THE USE OF HYDROCORTISONE BY LOCAL AND INTRA-ARTICULAR INJECTION IN A VARIETY OF COMMON ORTHOPAEDIC CONDITIONS

SIDNEY SACKS, F.R.C.S. (EDIN.)

Orthopaedic Surgeon, Johannesburg

The concept of altering the biochemistry and relieving pain in pathological joints and other tissues by intra-articular or local injection has always been an interesting one, and numerous substances have been used in the past.

Hydrocortisone is one of the more recent substances so employed and the results have been reported mainly in the American literature. In view of these reports a clinical trial with hydrocortisone in a variety of conditions was embarked upon, and this paper reports on the results of approximately 1,000 injections on 465 cases. It is based on the records of the Hydrocortisone Clinic at the Johannesburg General Hospital and on cases treated in private practice.

Hydrocortisone is a synthetic hormone, also known as (Kendall's) Compound F or (Reichstein's) Substance M. It is a distinct corticoid and differs from cortisone (Compound E) in that it has a more marked local anti-

inflammatory or decongestive effect at tissue-cell level. Its local effect was first studied by Leopold *et al.* in certain eye conditions, and by Spies and Stone on dermatological diseases. In 1951 Duff, Robinson and Smith reported that their results of intra-articular injection of Compound F supported the concept that adrenocortical steroids exert their favourable action in arthritis by a direct effect at connective-tissue cell level; and in addition to suppressing inflammatory changes, they influence the altered chemistry of connective tissue toward a more normal pattern.

Hollander *et al.* compared the effects of cortisone and hydrocortisone by intra-articular injection of these substances into arthritic joints. They based their evaluation on the following criteria: (*a*) measurement of joint circumference, (*b*) tenderness, (*c*) range of joint motion, (*d*) synovial cell count, (*e*) joint temperature. They concluded from their experiments that hydrocortisone exerted a constant anti-inflammatory effect on rheumatoid joints when administered locally, whereas cortisone did not. The intra-articular joint temperature was lowered, the synovial cell-count decreased and joint movements improved. It was presumed that because hydrocortisone is 7 times less soluble in blood plasma than cortisone, it has a slower rate of dispersion, and this reservoir or depot effect enhances its anti-inflammatory potency above that of cortisone.

They conducted a survey of the effects of hydrocortisone when injected into rheumatoid and osteoarthritic joints and in several other conditions such as gout, traumatic arthritis and bursitis, and concluded that (1) the beneficial effect of hydrocortisone is non-specific, (2) it cannot be regarded as a cure, and (3) it temporarily suppresses the local reaction to an irritant.

The clinical improvement in the conditions treated with hydrocortisone has encouraged them to persist in this method of treatment and they have already reported the results of 10,000 injections into joints, bursae or tendon sheaths in 800 patients.

TECHNIQUE

Hydrocortisone acetate (hydrocortone, Merck) is a white crystalline power slightly soluble in water (1 mg. per 100 c.c.). It is prepared as a suspension in saline along with other suspending agents and a preservative. It is supplied in 5-c.c. vials as a sterilized suspension; each 1 c.c. equals 25 mg. Refrigeration is not necessary. The substance should not be mixed with saline, distilled water or other substances, since its state of suspension and effectiveness may be altered.

