

## Section of Rheumatology & Rehabilitation

President P J R Nichols FRCP

Meeting 13 November 1974

### Ernest Fletcher Lecture

#### The Painful Shoulder

by A T Richardson MB FRCP  
(Royal Free Hospital, London NW3)

I particularly appreciate the invitation to deliver the fourth Ernest Fletcher Memorial Lecture because on my appointment to the Department of Physical Medicine at the Royal Free Hospital in 1953, I became a colleague of the late Ernest Fletcher's, he having been appointed Rheumatologist to that Hospital in 1938. Within a year of my appointment we combined our respective Departments into a Department of Physical Medicine and Rheumatology under which name it has existed to date, but which now, and coinciding with the move into the new Royal Free Hospital, is being renamed the Department of Rheumatology and Rehabilitation, thus matching the name of this Section.

Ernest Fletcher had many interests within rheumatology and previous lecturers have reflected some of these in choosing as their subjects hydroxyproline excretion in collagen metabolism and various aspects of rheumatoid arthritis. The painful shoulder was also an interest of Fletcher's and indeed the chapter (31) on the shoulder joint in his book 'Medical Disorders of the Locomotor System', first published in 1947, gives a comprehensive account of the problem. I have also been influenced in choosing the painful shoulder as my subject because although it is a common cause of disability it still receives scant mention in rheumatology books and at rheumatology meetings.

In a paper read to this Society in 1968 (Richardson 1969) I reviewed the arthritic causes of chest pain including arthropathies involving the acromioclavicular and the inconstant coracoclavicular joints. In this Lecture lesions of the

glenohumeral joint and surrounding structures are the main topics.

Referred pain to the shoulder from visceral, spinal and neurological lesions seldom presents difficulty in diagnosis and the association of a painful stiff shoulder with cardiac ischaemia, cerebral lesions, dorsal herpes, &c., and the development of the shoulder/hand syndrome in these situations is well recognized and will not be considered further. Shoulder arthropathies of the inflammatory group are uncommon apart from the generally late involvement of the glenohumeral joint in rheumatoid arthritis and its variants, e.g. ankylosing spondylitis. In the last decade, I have seen only one infected glenohumeral joint, in that case due to secondary staphylococcal infection in a rheumatoid arthritic. Apart from these I have analysed a personal series of 138 consecutive cases of pain in the shoulder seen over the last four years. This illustrates the rarity of degenerative arthropathies of the shoulder, there being only 6 with involvement of the glenohumeral joint and 6 with involvement of the acromioclavicular joint. It is perhaps worth mentioning in passing how easily acromioclavicular osteoarthritis can be overlooked, one reason being its confusion with the rotator cuff syndrome because the pain is made worse when the arm is raised above the shoulder. However, tenderness of the joint is easily elicited and the pain can be reproduced by flexing the arm across the chest and by such manœuvres as downward pressure on the clavicle in opposition to upward pressure on the elbow.

Of the 6 cases of glenohumeral degenerative arthritis in my series, one occurred in primary generalized osteoarthritis as judged by co-existence of Heberden's nodes, involvement of the first carpo-metacarpal joints and of the knees; one occurred in a chondro-osteodystrophy

of the Morquio type; one was almost certainly occupational as the degenerative process affected the elbow and shoulders in a heavy manual worker, and for one there seemed to be no precipitating cause. Two were examples of necrotic joint disease, one occurring almost certainly as the result of frequent steroid injections into the glenohumeral joint and one following radiation of the area for malignancy.

Thus 126 or some 90% of the painful and stiff shoulders in my series arose from the rotator cuff syndrome/capsulitis group of lesions. A further series of 66 cases of painful stiff shoulders due to the rotator cuff/capsulitis group seen in two outpatient rheumatology clinics in the Royal Free Hospital group over a two-year period made up to 14.6% of the total cases seen. This compares with 6.7% of cases of rheumatoid arthritis.

