



# The effects of pre-operative intra-articular glenohumeral corticosteroid injection on infective complications after shoulder arthroplasty

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## Abstract

**Background:** Many shoulder surgeons use intra-articular corticosteroid injections (IACI) in shoulder osteoarthritis, with the caveat that it precludes arthroplasty for at least 6 months to 12 months because of the theoretical risk of infection. To our knowledge, there is nothing available in the literature to support this notion.

**Methods:** We undertook a retrospective, matched cohort study of all patients who underwent shoulder arthroplasty in our unit between December 2010 and December 2013 aiming to assess whether pre-operative IACI had an impact on infective complications. Group I had received an IACI prior to their arthroplasty and Group II had not. A chi-squared analysis was performed ( $p < 0.05$ ).

**Results:** Group I comprised 23 patients with a mean age of 73 years (range 54 years to 90 years) had 23 shoulder arthroplasties and had mean follow-up of 16.6 months. Patients received an IACI approximately 11.4 months (range 2.5 months to 172.5 months) before their surgery. One patient developed a deep joint infection that warranted revision arthroplasty. Group II comprised 60 patients with a mean age of 75 years (range 34 years to 90 years) had 64 shoulder arthroplasties and a mean follow-up of 20.1 months. No patients developed infective complications ( $p > 0.05$ ), implying there was no statistically significant relationship between pre-operative IACI and infective complications.

**Conclusions:** We could not establish a causal link between IACI and infective complications after arthroplasty.

## Keywords

Arthroplasty, corticosteroid, infection, injection, shoulder

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## Introduction

A 2009 Cochrane review looking at the efficacy of corticosteroid injections for shoulder pain concluded that, although there have been numerous randomized controlled trials, small sample sizes, variable methodological quality and heterogeneity have meant that there is little evidence to guide treatment.<sup>1</sup> Nevertheless, we continue to use intra-articular corticosteroid injections (IACI) to temporize shoulder pain, even though the effect is small, short-lived, and may be no better than oral nonsteroidal anti-inflammatories.<sup>2</sup> The most devastating complication of IACI is septic arthritis, although it is presently unclear whether it is the actual process of injection or the local

immunosuppressive effects of the corticosteroid that is related to the development of infection.<sup>3,4</sup>

Many shoulder surgeons administer IACI into arthritic shoulders with the caveat that it precludes arthroplasty for at least 6 months to 12 months because IACI may influence the susceptibility to infection of

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any subsequent surgical procedure. In keeping with this, Kaspar and de Beer reported a 10% incidence of septic arthritis after total hip replacements in patients who had received IACI within 12 months of surgery.<sup>5</sup>

To our knowledge, there is no equivalent study in the context of the shoulder to support this notion.<sup>5</sup> We therefore undertook a retrospective, matched cohort study aiming to assess whether the administration of an IACI had an impact on the incidence of postoperative infective complications.

## Materials and Methods

By inspection of the theatre logbooks, we obtained the details of all patients who had undergone some form of shoulder arthroplasty in our unit by the two senior authors between December 2010 and December 2013. From their medical records, we were able to determine whether they had received pre-operative IACI, the length of the gap between injection and surgery, and whether they had developed any postoperative infective complications. Exclusion criteria included inflammatory arthropathy, previous septic arthritis of the shoulder, immunosuppressive medication, malignancy and avascular necrosis.

All injections had been performed in a fluoroscopy suite by radiologists after sterile preparation of the patient's skin with povidone iodine solution. A 22-gauge spinal needle was introduced into the glenohumeral joint, followed by injection of 40 mg of methylprednisolone, which was mixed with 10 ml of 0.25% bupivacaine.

Patients were divided into two groups: Group I who had received an IACI prior to their arthroplasty and Group II who had not. Patients were roughly matched for age, gender and American Society of Anaesthesia (ASA) grade (indirectly matching patients for general factors that might affect infection rates).

We used the same criteria as Papvasillou et al. to define infective complications.<sup>6</sup> Superficial surgical site infection (SSSI) was defined as an infection which occurred within 30 days of surgery, involved the skin or subcutaneous tissue around the incision only with either purulent discharge and/or a positive wound swab. Deep surgical site infection (DSSI) was defined as an infection occurring within 6 months of surgery, involving the deep tissues with either purulent discharge, a positive joint aspirate, swab or tissue biopsy from the deep-tissue layers or pus cells present on microscopy, a deep incision that spontaneously dehisced or was surgically opened, or an abscess or other evidence of infection involving the deep incision that was found by direct examination, during re-operation, or by histopathological or radiological examination.

A chi-squared analysis was performed using Excel (Microsoft, Redmond, WA, USA).  $p < 0.05$  was considered statistically significant.