Mode of Injection. In arthritis hydrocortisone is injected into the joint cavity. This can be performed as an office routine if proper aseptic precautions are observed, but it should preferably be carried out in an operating theatre. The skin over the joint is prepared by cleaning it with a spirit or iodine swab; shaving is unnecessary unless the hair is profuse. The superficial tissues are infiltrated with 2 c.c. of 2% procaine as far as the joint capsule. The needle is left *in situ* and another syringe containing 1-2 c.c. of hydrocortisone is attached to the needle; by advancing the needle through the capsule and synovium, the joint cavity is entered and the required amount is injected into the joint. There should be no resistance to the depression of the plunger while the substance is injected. Occasionally a tag of synovium may block the tip of the needle and it is advisable to rotate the syringe as the injection is being made, so as to spray the solution into the joint. If the material is injected into the peri-articular tissues in error, the results will be unsatisfactory and there may be a subsequent painful reaction. It is essential to place the needle point in the joint cavity and a good knowledge of joint anatomy is therefore required. This method of treatment may fall into disrepute if true puncture of the joint is not carefully observed at each injection. Occasionally there is excessive synovial fluid present in the joint and puncture is then more certain and easy. The excess fluid should be aspirated and discarded before the injection of the hydrocortisone. Immediately after the injection, the joint is passively moved through its maximum range to disperse the hydrocortisone, and the patient is instructed to continue with his normal activities.

Site of Injection. In the knee joint the needle is inserted 1 cm. medial to the mid-point of the patella and advanced under the patellar articular surface.

In the hip joint the needle is introduced 2 cm. above the tip of the greater trochanter and advanced inwards until it strikes the mid-point of the femoral neck superiorly. It is then withdrawn for 2 mm. and the point of the needle should then be within the joint capsule. Another more successful route to the hip joint is to approach it anteriorly about 3 cm. below the anterior superior iliac spine and directing the needle towards the anterior aspect of the femoral head at right angles to the skin surface. The depth of penetration varies, but the point of the needle should be felt to contact bone and then be withdrawn 2 mm. before the hydrocortisone is injected.

The shoulder joint is reached *via* the anterior approach just lateral to the coracoid process.

The other joints are entered by their most accessible anatomical routes.

Amount Injected. The amount of hydrocortisone injected into the respective joints was as follows: hip joint 2 c.c., knee joint 1·5 c.c., shoulder joint 1 c.c., elbow joint, wrist 0·5 c.c. and finger joints 0·25 c.c. 'Tennis elbow' 1·5 c.c.

Frequency of Injections. In the series to be described, the injections were given at weekly intervals. In some cases one injection alone sufficed to relieve the pain, but in most cases further injections at weekly intervals were necessary. Maximum improvement usually occurred after the 3rd or 4th injection. Several cases of rheumatoid arthritis have had from 7 to 15 injections. In other conditions the method was generally discontinued and regarded as a failure if there was no improvement after the 4th injection. Patients were emphatic that the mild discomfort of the injection was worth while because the relief obtained was frequently so dramatic. Many have persisted in reporting back for their weekly 'joint lubrication', as they termed it, because it was the best treatment they had so far experienced for the arthritis.

Side Effects. The action of hydrocortisone is entirely local on the joint. Its mode of action is not entirely

understood, but there are definitely no systemic disturbances when injected intra-articularly. Occasionally a patient complains of a burning discomfort and a fullness of the joint a few hours after the injection, and some actually develop a joint effusion for 2 or 3 days. There is occasionally increased redness and heat, but this usually passes off in 48 hours. No case of osteomyelitis or suppurative arthritis occurred in this series.

Hydrocortisone should not be injected into joints affected by some specific infection such as gonorrhoea or tuberculosis.

Conditions treated. Hydrocortisone has been employed in this series for a period of 2 years, during which time 465 cases were treated, receiving a total of approximately 1,000 injections.

	Number of Cases	*Number of Injections*
Osteo-arthritis and degenerative arthritis	121	308
Rheumatoid arthritis	59	187
Gout	19	25
Bursitis	12	19
Supraspinatus tendinitis and 'frozen' shoulder	28	68
'Tennis elbow'	56	100
Tenosynovitis and De Quervain's disease	21	25
Knee operations	40	40
Manipulations of joints	20	25
Chronic sprains and joint effusions	39	78
Ganglion	5	7
Dupuytren's contracture	3	6
Fibrositis	15	30
Trigger finger	5	10
Painful heel	16	40
Hallux rigidus	3	6
Alkaptonuric arthritis	1	15

