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Effect of intra-articular steroids on deep infections following total knee arthroplasty

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Abstract Intra-articular steroids have been commonly used for the treatment of arthritis. The aim of our study was to discover any relation between deep infections following total knee arthroplasty and intra-articular steroid use before the arthroplasty. We undertook a retrospective matched cohort study. In the study group there were 32 patients with confirmed deep infection following total knee replacement. The control group consisted of 32 patients with no evidence of infection in the knee. There was no significant difference between the numbers of patients who received intra-articular steroid injection between the groups ($P=1$). We believe that infection following total knee replacement is due to multiple factors and that the use of intra-articular steroids does not alter the incidence of deep infections following total knee arthroplasty.

Résumé L'injection de corticoïdes intra-articulaires est habituellement utilisée pendant le traitement de l'arthrose. Le but de notre étude a été de trouver s'il existait des relations entre des infections profondes après prothèse totale du genou et l'injection de stéroïdes de corticoïdes intra-articulaires avant l'arthroplastie. Nous avons entrepris une étude rétrospective avec comparaison de deux cohortes. Dans le premier groupe il y avait 32 patients avec une infection confirmée après prothèse totale du genou, dans le groupe contrôle, également 32 patients, sans infections. Nous n'avons pas trouvé de différence significative entre les deux groupes qu'ils aient bénéficié ou non d'infiltration de corticoïdes ($P=1$). Nous pensons que les infections après prothèse totale du genou sont

secondaires à de multiples facteurs et que l'utilisation d'injections intra-articulaires de corticoïdes n'entraîne pas une augmentation d'incidence des infections profondes après arthroplastie totale du genou.

Introduction

Intra-articular steroids have been used for nearly five decades for the symptomatic treatment of osteoarthritis [1]. They are also recommended in the American College of Rheumatology guidelines for managing acute knee pain in patients with osteoarthritis of the knee [2]. Septic arthritis following intra-articular steroid injections is a rare but well-recognised complication [3–5], and infection after total knee arthroplasty is a rare but serious complication. Recently there have been concerns regarding the safety of intra-articular steroid injections. A recent study has suggested an increased incidence of infections in patients who received intra-articular hip injections prior to total hip arthroplasty [6]. There are no published studies correlating infections following total knee arthroplasties with previous intra-articular steroid injections. We hypothesised that steroid injection in the knee could increase the incidence of deep infections following total knee arthroplasty; hence, patients with infected knee arthroplasties would be more likely to have received intra-articular steroid injections prior to the operation. The aim of this study was to discover any relation between deep infections following total knee arthroplasty and intra-articular steroid injections prior to the arthroplasty.

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Patients and methods

We undertook a retrospective matched cohort study on two groups of patients. The study group was comprised of patients with confirmed deep infection following total knee arthroplasty. The control group was comprised of patients who underwent total knee arthroplasty but had no clinical,

haematological, or radiological evidence of infection in the knee. The study was carried out after obtaining approval from the institutional audit department.

Thirty-two consecutive patients presented with evidence of deep infection following total knee arthroplasty between March 1997 and July 2005. We included only patients with bacteriologically confirmed deep infection in the knee following total knee arthroplasty and excluded patients with superficial infection and those under investigation for suspected infection. Although the patients presented with infection between 1997 and 2005, some patients had had their primary operation done as early as 1990.

The control group consisted of patients selected from our database of patients with total knee replacement arthroplasty. These patients had no clinical or radiological evidence of infection in the knee. We excluded patients from the control group who were being investigated for suspected infection. Patients were matched, in descending order of priority, by the year of total knee arthroplasty, age, gender, American Society of Anesthesia (ASA) pre-operative score, and the type of arthritis (osteoarthritis, rheumatoid arthritis, etc.). We excluded one patient from the study who underwent primary knee replacement in 1985 and presented with deep infection in 1997 because no matching patient could be found.

The hospital records of all the patients were reviewed, and the date of primary operation, secondary procedures, microbiology results, haematology results, and radiographs were recorded. Hospital records were searched to find out whether the patients in either group had received any intra-articular steroid injections prior to total knee arthroplasty. The number of injections received and the time gap between the last injection and total knee arthroplasty were also recorded. In the group with infection, the time gap between injection and the diagnosis of infection was recorded.

