Comparison of injection techniques for shoulder pain: results of a double blind, randomised study

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Abstract

Seventy seven patients with soft tissue shoulder lesions including adhesive capsulitis and disorders of the rotator cuff and acromioclavicular joint were admitted to a trial comparing two different methods of corticosteroid injection with local anaesthetic in a randomly allocated double blind study. The method of anatomical injection after diagnosis by the technique of selective tissue tension gave 60% success compared with the method using tender or trigger point localisation, giving 20% success ($p < 0.001$).

Introduction

Corticosteroid injections have been used for painful shoulders for 30 years.¹ Several reports have shown these injections to be effective, not only relieving pain but restoring function as well.²⁻⁴

There are two commonly used techniques of injection. One requires placement of the corticosteroid accurately into an anatomical area believed to be the source of the pain, and the other requires injection of the most tender point, without placing emphasis on the anatomical structure at fault. If the anatomical area is to be injected, accurate diagnosis of the structure at fault is essential. Diagnosis by the examination of selective tissue tension, first produced by Cyriax,⁵ allows differentiation of soft tissue lesions in the neck, shoulder, and arm, as the pain is reproduced in recognisable patterns by active, passive, and resisted movements.⁶ The resulting anatomical diagnosis guides placement of the corticosteroid injection.⁷ Alternatively, the injection of the point which is most tender to palpation, especially of myofascial trigger points, is advocated as a simple and effective approach to the management of soft tissue lesions.^{8,9}

Because of the phenomenon of referred pain and tenderness, the injection sites for the two methods may not correspond. We have therefore carried out a randomised, double blind study to compare the effectiveness of these two techniques of injection in patients with shoulder pain.

Patients and methods

Seventy seven patients with shoulder pain referred by general practitioners to the rheumatology outpatient clinics completed the study. Criteria for inclusion in the study were: (a) that the diagnosis indicated the pain to be of soft tissue origin, (b) that the pain was predominantly in the shoulder or upper arm of any duration and of spontaneous or traumatic origin, (c) that the patients were prepared

to have a corticosteroid and local anaesthetic injection for their complaint, and (d) that they had positive signs on selective tissue tension examination of the shoulder structures.

Patients excluded from the study were: (a) those with predominantly neck pain (as determined by clinical examination of the cervical spine, which included flexion, extension, side flexions, and rotations) with or without referred pain to the shoulder; (b) those with paraesthesiae or neurological signs in the arms or hands; (c) those with specific arthritis (septic, gout, pseudogout); (d) those with any polyarthritis and generalised disease relevant to the symptoms (including hyperuricaemia); (e) those with radiological evidence of osteoarthritis or other bone disease; (f) those with overt, predominant psychological overlay.

Patients were classified by the technique of selective tissue tension as having tendinitis, bursitis, or capsulitis (frozen shoulder) on the following basis.

Supraspinatus tendinitis, pain on active raising and resisted abduction, with or without a painful arc.

Infraspinatus tendinitis, pain on active raising or resisted external rotation, or both, with or without a painful arc.

Subscapularis tendinitis, pain on active raising or resisted internal rotation, or both, with or without a painful arc.

Bursitis, pain on active raising with a painful arc but no pain on resisted movements.

Acromioclavicular joint strain, pain worse on passive adduction of the arm flexed 90°, the pain typically limited to the tip of the shoulder.

Capsulitis (frozen shoulder), painful, restricted active and passive movements, passive rotation being more restricted than glenohumeral abduction.

Each patient was randomly assigned to one of two treatment groups by the physician who was to give the injections. The assessing physician was not aware of the treatment group to which patients were assigned. The patient knew only that he would receive the injection by one of two techniques, but that the alternative technique would be used the following week if improvement was not adequate. He could withdraw from the study to alternative treatment at any time.