RESULTS

The follow-up period has varied from 1 week to 18 months. Most cases were seen at weekly intervals for 2-3 months after cessation of their treatment. The assessment of results of treatment in these cases is always difficult; the patients were asked to tell in their own words what percentage of improvement, if any, they themselves noticed in their joints. Most were intelligent adults and their own personal assessments were coupled with the results of the clinical examination of joint circumference, measurements of joint movements and skin temperature, in order to obtain some idea of the effect of this form of treatment. While this method does not give an accurate scientific estimation, it is held to be quite as good as any of the methods of assessment at present available.

1. *Osteo-arthritis and Degenerative Arthritis*

The joints treated included the hip, knees, shoulder, elbow, wrist, acromio-clavicular, temporo-mandibular, ankle, fingers and toes.

In 75% of cases the results of treatment were satisfactory to the patient and to the clinician, in that pain and swelling subsided completely and there was some slight improvement in joint function. Pain is usually the main presenting symptom and is more frequently relieved than the swelling. When there is gross diminution of joint function, movement is not as a rule markedly improved by hydrocortisone.

The first injection usually relieves 50% of the pain and 2 subsequent injections at weekly intervals generally suffice to rid them of the other 50% of the discomfort. In some cases the results are much more dramatic, and one injection has sometimes been sufficient to give relief for periods up to 12 months. The effect of hydrocortisone is extremely capricious and unpredictable, affecting different individuals and different joints in a varying manner.

Approximately 25% of the patients received no relief whatsoever even after 5 or 6 injections. However, none of them have been made worse. Hip joints particularly respond in a most erratic manner, and on the whole the results of injection into these joints were unsatisfactory. This can be ascribed to the difficulty in placing the hydrocortisone accurately within the joint cavity, and also because most of these patients first presented themselves for treatment when advanced bony and articular damage was already present in their hips. More knee joints were treated for osteo-arthritis than any other joint and it is in these that the most gratifying results were obtained. The pain and swelling was often diminished even after the first injection and in many cases further injections were unnecessary. It must be stressed that an inadequate puncture of the joint is liable to give poor results and this method of treatment should not be discarded until a satisfactory injection into the joint cavity has been made.

Ten cases of shoulder pain due to acromio-clavicular arthritis were all relieved. Two of these cases had previously received hydrocortisone directly into the shoulder joint, until it was realized that it was actually the acromio-clavicular joint that was the cause of the discomfort. They had instant relief after the first injection into this joint. Of these cases, 3 have subsequently had an operation for excision of the outer 1 inch of the clavicle, for recurrence and persistence of pain.

Osteo-arthritic fingers with Heberden's nodes were relieved of discomfort in 75% of cases after 2-3 injections of 0·25 c.c. of hydrocortisone into the terminal interphalangeal joints.

Four cases of temporo-mandibular joint arthritis were all relieved of pain for periods up to 12 months.

Three attempts at relieving backache due to degenerative arthritis of the paravertebral joints at the lumbosacral level failed, probably owing to the difficulty of entering these joints satisfactorily with the needle-point.

These findings indicate that hydrocortisone by injection should be prescribed in osteo-arthritis and degenerative arthritis particularly in an acute or sub-acute 'flare-up' of the joint, and in which other methods of treatment have failed or are not feasible. The patient should be warned that it is not a cure and the results are unpredictable, and that several injections may be required before any relief is obtained. In 75% of cases a satisfactory result can be expected if the injection has been satisfactorily made within the joint cavity.

2. *Rheumatoid Arthritis*

In this condition the general physical management of the case, together with the systemic administration of

cortisone or corticotropin, is still the most important aspect of treatment. Hydrocortisone can be used in the following instances:

1. where only one or 2 peripheral joints are involved;
2. where cortisone is contra-indicated because of hypertension, cardiac decompensation, nephritis, diabetes, tuberculosis, or peptic ulcer;
3. where cortisone or corticotropins have been successful on most of the joints, but one or 2 joints are still unrelieved of pain and swelling;
4. when manipulative procedures are performed on rheumatoid joints to correct contractures.