The rotator cuff/capsulitis group of painful stiff shoulders continues to suffer terminological confusion. Fletcher (1947) lists under Duplay's syndrome, periarthritis of the shoulder or subacromial (subdeltoid) bursitis, four groups, i.e. primary tendinitis, tendon calcification (both with and without bursitis), periarticular adhesions and adhesive capsulitis (or possibly adhesive bursitis), but states that Duplay's syndrome 'conveys no belief in any particular pathology'. He also quotes Codman's view (1934) that the subacromial bursa is a 'structure that limits disease in adjacent structures rather than a structure wherein disease starts'. Most would agree that subacromial bursitis is usually secondary to lesions of the rotator cuff but of course primary lesions such as gout and rheumatoid arthritis do occur.

Correlation between the pathological and clinical findings in the rotator cuff/capsulitis group do in fact support such a basic classification and can, I believe, be used in studies of treatment. The rotator cuff and particularly the supraspinatus tendon is known commonly to undergo degenerative changes accompanied by oedema of the tendinous fibres with round cell infiltration and later fibrosis. The matching clinical picture consists of shoulder pain, cuff tenderness, a painful arc on abduction, occasional loss of passive rotation of the arm and pain on attempted abduction and/or external rotation of the dependent arm against resistance – usually referred to as pain on resisted movement. X-ray appearances are inconstant and consist of cystic changes in the humeral head and tendon calcification.

Additional loss of passive movements of the glenohumeral joint is usually taken to indicate the onset of an adhesive capsulitis and/or subacromial bursitis caused by prolonged immobilization of the shoulder with or without spread of inflammation from the cuff. This loss of

passive movements particularly involves external rotation and abduction. The pathology of adhesive capsulitis consists of adhesion of the synovium to the humeral head with obliteration of the synovial folds, particularly the lower part of the joint. The course of the condition is notoriously chronic with restoration of movements sometimes delayed for a year or two and then often incomplete. However, the occasional acute and early onset of loss of passive movements and their occasional dramatic restoration with local injections of steroid or even local anaesthetic must suggest that muscle guarding, presumably from pain, can also cause loss of passive movements of the glenohumeral joint. It is also noteworthy that loss of passive movements of the shoulder and the apparent vascular changes of the shoulder/hand syndrome may similarly have an acute and early onset following herpes zoster of the upper dorsal roots when immobilization of the shoulder is not usual. Thus, comparing the clinical picture of the rotator cuff syndrome with adhesive capsulitis, it would seem that the most important physical sign differentiating them is pain on resisted movements rather than loss of passive movements which may have more than one cause. In theory this is not surprising for, again to quote Fletcher, 'the essential action of the supraspinatus appears to be abduction (of the arm) *against resistance*'.

The introduction into clinical practice of this physical sign – pain on resisted movement – must be attributed to Cyriax who first referred to it in his 'Textbook of Orthopaedic Medicine' in 1954. It does not appear to have gained widespread acceptance and only Fearnley & Vadasz (1969) refer to it in a treatment study. They studied factors in the response of rotator cuff lesions to local steroid injections which of course are now widely used in this condition. Their study was on 38 patients with painful shoulders characterized by pain on resisted (and active) movements and they injected the area of maximum tenderness in the rotator cuff with a mixture of lignocaine and methylprednisolone. They concluded that 25 of 41 painful shoulders showed definite improvement or became asymptomatic but 16 failed to respond. The group that responded had higher mean ESRs but not a greater incidence of clinical or radiological evidence of cervical spondylosis. A controlled trial by Murnaghan & McIntosh (1955) of hydrocortisone given in a fan-shaped infiltration in 'painful shoulder', a group which excluded supraspinatus rupture, painless stiff shoulder and recent bony injury, failed to show any benefit from the injection of steroid. To this may be added uncontrolled studies concluding improvement with local steroid injections, notably those

by Hollander (1953), Quin (1955), Crisp & Kendall (1955) and a retrospective survey of a mixed group described as cuff lesions, capsulitis or frozen shoulder by Sheldon (1972) which failed to show any benefit from local steroids.