Treatment group 1 received a tender or trigger point injection of 2 ml 40 mg methylprednisolone acetate mixed with 1% lignocaine. The most tender point which reproduced the patient's pain was identified by deep palpation. The site of injection was recorded on a diagrammatic illustration of the shoulder girdle and arm.

Treatment group 2 received a "functional" injection, the site of injection being the anatomical area indicated by the selective tissue tension examination. The same injection solution was used. In the case of rotator cuff tendinitis a 25 gauge needle was used to place the solution around, deep, and superficial to the tendon; in intra-articular or bursal injections a 21 gauge needle was used to instil the solution into the structure.

Follow up assessments were made one, four, and eight weeks after injection. At one week, if the pain had not cleared completely or considerably diminished, the alternative (crossover) injection was given. If the crossover injection was not effective after one week then the original injection was given again (recrossover).

An injection was judged a success if the subjective assessment of pain reduced from severe to mild or nil, with a corresponding clearing of signs on objective examination.

Statistical analysis was by χ^2 test using Yates's correction.

Results

Of the 77 patients (38 men, 39 women), 38 (21 men) were randomly assigned initially to group 1 (tender or trigger point injection) and 39 (17 men) to group 2 (functional injection). The mean ages of the two groups were 57 years (range 33-74) and 53 years (range 20-80) respectively. The mean age of all the patients was 55 years. The mean duration of symptoms for all patients was 8.5 months (range 3 days to 30 months), group 1 averaging 7.5 months and group 2 9.5 months (difference not statistically significant).

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Sixty three trigger or tender point injections were given (including crossovers and recrossovers), whereas 69 functional injections were given (including crossovers and recrossovers). Table I shows the success rates for the two techniques. Statistically functional injection (60% effective) was superior to tender point injection (20% effective) ($\chi^2 = 13.79$; $df = 1$; $p < 0.001$). Analysis of the success rates excluding all diagnoses of capsulitis (table I) showed that 73% of patients with bursitis and tendinitis were successfully treated by the functional injection compared with 29% with the tender point injection ($\chi^2 = 11.54$; $df = 1$; $p < 0.001$). Fourteen out of 43 patients (33%) required crossover to a tender point injection after initially receiving a functional injection, whereas 26 out of 49 patients (53%) crossed over from a tender point injection to receive a functional injection.

TABLE I—Number of successes per number of injections (a) for all diagnoses and (b) for all diagnoses excluding capsulitis. (Percentages given in parentheses)

Injection	Initial	Crossover	Total
<i>All diagnoses</i>			
Tender point	10/49 (20)*	2/14 (14)	12/63 (19)†
Functional	26/43 (60)*	15/26 (58)	41/69 (59)†
<i>All diagnoses excluding capsulitis</i>			
Tender point	10/35 (29)‡	2/8 (25)	12/43 (28)§
Functional	24/33 (73)‡	11/13 (85)	35/46 (76)§

* $\chi^2 = 13.79$; $df = 1$; $p < 0.001$.

† $\chi^2 = 20.69$; $df = 1$; $p < 0.001$.

‡ $\chi^2 = 11.54$; $df = 1$; $p < 0.001$.

§ $\chi^2 = 18.81$; $df = 1$; $p < 0.001$.

TABLE II—Frequency of diagnoses

Diagnosis	No (%)
Capsulitis	25 (27)
Supraspinatus tendinitis	22 (24)
Infraspinatus tendinitis	17 (18)
Bursitis	11 (12)
Acromioclavicular joint strain	11 (12)
Subscapularis tendinitis	6 (7)
Total	92 (100)

TABLE III—Number of successes per number of injections for each diagnosis (including crossovers). (Percentages given in parentheses)

Diagnosis	Injection	
	Tender point	Functional
Capsulitis	0/20	6/23 (26)
Supraspinatus tendinitis	5/13	14/17
Infraspinatus tendinitis	5/11	8/10
Bursitis	1/7	5/8 (76)
Acromioclavicular joint strain	1/8	5/8
Subscapularis tendinitis	0/4	3/3
Total	12/63 (19)	41/69 (59)

