Clin Rheumatol (2014) 33:1005–1008
DOI 10.1007/s10067-014-2501-x

BRIEF REPORT

The effectiveness and cost of corticosteroid injection and physiotherapy in the treatment of frozen shoulder—a single-centre service evaluation

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Received: 1 November 2013 / Revised: 8 January 2014 / Accepted: 13 January 2014 / Published online: 2 February 2014

Abstract Frozen shoulder is a common condition resulting in pain, stiffness and functional impairment. Symptoms can persist for months or even years if left untreated. Various treatments are available, but a standard care package does not exist and the most cost-effective treatment has not been established. The objective of this study was to conduct a service evaluation of current practice to establish the effectiveness of corticosteroid injection and physiotherapy intervention and the costs associated. A review of all patients with a diagnosis of frozen shoulder who had received a corticosteroid injection and physiotherapy was undertaken for a 12-month period at a single NHS hospital in the UK. Patient-reported outcome measures were analysed and the costs for treatment calculated. Out of the 55 patients, 43 were happy to be discharged following treatment. Ten were referred for a surgical opinion and two were lost to follow-up. The median pain rating significantly reduced from 8 (interquartile range (IQR) 7, 9) to 2 (IQR 0, 3.75) ($p<0.001$). Of the patients, 62 % reported a greater than 60 % improvement. On average, patients attended for an initial consultation and four follow-up sessions at a total cost to the NHS of £135. Based on this small service evaluation study, corticosteroid injection administered by an experienced physiotherapist with follow-up physiotherapy appears to be an effective treatment for frozen shoulder.

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Keywords Corticosteroid · Cost · Frozen shoulder · Injection · Physiotherapy

Background

Frozen shoulder is a common condition that is reported to affect up to 8.2 % of men and 10.1 % of women who are of working age in the UK [1]. The exact cause is unknown. Patients usually complain of pain that is severe enough to disturb their sleep, and as time elapses, the shoulder becomes less mobile and restricts their ability to perform daily tasks [2]. Frozen shoulder is more common in patients who also suffer from diabetes or thyroid disorders [2–4]. The pathology is thought to be self-limiting with pain and movement recovering over time. However, full range of movement does not always return, and patients may experience disabling symptoms for several years if left untreated [2, 4]. There are several treatment options that are widely used to treat frozen shoulder, but a standard treatment pathway does not exist in the UK [5, 6]. Possible treatments include watchful waiting, shoulder exercise, manual therapy, corticosteroid injection, hydrodilation, manipulation under anaesthesia and arthroscopic capsular release [3, 5–7]. A wide body of literature exists on the topic but limitations remain in the evidence base. A recent health technology assessment report [5, 6] involved a detailed systematic review of all of the evidence for such treatments. The quality of previous studies was scrutinised, and it was highlighted that a standard care package for conservative treatment did not exist. Only five of the studies included had been performed in the UK National Health Service setting raising concerns regarding the relevance to the UK population and the NHS. Of the six RCTs that met the quality criteria investigating the use of corticosteroid injections, two studies were highlighted to be of most relevance. Carette et al. [8], in Canada, compared image-guided

corticosteroid injection against a placebo injection with and without the addition of 12 h of physiotherapy and home exercise. Corticosteroid injection and home exercise was found to be an effective treatment. The relevance to UK practice is questionable given that access to image-guidance facilities is limited in the UK and adds costs as these procedures are usually performed via orthopaedic or rheumatology clinics. The other study by Ryans et al. [9] compared similar treatments where injections were performed unguided by a consultant rheumatologist. Again, corticosteroid injection and home exercise was found to be effective. A limiting factor was that only 20 patients were allocated to each of the treatment arms.