In contrast to these uncontrolled studies of steroid injections in often clinically ill-defined painful shoulders there are a group of studies of steroid injection in peri-arthritis, freezing arthritis, frozen shoulder, &c. which clearly have in common loss of passive movements of the glenohumeral joint. One study by Lee *et al.* (1973) compared 80 consecutive cases treated by infra-red and exercises, hydrocortisone acetate into the shoulder-joint anteriorly or into the biceps sheath (with exercises) or with analgesics. They concluded that exercises produce greater improvement than analgesics alone but there was no difference between hydrocortisone injections and infra-red. Quin (1965) compared 14 patients treated by injections of hydrocortisone with procaine and hyaluronidase below the acromion partly inside and outside the joint capsule with 15 cases not injected. He demonstrated no more than short-lived improvement in pain and movement in the injection group at 2 months. Studies by Robecchi & Capra (1953) and Kendall (1956) apparently showed more benefit from steroid injections in a capsulitis group but those of Cyriax & Trosier (1953) and Glyn & Newton (1958) did not. A retrospective survey by Hazleman (1972) in this group and specifically excluding rotator cuff lesions showed no difference between steroid injections, physiotherapy and manipulation under anaesthetic. Finally, Lloyd-Roberts & French (1959) and Neviasser (1962) suggest that steroid injections may be a useful addition to manipulation of the shoulder.

Thus the results published to date of steroid injections into the painful shoulder indicate, if anything, that little or no response of shoulder capsulitis as judged by loss of passive movements can be expected, but some response may be expected in other groups of painful shoulders which appear to be largely made up of rotator cuff lesions.

My own contribution to this vexed subject is made up of one retrospective study used for no more than indicating trends and a multicentre controlled trial. From a personal series of 126 painful shoulders in the rotator cuff/capsulitis group I have excluded 10 cases: 5 with symptoms in excess of 50 weeks; 2 with ruptured supraspinatus tendons; one with a ruptured biceps tendon; one with acute calcific subacromial bursitis; and one shoulder/hand syndrome. The remainder (116 cases) fall into the rotator cuff/capsulitis group and were treated by subacromial injections of methylprednisolone acetate combined with an analgesic/anti-inflammatory drug usually indomethacin. Group A, 23 cases, showed pain on resisted movements and loss of passive movements, most commonly internal rotation and abduction. Group B, 63 cases, showed pain on resisted movements with no loss of passive movements. Group C, 30 cases, showed painless resisted movements but loss of passive movements. The interval in weeks between first attendance and discharge as 'cured' was plotted against the numbers. A comparison of Groups A and B, cases showing pain on resisted movements, with Group C, cases without pain on resisted movements, by conventional *t* test failed to show any significant difference (Fig 1A). However, an unpaired *t* test shows a significant difference between them after making a logarithmic trans-

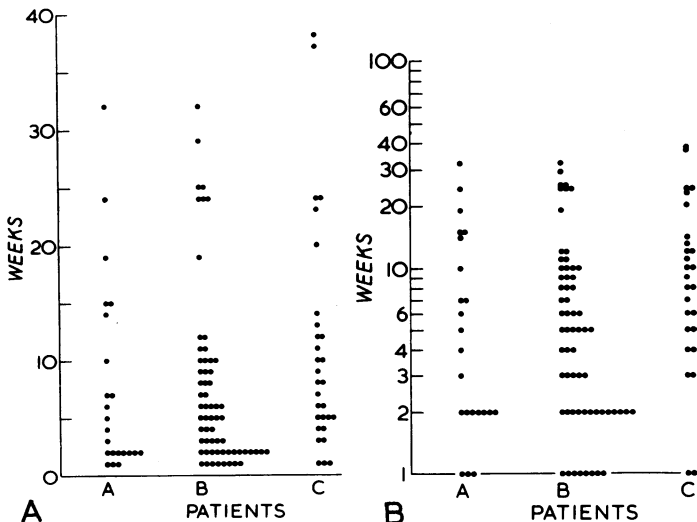


Fig 1 Interval (in weeks) between first attendance and discharge as 'cured'. A, by conventional *t* test. B, by unpaired *t* test which shows a significant difference ( $P < 0.05$ )

formation of the data (Fig 1B) ( $P < 0.05$ ) indicating a greater improvement in those cases showing pain on resisted movements.

A trial was therefore designed to determine the response, if any, of cases of rotator cuff/capsulitis lesions to local steroid injections with particular reference to pain on resisted movements.