Table II shows the frequency of diagnoses. This includes 10 patients who had an initial pattern of signs successfully cleared and who at the follow up examination at one week had a different pattern of pain. For example, one patient initially was diagnosed as having an infraspinatus tendinitis. After one week there was no pain on active raising or resisted external rotation but there was pain over the acromioclavicular joint on passive adduction which was not present initially. The treatment for the infraspinatus tendinitis was considered a success and the patient was given a crossover injection for the acromioclavicular joint pain.

Table II also includes three patients who returned with new injuries (two supraspinatus tendinitis and one infraspinatus tendinitis) after obtaining a cure from their initial injection. In addition, there were two spontaneous recurrences. One was a supraspinatus tendinitis at eight weeks after an initial tender point injection, and the other was an infraspinatus tendinitis at four weeks after an initial functional injection.

Table III shows the success rates for each diagnosis. All patients who were considered a success at one week maintained their relief

at four and at eight weeks except for the five patients who presented with new injuries or spontaneous recurrences.

There were eight patients who developed pain of cervical origin as the study progressed who initially had no signs suggestive of disease of the cervical spine. Five of these were diagnosed as having a capsulitis, two as acromioclavicular joint strain, and one as bursitis. All eight were failures of one or other of the injections (seven tender point injections and seven functional injections, including crossovers).

Discussion

This study confirms that corticosteroid injections may be an effective method of treating many patients with soft tissue lesions of the shoulder. The results with the functional technique were superior to the results with the injection of painful or trigger points ($p < 0.001$). The success rate for the injection of capsulitis was, however, much poorer than the success rate for the injection of bursitis or tendinitis.

Several studies have shown conflicting results with respect to the effectiveness of corticosteroid injections in treating painful shoulders. Coomes and Darlington¹⁰ compared local steroid injections with local anaesthetic injections for supraspinatus tears proved by arthrography and found that, although pain had greatly diminished three weeks after injection, the range of motion and painful arc were unaffected by the injection. They concluded that there was no objective evidence to show that local steroids improved the condition.

Kessel and Watson,³ who placed a corticosteroid and local anaesthetic injection at the anatomical site, achieved success in 71 out of 99 cases of painful arc syndromes. They found that many of the unsuccessful cases included a combination of degeneration of the acromioclavicular joint and a superior rotator cuff lesion, which would be relieved only by the improved clearance provided by surgery to the coracoacromial ligament and acromioclavicular joint.

Weiss⁴ reported success in 13 of 15 patients treated with multiple (up to three) intra-articular injections of 40 mg triamcinolone acetonide under radiological control for tears of the rotator cuff diagnosed by arthrography.

Our study shows that a single injection of 40 mg methylprednisolone acetate plus 1% lignocaine, guided to the anatomical area at fault by appropriate examination, will produce complete resolution of the problem in 73% of cases (excluding capsulitis).

Several investigators have advocated the injection of myofascial trigger points as effective in relieving shoulder pain and producing longlasting relief.^{8, 9, 11, 12} These trigger points have been injected with either local anaesthetic, with or without steroid, or physiological saline. Many of our tender point injections corresponded in location to the classical trigger points identified by Travell^{8, 13} and Sola.⁹ Indeed, the identification of our tender points fits the definition of trigger points in that they were abnormally sensitive, discrete areas in muscle or tendon which when stimulated by palpation reproduced the pain.^{9, 11, 13} But our study showed that only 20% of our tender point injections were successful compared with 60% of our functional injections ($p < 0.001$). The tender points were estimated to be an average of 4 to 5 cm from the corresponding functional injection site.