Further recommendations were also made in the health technology assessment (HTA) report [5, 6] detailing the need to find successful treatments that were cost-effective for the NHS. The NHS treatment pathway in our locality for patients with frozen shoulder usually involves an initial consultation with a GP then referral to physiotherapy. The physiotherapy treatment provided to patients is not standardised and tends to vary according to the preferences of each individual physiotherapist. If patients fail to improve, they are referred either back to their GP or to one of the small number of physiotherapists locally who are trained to give corticosteroid injections. The HTA report [5, 6] detailed costs of initial assessment and two corticosteroid injections if performed by different providers taking into account the clinician's time and drug costs:

- Physiotherapist £36.18
- GP £108.68
- Orthopaedic clinic £299.68 (image-guided injections)
- Rheumatology clinic £472.68 (image-guided injections)

If the results are comparable, therefore, it would be more cost-effective for the NHS for physiotherapists to administer these injections.

Method

A review of all patients that attended the Physiotherapy Outpatient Department at the London Road Community Hospital in Derby, UK, between April 2012 and March 2013 was undertaken. Data was collected on patients that received corticosteroid injection after a diagnosis of frozen shoulder. The diagnosis was made based on clinical findings of a painful global restriction of shoulder movement with 50 % passive restriction of glenohumeral joint external rotation compared with the contralateral side in the presence of normal muscle power. This is consistent with previous studies [7–9] if associated with a normal radiograph. It is our normal practice to offer radiographic imaging to exclude arthropathy if not already performed prior to referral. Fifteen patients declined imaging in favour of trying treatment first assuming the diagnosis of frozen shoulder to be correct. The remaining 41 patients had normal radiographic images, but one patient was known to have an underlying 1-cm rotator cuff tear.

Outcomes were measured using patient-reported outcome measures (PROMs) that were standard practice in our department at the time. These were a pre- and post-treatment numerical rating of pain from 0 to 10 (0 = no pain, 10 = severe pain) and a percentage improvement in one of four categories: 0–30, 30–60, 60–90 and 90–100 %. The overall outcome of treatment was also reviewed, i.e. whether the patient was happy to be discharged or whether they had been referred on for an orthopaedic surgical opinion.

Data were analysed using Wilcoxon signed-rank tests and univariate linear regression analyses.

Results

Table 1 shows the demographics of the patients identified. A total of 55 patients were identified who received corticosteroid injection after a diagnosis of frozen shoulder. Twenty-four patients were male and 31 female. Ages ranged from 35 to 68 with a mean of 56. Eleven were diabetic (three with type 1) and four had hypothyroid disorders. The mean length of symptoms prior to injection was 6.75 months.

All injections were performed without image guidance by an Upper Limb Clinical Specialist Physiotherapist (MB) with experience of over 1,500 injections. All injections were administered to the glenohumeral joint from a posterior approach using 40 mg triamcinolone acetonide and 10 ml 0.5 % bupivacaine hydrochloride. No adverse reactions occurred. Some patients received physiotherapy treatment in the form of stretching exercises with or without manual therapy prior to injection. Others opted to have an injection as the first line of treatment. All patients were taught stretching exercises to perform after the injection, but these were not standardised reflecting the personal choice of the individual physiotherapists in the department and also the personal needs of each patient. Fifty of the 55 patients received one injection and the remaining 5 received two. On average, patients were seen for

Table 1 Patient demographics—number (%) unless otherwise stated

Age (mean, range)	56 (35 to 68)
Gender	
Male	24 (43.6 %)
Female	31 (56.4 %)
Diabetes	
Type 1	3 (5.5 %)
Type 2	8 (14.5 %)
Thyroid disorder	4 (7.3 %)

an initial assessment and four follow-ups. Twenty-six patients elected to have the injection as a first line of intervention, and the remainder tried physiotherapy first. On average, patients were seen twice for follow-up after their injection. Out of the 55 patients, 43 were happy to be discharged following treatment. Ten were referred for an orthopaedic opinion and two were lost to follow-up.