#### *Multi-centre Controlled Trial of Local Injection of Steroid in Painful Shoulder*

Consecutive patients complaining of pain in one or both shoulders who showed (a) pain on resisted abduction and/or external rotation of the arm, and/or (b) loss of passive movement(s) of the glenohumeral joint were admitted, with the exception of polymyalgia rheumatica, as judged clinically and by an ESR over 40 mm in 1 hour (Westergren); biceps tendinitis, as judged by pain on resisted forearm supination; polyarthritis with involvement of the shoulder joint, as judged clinically and radiologically; and patients showing abnormal neurological signs or the shoulder/hand syndrome. In the group showing loss of passive movements any possible association with cerebrovascular accident, cardiac ischaemia, herpes zoster of the dorsal roots and arthritis of acromioclavicular joint, as judged by joint tenderness, led to exclusion.

A total of 101 patients were admitted to the trial (Royal Free Hospital, 32 cases; North Middlesex Hospital, 37; Royal Northern Hospital, 11; University College Hospital, 8; Whittington Hospital, 13 cases). Fifty-four patients received the steroid injection and 47 received saline. The steroid and placebo groups were comparable with regard to age, sex, duration of symptoms before treatment, ESR, X-ray abnormalities, prior trauma and over-use of the shoulder but not to neck symptoms (Table 1). Fifteen patients

**Table 1**

Multi-centre controlled trial of local injection of steroid in painful shoulder: comparison of steroid and placebo groups (101 cases)

	No. of cases receiving	
	Steroid	Placebo
Total	54	47
Male	27	26
Female	27	21
Age (years):		
Under 35	5	4
36-60	31	27
Over 60	18	15
Onset (weeks):		
0-6	19	14
7-26	26	27
Over 26	9	6
ESR 16 mm in 1 hour or over	6	9
X-ray abnormalities	8	12
Trauma	9	6
Over-use of shoulder	13	12
Neck symptoms	16	5

**Table 2**

Results in 15 patients who withdrew from trial

	No. of cases receiving	
	Steroid	Placebo
Worse	4	3
Cured	5	0
Unknown	0	2
Unrelated	0	1
Total	9	6

withdrew from the trial; 9 were in the steroid group and 6 in the placebo group (Table 2). Of those who withdrew from the steroid group 5 gave as the reason remission of symptoms after injection whereas none of the placebo group withdrawals gave this reason.

All patients were put on Distalgesic (2 tablets three times a day). Previous analgesic and/or anti-inflammatory drugs were withdrawn at first attendance. Injections were given at first attendance and at 2 weeks, of prednisolone acetate B.P. 1963 (Deltastab 25 mg/ml) or of normal saline according to random treatment allocation schedule. Injection was carried out with a 2 ml syringe Luer No. 1 needle; 1 ml of injection fluid was given into the subdeltoid bursa and 1 ml into the glenohumeral joint (posterior route) with a single skin puncture by the injecting physician (see Cyriax 1954, p 279). Checks by arthrograms indicated that placing of the injected material into the subacromial bursa was readily obtained but into the joint only inconstantly.

Assessment of pain by the patients and the presence of night pain, pain on resisted abduction and/or external rotation and loss of passive abduction, external and/or internal rotation, were recorded by a second physician who had no knowledge of the substance injected.

#### *Results*

The patients were classified at 2 weeks and at 6 weeks after the initial injection into 5 categories (score groups) according to the degree of improvement, i.e. worse (1), no change (2), slight improvement (3), definite improvement (4), complete recovery (5); first in relation to subjective pain and night pain score; second, for pain on resisted abduction or external rotation (mean score); and third for loss of passive abduction, external and internal rotation (mean score).

*Subjective pain and night pain score:* At 2 weeks 33% of the steroid group were scored 4 and 5, compared to 20% of the placebo group. At 6 weeks 53% of the steroid group were so classified, compared to 46% of the placebo group (Fig 2A). These differences are not statistically significant.