Our poor results for patients with capsulitis (26% success) confirmed the findings of Bruckner,¹⁴ who stated that there is no simple satisfactory treatment for capsulitis (frozen shoulder). Cyriax's initial results for injection of hydrocortisone intra-articularly for "freezing arthritis" were also poor.¹ More recently, he has advocated multiple intra-articular injections at weekly or biweekly intervals for capsulitis.^{6, 7}

Other studies have been done on the treatment of capsulitis and results have been inconclusive. Lee *et al*¹⁵ compared analgesics with intra-articular hydrocortisone plus exercises, bicipital tendon injection plus exercises, and heat plus exercises. All three exercise groups had a significantly improved range of

motion compared with the analgesic group but there was no difference among the three exercise groups.

In our series the six successes with the functional injection all had considerable relief of pain at one week with more than 50% improvement in range of motion. Eight of our patients who failed to improve developed signs of cervical spondylosis, which was then taken to account for their persistent shoulder pain, despite their initial examination having shown no signs of that type. We suggest that irritation of the cervical nerve root is a not uncommon cause of shoulder and arm pain and that close attention should be paid to examination of the cervical spine in all patients with shoulder pain.

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Multiple endocrine neoplasia associated with von Recklinghausen's disease

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Abstract

Details were studied of three patients with duodenal carcinoid tumour in association with neurofibromatosis and phaeochromocytoma, and of four patients with duodenal carcinoid and either von Recklinghausen's disease or phaeochromocytoma. The rarity of these endocrine tumours, together with the unusual morphological features and somatostatin content of the two duodenal carcinoids examined, suggest that this combination of tumours is not a chance association.

It is suggested that this linkage of neurofibromatosis, phaeochromocytoma, and duodenal carcinoid is a specific multiple endocrine neoplasia syndrome.

Introduction

A variety of multiple endocrine neoplasia syndromes have been described, but at present three major types are accepted, usually referred to as types I, IIa, and IIb. Multiple endocrine neoplasia type I, first clearly defined in the 1950s,¹ affects the anterior pituitary, parathyroids, pancreatic islets, and adrenal cortex, the glands showing a variable degree of adenomatous hyperplasia, adenomas, or carcinomas.² It may be accompanied by carcinoid tumours, both bronchial and at other sites.³ Multiple endocrine neoplasia type IIa, the combination of

medullary carcinoma of the thyroid and phaeochromocytoma,⁴ is often referred to as Sipple's syndrome.⁵ Multiple endocrine neoplasia type IIb is the link between multiple mucosal neuro-mas, medullary carcinoma, and phaeochromocytoma.⁶ In types IIa and IIb both medullary carcinoma and phaeochromocytoma may be bilateral, multifocal, and preceded by hyperplasia of thyroid C cells and phaeochromocytes respectively.

Many workers have reported the occurrence of tumours of more than one endocrine gland in the same patient or within the same family that do not fall into these recognised patterns,⁷⁻⁸ and it is often difficult to exclude the possibility of a chance association. We have recently seen an unusual combination of duodenal carcinoid, phaeochromocytoma, and neurofibromatosis and have subsequently found that a sufficient number of similar cases had been reported to make us believe that this is not a chance association and may be important in the management of patients.

Details of patients

Over the past three years we have seen four patients with tumours of the duodenum with unusual histopathological features, three of whom were referred from other hospitals. All four tumours were endocrine cell tumours (carcinoids) that reacted only weakly to normal silver impregnation techniques and had an unusual glandular pattern, and three of the tumours contained psammoma bodies. Three of the tumours were resected; they were strongly positive on immunolocalisation with an antibody to somatostatin (figure). This antibody had been shown to stain normal pancreatic D cells; the staining was abolished by preabsorption with somatostatin 14. The fourth tumour was an incidental finding at necropsy and therefore unsuitable for somatostatin immunolocalisation.

We regarded these tumours as carcinoids, using the terminology recommended by the World Health Organisation international histological classification of tumours.¹⁰ They could be further sub-classified as D cell carcinoids or so called somatostatinomas. We

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