The value of hydrocortisone injections into these joints is probably attributable to the relief from pain experienced soon after the injection because, when the pain is relieved, muscle spasm is diminished and the patient is able to commence active exercises and thus 'build up' his muscles. Stiffness, contractures and muscle wasting can therefore be counteracted.

The rheumatoid joint is frequently swollen and injection is therefore a simpler procedure. Some of the fluid can be aspirated to relieve joint tension. Hydrocortisone can be mixed with a small amount of this fluid in the aspirating syringe before injection, resulting in better dispersal within the joint cavity.

The results of treatment in rheumatoid arthritis have been less satisfactory from the point of view of prolonged local relief of joint pain than in osteo-arthritis. In 75% the swelling diminished and pain subsided, but for only a brief period of 4-5 days. In osteo-arthritis the pain was relieved for a longer period; injections therefore had to be made at much more frequent intervals than in the latter condition. In only 10 cases were the joints rendered free of fluid and pain for periods of up to 3 months. However, even the short respite from pain between the injections enabled these patients to exercise their stiff joints and muscles, thus obviating contractures and muscle wasting. The patients themselves were only too eager for repeated injections, for the evanescent relief was much greater than that experienced from any other pain-relieving drug which had previously been administered to them.

In rheumatoid arthritis it is easier to assess results of treatment in an objective manner because diminished joint temperature, subsidence of joint swelling and relaxation of muscle spasm can be measured more accurately. In 58% of cases of this series these symptoms were improved by hydrocortisone, but the improvement was not sustained despite repeated injections.

Whilst no permanent success can be attributed to intra-articular hydrocortisone in this small series of cases, it is felt that a place for this method of treatment can be found, particularly if the indications previously mentioned exist.

3. *Gout*

All the cases of gout had received some other form of treatment during their acute attacks but they still had chronic unrelieved pain in one or other joint.

A dramatic response with complete relief of pain after one injection of hydrocortisone was experienced in 12 cases with painful knees.

Two cases with chronic painful metatarso-phalangeal joints were entirely relieved after one injection.

Two hip joints responded poorly, in that the pain only subsided for 4-5 days and then recurred. Subsequent injections did not give a favourable response.

One wrist joint was completely relieved after 2 injections.

One case with a tender painful gouty tophus at the insertion of the ligamentum patellae was instantly relieved of his discomfort.

From these results one gains the impression that hydrocortisone is an extremely useful adjunct in the treatment of gout localized to one particular joint.

4. *'Tennis Elbow' Syndrome*

This condition yielded the most spectacular and most constant results to hydrocortisone injections. Here the material injected was not always placed intra-articularly, but into the lateral ligament of the elbow joint or into the extensor muscle origins at the level of the lateral epicondyle. The site of maximum tenderness was determined, and 1 c.c. of procaine injected into the skin and subcutaenous tissues. Multiple punctures were then made in a radiating manner in the soft tissues, ligament and muscle origins in the vicinity of the external epicondyle, in order to ensure a wide diffusion of the hydrocortisone. (In some cases hyaluronidase was added to the procaine to assist in this spreading effect.) Hydrocortisone, 1—1·5 c.c., was then injected into the tender soft-tissue area, and the patient was advised to use his arm in a normal manner and even to partake of sport if he so desired.

In 50% of cases only one injection was required to relieve the symptoms completely; 30% were relieved of their discomfort after 2 or 3 injections, and 20% were failures in this series, even after 4 injections. Three of these cases subsequently underwent operation, and on exposure of the extensor muscle origins at the lateral epicondyle, a hard fibro-cartilaginous nodule was demonstrated in the common tendon origin which could obviously not have been relieved by any form of treatment other than excision. In 2 of them a small milky fluid collection was present in the interior of the fibro-cartilaginous nodules. Operation resulted in prompt relief of symptoms in each case.