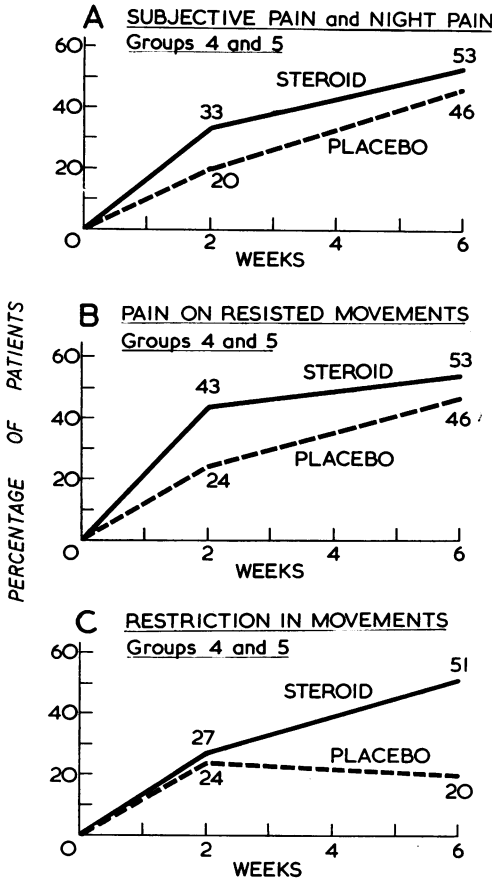


Fig 2 Percentage of patients with definite improvement or complete recovery (score groups 4 and 5) after 2 and 6 weeks in relation to, A, subjective pain and night pain; B, pain on resisted movement; C, restriction of movements

**Pain on resisted movement score:** At 2 weeks 43% of the steroid group were scored 4 and 5, compared to 24% of the placebo group. At 6 weeks 53% of the steroid group were so classified compared to 46% of the placebo group (Fig 2B). These differences are not significant but there appears to be a trend for earlier improvement in the steroid group.

**Restriction in movements (loss of passive movements) score:** At 2 weeks 27% of the steroid group were scored 4 and 5 compared to 24% of the placebo group. At 6 weeks 51% of the steroid group were so placed, compared to 20% of the placebo group (Fig 2c). The difference at 6 weeks is highly significant ( $\chi^2$  test:  $P < 0.01$ ).

Patients were further classified on entry to the trial into two definitive groups according to the findings on clinical examination. The remainder

were put into a third indeterminate group. A 'tendinitis' group included all patients in whom the score for pain on resisted movements exceeded the movement restriction score. The 'capsulitis' group included all patients in whom the score for restriction of movements exceeded the score for pain on restricted movements.

**Tendinitis group (Fig 3):** Forty-two patients were included in this group, of whom 23 received the steroid treatment and 19 the placebo. Five patients from the steroid group withdrew, 3 because they were 'cured' and 2 because they were 'much worse'; one patient from the placebo group withdrew because he was 'much worse'. Patients completing the trial were again scored into the 5 groups according to the degree of improvement at 6 weeks.

Of the steroid group 72% scored 4 and 5 with regard to subjective pain and night pain, 67% scored 4 and 5 with regard to pain on resisted movement, and 67% (with some movement restriction at week 1) scored 4 and 5 with regard to restriction of movement. Comparable results in the placebo group were 50%, 47% and 18% respectively.

In the tendinitis group no restriction of movement was present in 16 patients, of whom 11 received steroids and 5 placebo. Internal rotation was restricted in 21 (of 26 patients with some restriction of movements) and in 10 it was the movement exclusively or predominantly affected. Abduction was restricted in 15, and external rotation in 11. At the end of the trial there was complete return of internal rotation in 10 of 21 patients (of whom 6 had steroids), return of

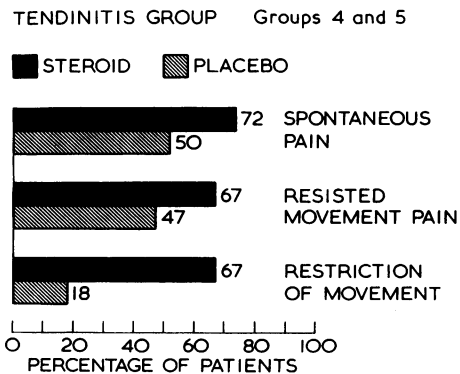


Fig 3 Percentage of patients with tendinitis showing definite improvement or complete recovery (score groups 4 and 5) in relation to subjective pain and night pain, pain on resisted movement, and restriction of movements

full abduction in 4 of 14 and return of full external rotation in 3 of 11.

**Capsulitis group:** Thirty-seven patients were included in this group of whom 17 received the steroid treatment and 20 the placebo.

One patient withdrew from the steroid group because of 'cure'; 2 withdrew from the placebo group, the benefit being most evident in the weeks 38% of the steroid group compared to 61% of the placebo were scored 4 and 5 with regard to pain; 31% compared to 50% with regard to resisted movement pain; and 50% compared to 33% with regard to loss of passive movements. None of these differences is significant.