There was a statistically significant improvement between the pre- and post-injection pain scores ($p<0.001$) measured on the numerical rating scale assessed using a Wilcoxon signed-rank test, but there was incomplete data in 17 cases. The median pain score reduced from 8 (interquartile range (IQR) 7, 9) to 2 (IQR 0, 3.75).

The percentage improvement is shown in Fig. 1. Ten patients did not complete the outcome questionnaire. Of those that responded, 62 % considered themselves to have a greater than 60 % improvement.

Table 2 gives the risk ratios (95 % confidence intervals (CIs)) from a univariate linear regression analysis for the improvement in pain score pre- and post-injection. There were no statistically significant associations between improvement in pain score and gender ($p=0.428$), thyroid disorder ($p=0.117$), diabetes ($p=0.075$ for type 1 and $p=0.530$ for type 2) or length of symptoms ($p=0.847$). There was, however, a significant association between age and improvement in pain score (0.84 (0.73 to 0.96), $p=0.012$) which suggests that older patients had a greater improvement in pain score.

Table 2 Risk ratios (95 % CIs) for improvement in pain score (pre- and post-injection) from a univariate linear regression analysis

Variables in univariate analysis	Risk ratio (95 % CI)	*p* value
Age	0.84 (0.73 to 0.96)	<0.001
Gender		
Male (reference group)	1 (−)	–
Female	0.45 (0.06 to 3.34)	0.428
Length of symptoms	1.02 (0.81 to 1.30)	0.847
Diabetes		
No (reference group)	1 (−)	–
Type 1	244.69 (0.56 to 107,773)	0.075
Type 2	2.46 (0.14 to 43.94)	0.530
Thyroid	0.03 (0.0004 to 2.48)	0.117
Number of sessions before the first injection	0.95 (0.64 to 1.43)	0.816
Number of sessions after the first injection	1.01 (0.54 to 1.87)	0.983

Discussion

The demographics of the patients in our series reflect the previously reported gender ratio, age range and comorbidities associated with frozen shoulder [3, 4]. Interestingly, an increase in age was statistically significantly associated with a better treatment outcome in terms of improvement in pain score. To our knowledge, this has not been reported previously and we are unsure of the reasons for this.

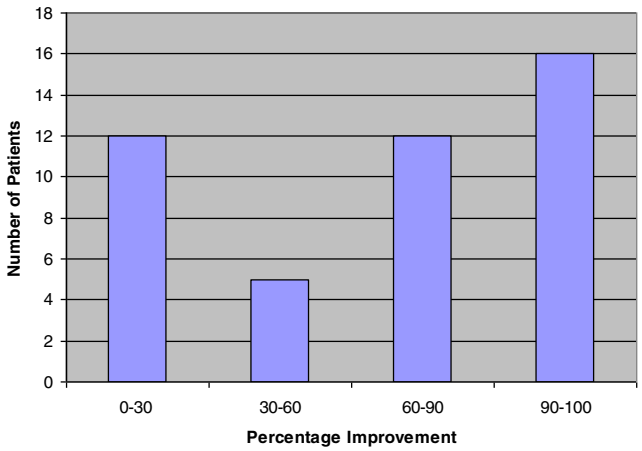

Fig. 1 Treatment outcome

Fifteen patients did not have radiographic imaging of the affected shoulder, so underlying arthritic change cannot be ruled out. None of these patients required orthopaedic referral after treatment, so it was assumed that the frozen shoulder diagnosis had been correct.

The results suggest that our service of corticosteroid injection and physiotherapy for patients with frozen shoulder can be effective, but this was a small single-centre study conducted retrospectively. Further work in the form of a prospective randomised controlled trial is required before firm conclusions are made.

One limitation in this study is the under-completion of the patient-reported outcome measures and also the choice of outcome measures themselves. More detailed subjective outcome measures are available for measuring shoulder pain and function, such as the Oxford Shoulder Score for example, that would aid more in-depth analysis of results.