Five cases experienced a mild recurrence of their 'tennis elbow' symptoms 3-6 months after their last injection of hydrocortisone, but they have been relieved by subsequent injections.

A control series of 10 cases with 'tennis elbow' symptoms were treated by procaine injections alone. One of these experienced permanent relief, whilst the others were not alleviated except during the 12-24 hours immediately after the injection.

5. *Supraspinatus Tendinitis and 'Frozen Shoulder'*

These patients were divided into 3 categories:

(*a*) *Acute supraspinatus tendinitis with or without a radiologically-seen calcific deposit.* Fifteen such cases were treated by injection of hydrocortisone into the most tender spot over the greater tuberosity, with instant relief. In 3 of them X-rays taken 4 weeks later showed complete disappearance of the radio-opaque material

in the supraspinatus tendon. It is difficult to determine whether hydrocortisone or the mere puncture of the degenerated tendon with the needle was the cause of the dramatic subsidence of symptoms. In the past similar results have been obtained with procaine infiltration alone.

(*b*) *Chronic painful shoulder joint with a large calcified mass in the vicinity of the greater tuberosity*. Six of these cases were treated by hydrocortisone injections into and around the calcified mass. Each case received 5 injections at weekly intervals, with relief of pain in one case after a follow-up period of 6 months, and very little relief in the other 5 cases.

(*c*) '*Frozen shoulder*' *syndrome*. Seven cases were not relieved at all, even after 4 or 5 injections at weekly intervals into the shoulder joint and the surrounding soft tissues. There were, however, 6 cases (included elsewhere in this paper) who were suffering from 'frozen shoulder' symptoms in which manipulation of the shoulder under general anaesthesia was performed, followed by injections of hydrocortisone into the joint whilst the patient was still under the anaesthetic. In these the results were much more satisfactory and pain was far less than in those patients who only underwent manipulation. Movements were improved because of the diminished pain and because active exercises could be performed immediately after the manipulation.

6. *Bursitis*

The 12 cases were as follows: prepatellar bursitis 5 cases, bursa anserina 1 case, olecranon bursitis 5 cases, subdeltoid bursitis 1 case.

In each case the bursa was aspirated and 1 c.c. of hydrocortisone injected. A crape bandage was applied to compress the bursa. One, or at the most 2, injections were necessary to prevent recurrence. All these cases were cured by this method.

7. *Knee Operations*

In 40 cases, hydrocortisone, 1 c.c., was sprayed into the knee joints with a syringe at the conclusion of such knee operations as meniscectomy, synovectomy and patellectomy. The post-operative morbidity was markedly diminished in all these cases and effusions rarely occurred. This procedure has now become a routine one and can be recommended.

8. *Chronic Ligamentous Sprains and Joint Effusions*

The cases treated were particularly sprains of the collateral ligaments of the knee joint accompanied by effusion, and also sprains of the elbow and ankle joints. The effusion disappeared rapidly and pain was markedly reduced on intra- and peri-articular injection. Chronic finger sprains were particularly amenable to intra-articular injection of hydrocortisone, and several boxers and labourers were speedily relieved of their discomfort.

9. *Fibrositis*

Although hydrocortisone is not specifically recommended for intramuscular injection, a number of cases in which no other diagnosis but fibrositis could be made were subjected to hydrocortisone infiltration of the tender palpable nodules. Most of these cases suffered from pain in the scapular and gluteal regions. Approximately 0·5 c.c. was injected in a radiating manner into the nodule after multiple punctures with the needle had been made.

In a series of 15 cases receiving a total of 30 injections, approximately 40% were relieved of their acute discomfort. The other 60% were unaffected.