It seems therefore that there is a trend to indicate that steroid treatment is of more benefit in the 'tendinitis' group than in the 'capsulitis' group, the benefit being evident in the return of movements.

Finally, the response to steroid treatment was not apparently affected by age, sex, ESR, duration of symptoms, presence of X-ray changes, previous trauma to the shoulder or preceding neck symptoms.

#### *Conclusion*

Pain and stiffness of the shoulder arising in the glenohumeral joint is only uncommonly due to arthropathies, being generally due to lesions of the rotator cuff/capsulitis group of lesions. These lesions are common but the clinical syndromes are confused and treatment unsatisfactory because of the lack of controlled trials.

It is suggested that pain on attempted abduction and/or external rotation against resistance with or without loss of passive movements is an essential sign in differentiating lesions of the rotator cuff (tendinitis) from capsulitis and that loss of passive movements of the glenohumeral joint may not always indicate an adhesive capsulitis. These physical signs can be related to the effect of treatment and this has been done in relation to the local injection of steroids into the subacromial bursa and posterior region of the joint.

It appears that local steroid injections are of benefit in the treatment of the rotator cuff/capsulitis group of lesions, producing a statistically significant improvement in passive shoulder movements compared with controls and a trend towards reduction of pain on resisted movements. This benefit seems most marked in these patients showing relatively more pain on resisted move-

ments than loss of passive movements, generally internal rotation, and who may be reasonably regarded as suffering from rotator cuff lesions. No other factors including duration of symptoms, X-ray changes or previous trauma to the shoulder were found to affect the response to steroid injections.

It is interesting to speculate on the action of local steroids. It may well be that by reducing swelling in the area of cuff degeneration and reducing the pain sensitivity of the cuff to compression and traction the results described above are obtained. The insignificant reduction of pain recorded in the trial with steroid injections probably reflected not only the difficulty of measuring this parameter but also its provocation by movements even when those movements have increased as a result of steroid injections. However, more information is required and the trial I have described will be continued with an improvement in the injection technique, longer follow up and particularly a more accurate analysis of the pattern of passive movements of the glenohumeral joint.

**Acknowledgments:** I am grateful to the staffs of the Rheumatology Departments of University College, Whittington, Royal Northern and North Middlesex Hospitals, to my colleagues at the Royal Free Hospital for their cooperation in the multicentre trial, and particularly to Dr P Mangion who coordinated the trial and Dr M Grayson for statistical advice.

#### REFERENCES

- Codman E A (1934) *The Shoulder*. Todd, Boston, Mass.  
 Crisp E J & Kendall P H (1955) *British Medical Journal* i, 1501  
 Cyriax J (1954) *Textbook of Orthopaedic Medicine*. Cassell, London.  
 Cyriax J & Trosier O (1953) *British Medical Journal* ii, 966  
 Fearnley M E & Vadasz I (1969) *Annals of Physical Medicine* 10, 53  
 Fletcher E (1947) *Medical Disorders of the Locomotor System*. Livingstone, Edinburgh.  
 Glyn J H & Newton D R L (1958) *Annals of Physical Medicine* 4, 176  
 Hazleman B L (1972) *Rheumatology and Physical Medicine* 2, 413  
 Hollander J L (1953) *Annals of Internal Medicine* 39, 735  
 Kendall P M (1956) *Annals of Physical Medicine* 3, 1  
 Lee M, Haq A M M M, Wright V & Longton E B (1973) *Physiotherapy* 59, 312  
 Lloyd-Roberts G C & French P R (1959) *British Medical Journal* i, 1569  
 Murnaghan G F & McIntosh D (1955) *Lancet* ii, 748  
 Neviasser J S (1962) *Medical Times* 90, 783  
 Quin C E (1955) *Proceedings of the Royal Society of Medicine* 48, 425  
 (1965) *Annals of Physical Medicine* 8, 22  
 Richardson A T (1969) *Proceedings of the Royal Society of Medicine* 62, 872  
 Robecchi A & Capra R (1953) *Rheumatology Review* 20, 757  
 Sheldon P J H (1972) *Rheumatology and Physical Medicine* 11, 422