## Results

Eighty-two patients with a mean age of 72 years (range 34 years to 90 years) had 87 shoulder arthroplasties (including the Epoca resurfacing hemiarthroplasty, Mathys Affinis short stem ceramic hemi-arthroplasty, Mathys Affinis short stemmed anatomic shoulder replacement, Mathys Inverse shoulder replacement and Depuy Delta Reverse shoulder replacement) between December 2010 and December 2013. There were no exclusions and all patients were available for follow-up.

Group I comprised 23 patients (five males, 18 females) with a mean ASA grade of 2 and a mean age of 73 years (range 54 years to 90 years) undergoing 23 shoulder arthroplasties and had mean follow-up of 16.6 months (range 3.2 months to 53.3 months). Patients received an IACI approximately 11.4 months (range 2.5 months to 172.5 months) before surgery. No patients developed SSSI and one patient developed a DSSI that warranted revision arthroplasty.

Group II comprised 60 patients (16 males and 44 females) with a mean ASA grade of 2 and a mean age of 75 years (range 34 years to 90 years) undergoing 64 shoulder arthroplasties and had a mean follow-up of 20.1 months (range 1.6 months to 67.4 months). No patients developed SSSI or DSSI.

There was no statistically significant relationship ( $p > 0.05$ ) between pre-operative IACI and the development of postarthroplasty infective complications.

## Discussion

Shoulder pain is common, with a reported prevalence of 6.9% to 34% in the general population and 21% in those over 70 years of age.<sup>7</sup> Although there are many accepted forms of conservative therapy for shoulder disorders, evidence of their efficacy is not well established.<sup>1</sup> Corticosteroid injections are a commonly used modality to treat shoulder pain, irrespective of underlying aetiology. Corticosteroids may be injected into the glenohumeral joint via an anterior or posterior approach, into the subacromial space, tendon sheaths of specific tendons, or locally into trigger or tender points. Apart from placement of the injection into various anatomical sites, other variations in the use of steroid injections include single or multiple injections over time; injection of different sites at one time; use of different corticosteroid preparations, different volumes and types of local anaesthetic; and different total volumes of injection.<sup>1</sup>

Corticosteroids exert their action by interrupting the inflammatory and immune cascade at several levels.<sup>4</sup> Although earlier studies reported that corticosteroid injections might worsen cartilage lesions, more recent studies show that low-dose intra-articular steroids reduce the severity of cartilage erosion and osteophyte formation, thus modulating pain with duration of symptom relief lasting from 1 week to more than 1 year.<sup>2,4,8</sup> However, the steroid may not fully dissolve, becoming trapped within the soft tissues or cystic areas of degeneration within the joint. This becomes re-activated during operation, leading to catastrophic results. There is experimental evidence to suggest an increased risk of infection after the intra-articular administration of steroids.<sup>5</sup>

Kaspar and De Beer reported a high incidence of infection in injected patients in comparison with a matched cohort of uninjected patients having lower limb arthroplasty.<sup>5</sup> The choice of patients for injections in their study appears to have been made by radiologists, rheumatologists and multiple surgeons. It is also not clear whether one surgeon or multiple surgeons performed the surgical procedure and whether the protocol was standardized. However, it is still unclear which component of the injection may be culpable, from injection of arthrography dye, the steroid itself or its depot vehicle, contamination of the local anaesthetic, the invasiveness of a needle through prepared skin, or any breach of sterile technique by the radiologist.

Only one patient in our entire study developed infective complications. She was a 54-year-old female with a history of previous alcohol abuse. She sustained a proximal humeral fracture that was fixed and went on to develop post-traumatic osteoarthritis. She received an IACI to temporize her pain 75 days prior to her arthroplasty. She subsequently developed a deep surgical site infection, which was treated with a two-stage revision.

In the present study, we found no such correlation between intra-articular steroid injection and deep infection after shoulder arthroplasty. The present study has the inherent limitations of any retrospective review. Some selection bias may have been introduced because the choice of candidates for injections was made by multiple surgeons and injections may have been administered by general practitioners, musculoskeletal physicians and physiotherapists before referral to the senior authors. Furthermore, a recent study has shown that, although the majority of infective complications occur in the first 2 years after surgery, as many as one in five may become apparent later.<sup>9</sup> If we had excluded all patients with less than 2 years of follow-up, this would have significantly affected the number of subjects in the study.

## Conclusions

Judicious use of intra-articular corticosteroids is of both diagnostic and therapeutic value to patients with arthritis of the shoulder. We could not, however, establish a causal link between administration of IACI and the development of infective complications after arthroplasty. Based on the current body of evidence, it would appear that the administration of IACI does not preclude joint replacement for fear of developing infective complications. However, given the limitations of the present study, we consider that a prospective randomized controlled trial is warranted to establish the safety of this practice. Regardless, this does not obviate the need for pre-operative methicillin-resistant *Staphylococcus aureus* screening, proper surgical technique, careful handling of soft tissues, and a shorter operating time, which all contribute to minimizing the risk of infection.

## Declaration of Conflicting Interests

None declared.

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