In our series, 50 patients received just one injection. Whilst 43 of the 53 patients who completed their treatment were happy to be discharged, only 16 reported a 90–100 % improvement and 11 reported no pain. Even making allowance for the missing outcome data, this suggests that whilst patients have manageable residual symptoms, many may still have some pain or functional impairment. This supports the recommendations of the HTA report [5, 6] that further research is needed to investigate multiple corticosteroid injections as this may lead to even better outcomes.

The previously reported costs in the HTA report [5, 6] of £36.18 for two injections given by a physiotherapist were calculated based on just the clinician's time to assess the patient, deliver two injections and the costs of the drugs. The

time was calculated based on a 20-min assessment and 15-min follow-ups which is not representative of our service or those in our region. Typical NHS physiotherapy departments in our locality use 40-min assessments and 20-min follow-ups. Additional costs such as injection consumables, administration, stationary, electricity, etc. were also not accounted for, so the cost of £36.18 significantly underestimates the true cost to the National Health Service. The cost for our service is £35 per new patient consultation and £25 per follow-up. This takes into account all considerations, and the small costs of consumables and drugs for corticosteroid injections are absorbed within the tariff. On average, patients were seen for a new consultation and four follow-up sessions meaning a total cost of treatment to the NHS of £135 per patient. This included physiotherapy treatment as well as injection. The HTA report [5, 6] also analysed costs for likely treatment scenarios that included six physiotherapy sessions and two injections. If the injections were provided by a GP, the total cost was £226.75. Our service in comparison therefore offers good value for money. The results suggested that patients who received an injection as a first intervention with two follow-up physiotherapy sessions did just as well as those who tried physiotherapy first. If patients are assessed and injected at the first visit and just required two further appointments, the costs could be reduced to as little as £85.

Conclusions

Based on this small retrospective study, corticosteroid injections, administered by appropriately trained physiotherapists, and physiotherapy can be an effective conservative treatment for patients with frozen shoulder. Further research should be conducted into the possible benefit of multiple injections in the form of a prospective randomised controlled trial.

Ethics Ethical approval was not required as this was a retrospective service evaluation of standard treatment practice.

Funding No funding was required.

Disclosures None.

References

1. Walker-Bone K, Palmer KT, Reading I, Coggon D, Cooper C (2004) Prevalence and impact of musculoskeletal disorders of the upper limb in the general population. Arthritis Care Res 51:642–651
2. Bunker TD (2009) Time for a new name for frozen shoulder—contracture of the shoulder. Shoulder Elbow 1:4–9
3. Dias R, Cutts S, Massoud S (2005) Frozen shoulder. Br Med J 331: 1453–1456
4. Hand C, Clipsham K, Rees JL, Carr AJ (2008) Long-term outcome of frozen shoulder. J Shoulder Elbow Surg 17:231–236
5. Maund E, Craig D, Suekarran S, Neilson AR, Wright K, Brealey S et al (2012) Management of frozen shoulder: a systematic review and cost-effectiveness analysis. Health Technol Assess 16(11):1–264
6. Chambler AF, Carr AJ (2003) The role of surgery in frozen shoulder. J Bone Joint Surg Br 85:789–795
7. Manske RC, Prohaska D (2010) Clinical commentary and literature review: diagnosis, conservative and surgical management of adhesive capsulitis. Shoulder Elbow 2:238–254
8. Carette S, Moffet H, Tardif J, Bessette L, Morin F, Fremont P et al (2003) Intraarticular corticosteroids, supervised physiotherapy, or a combination of the two in the treatment of adhesive capsulitis of the shoulder: a placebo-controlled trial. Arthritis Rheum 48:829–838
9. Ryans I, Montgomery A, Galway R, Kernohan WG, McKane R (2005) A randomized controlled trial of intra-articular triamcinolone and/or physiotherapy in shoulder capsulitis. Rheumatology 44:529–535