, especially in weightbearing joints".

There is no need to inject the corticosteroid and lignocaine mixture into any joint cavity or bursa if the site of pain is in synovium or ligament which
can be reached with a needle. I have rarely injected corticosteroid into a joint space. Patients suffering from inflamed rheumatoid or arthritic joints with effusion were always referred to a consultant rheumatologist. Now, however, there are general practitioners who are equipped to perform arthrocentesis under sterile conditions in special treatment rooms at health centres, and there is great temptation to inject corticosteroid through the same needle.

Intra-synovial corticosteroid injection
In contrast to the possible harmful effects of intra-articular injections of corticosteroid (Charcot-like arthropathies have been reported), injections into inflamed synovium are beneficial. Hollander discusses intra-synovial and intra-articular therapy separately. He studied the results of 400,000 intra-synovial corticosteroid injections (including tendon sheaths and bursae) and concluded: "No other form of treatment for arthritis has given such consistent local symptomatic relief for so long with so few harmful effects". The synovium, peri-articular and intra-articular ligaments, and tendon aponeuroses are well supplied with pain end-organs, and removal by injection is aimed at these tissues.

Clinical trials
In a series of 250 patients seen in general practice and treated with local injection therapy, cure or relief of chronic soft tissue pain was achieved in 75% of cases. Like results were recorded in a prospective, controlled, hospital-based trial to evaluate the effectiveness of local injection therapy in a series of 57 patients suffering from chronic backache. Treatment of a series of patients suffering from chronic pain in other parts of the body gave similar results.

Conclusion
The injection of small doses of insoluble corticosteroid into tender spots associated with painful areas can give rapid, effective and long-lasting relief without significant danger of side-effects. There is evidence that even if pain recurs, there is no recurrence of tenderness at the injected points, but that other tender spots nearby may require treatment.

Acknowledgements
This could not have been written without the help or advice of Dr Stephen Bourne, Dr Basil Garo-Falides and my wife Mrs Mary Bourne. I am also indebted to Dr Michael Wright for his advice.

Editor's note
This is the fourth in a series of articles (1-3), with several more planned, which has been prepared from a manuscript originally intended to be published as a book. Unfortunately, although a comprehensive reference list had clearly been produced, this has been mislaid. The editor believes the remaining content to be of sufficient importance to merit publication despite this and other deficiencies, which can not now be rectified, and asks the indulgence of readers for the current and the planned future articles, which have been made available to us through the kindness of Mrs Mary Bourne, and with the assistance of Dr Stephen Bourne.

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