10. *Tenosynovitis and De Quervain's Disease*

Those cases suffering from tenosynovitis of tendons either around the wrist joint, the fingers or the ankle joint were treated by injection of 0·5 c.c. of hydrocortisone into the palpable fluid swelling. There was marked improvement in all cases. In 5 cases of De Quervain's disease (tendovaginitis stenosans) of the thumb tendons treated by infiltration of the thickened tendon sheath with 0·5 c.c. hydrocortisone, relief of pain was obtained in 3 cases. Five cases of trigger finger due to stenosing tendovaginitis were injected, with temporary relief of pain for a few days but without any permanent relief of the disability.

11. *Joint Manipulations*

In 20 cases in which joint manipulations were performed under general anaesthesia, hydrocortisone was injected into the affected joint immediately after the manipulative procedure. The purpose was to relieve pain and muscle spasm and prevent further joint adhesions. Included in this series were cases of 'frozen shoulder', rheumatoid contractures, and contractures following decubitus and poliomyelitis. Results were encouraging in that the patients were much more comfortable after the manipulation; particularly in the 'frozen shoulder' group it was noted that greater mobility was regained, with less pain than in those cases in which manipulation alone, or hydrocortisone alone, was employed.

12. *Dupuytren's Contracture of the Fingers*

Three cases received a total of 6 injections of 0·25 c.c. of hydrocortisone into the thickened palmar fascia, without any relief.

13. *Painful Heels*

This obstinate condition, which often persists despite all measures for relief, was treated in 16 instances with injection of hydrocortisone into the tender area (usually situated at the attachment of the long plantar ligament to the under surface of the calcaneum.) In 10 cases the symptoms disappeared after an initial 48 hours of increased discomfort. Six other cases were not improved.

14. *Ganglion*

Three ganglia on the dorsum of the wrist and 2 on the dorsum of the foot were injected with 0·5 c.c. of hydrocortisone. A definite reduction in the tenseness of the swellings was noted, but the lumps did not disappear, despite repetition of the injections. The patients, however, expressed satisfaction with this form of treatment, possibly due to the diminution of pain because of the reduced tension within the ganglion.

15. *Hallux rigidus*

Three cases of hallux rigidus received 2 injections each into the metatarso-phalangeal joints. The patients maintained that the acute pain had been relieved temporarily, but movements were unaffected. Because of

the recurrence of pain, 2 of these cases subsequently submitted themselves to operation.

16. *Alkaptonuric Arthritis*

One case suffering from alkaptonuric arthritis of almost every joint in his body, submitted himself to a total of 15 injections of hydrocortisone into his knees, elbows and shoulder joints. He stated emphatically that this was the best form of treatment he had so far received, and he is still reporting back at intervals for repeated injections when the pain becomes severe. The periods of relief from pain after the hydrocortisone injections vary from 3 to 10 weeks.

17. *Miscellaneous Conditions*

Several patients suffering from conditions such as plantar warts, painful superficial scars, amputation-stump neuromata, plantar fasciitis of the foot, and peri-articular rheumatoid swellings, have also been treated, with relief in approximately 50% of cases.

CONCLUSIONS

1. Hydrocortisone is a useful adjunct to general measures in the treatment of rheumatoid arthritis, osteo-arthritis and gout. Its beneficial effect is non-specific and it cannot be regarded as a cure for these conditions.

2. In certain localized conditions such as traumatic ligamentous lesions, bursitis, tendinitis and 'tennis elbow' syndrome, it has in a high percentage of cases been successfully employed alone.

3. It has proved useful in certain orthopaedic procedures, e.g. after operations on joints, and in the rehabilitation of cases suffering from joint contractures and deformities.

4. The treatment is harmless and no severe toxic effects have been noted, despite repeated injections.

5. Hydrocortisone has not been found to be very effective in Dupuytren's contracture, ganglion, fibrositis, trigger fingers, or hallux rigidus.

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