Results

The mean age of the group with confirmed infection in the knee was 69 years (range 46–86), and the group included 18 females and 14 males. The mean follow-up was 79 months (range 22–170 months), and the mean ASA score was 2.3. Twenty-eight patients had osteoarthritis of the knee, and four had inflammatory arthritis of the knee. The control group had comparable characteristics (Table 1). All patients in both groups had cemented implants.

Patients in the group with infection underwent an average of 2.2 major surgical procedures (range 1–7) requiring anaesthesia in addition to the primary operation. The bacteria isolated included *Staphylococcus aureus* in 20 patients (sensitive to flucloxacillin) and methicillin-resistant *Staphylococcus aureus* in five. *Staphylococcus epidermidis* was isolated from three patients, *Escherichia coli* from two, and *Pseudomonas* from two.

Eight patients in the group with confirmed infection received a total of 14 intra-articular steroid injections prior

Table 1 Baseline characteristics of the patients in the two groups

Characteristics	Study group (infected arthroplasty)	Control group
Age in years	46–86 (mean 69)	47–86 (mean 70)
Time since operation (months)	22–170 (mean 79)	23–156 (mean 77)
American Society of Anesthesia score	2.3	2.5
Male/female ratio	14/18	13/19
Type of arthritis	Osteoarthritis–28 Inflammatory arthritis–4	Osteoarthritis–28 Inflammatory arthritis–4

to the knee arthroplasty. In the eight patients who received steroid injection, the mean time gap between the last steroid injection and knee arthroplasty was 46 months (range 12–121 months). The mean time gap between the last injection and a clinical diagnosis of deep infection in the knee was 59 months (range 13–132 months).

In the control group, nine patients received a total of 13 injections. The mean time gap between last injection and total knee replacement was 33 months (range 8–56 months). All patients in both groups received the injection in the outpatient department.

Statistical analysis was done using McNemar's test. This showed no statistically significant difference between the two groups ($P=1$).

Discussion

The aim of this study was to look for any correlation between intra-articular steroid injection and deep infections following total knee arthroplasty. In this study, nearly a quarter of the patients received steroid injections before knee arthroplasty.

Intra-articular steroids can provide excellent pain relief and reduce joint stiffness in inflammatory conditions such as rheumatoid arthritis [3]. They are also effective in providing symptomatic relief in osteoarthritis of the knee [7–9], and the duration of symptom relief can last from one week to more than one year [7–9]. Intra-articular steroids are also recommended in the American College of Rheumatology guidelines for managing acute knee pain in patients with osteoarthritis of the knee [2]. Corticosteroids exert their action by interrupting the inflammatory and immune cascade at several levels [10]. Although earlier studies reported that corticosteroid injections may worsen the cartilage lesion, more recent studies show that low-dose intra-articular steroids reduce the severity of cartilage erosion and osteophyte formation [10]. The complications due to intra-articular steroids, although rare, include septic arthritis, osteonecrosis, tissue atrophy, hypertension, and hyperglycaemia [3]. Septic arthritis following intra-articular steroid injection is extremely rare [3, 4].

The reported incidence of infection following total knee arthroplasty varies between 0.5% and 12% [11–16]. Risk

factors for infection following total knee arthroplasty are rheumatoid arthritis, previous surgery to the knee, diabetes, hypothyroidism, immunodeficiency, poor nutrition, renal failure, and local skin ulcers [17–19]. Other risk factors include alcohol abuse, presence of infectious foci, smoking, and obesity [19]. Proper surgical technique, careful handling of soft tissues, and a shorter operating time minimise the risk of infection [20]. Haematogenous spread is the most common mechanism by which the infection spreads to the knee following a knee arthroplasty [19].

A recent study had suggested increased incidence of infectious complications following total hip replacement in those patients who received intra-articular steroid injections [6]. In our study we found no such correlation between intra-articular steroid injection and deep infection following total knee arthroplasty. Our study has inherent limitations because of its retrospective nature. We matched the patients for most of the general factors, which could have an effect on infection rates.

We believe that infection following knee replacement is due to multiple factors and that the use of intra-articular steroids is not a predisposing factor. Judicious use of intra-articular steroids is beneficial to most patients with arthritis of the knee. We recommend more studies on this topic to reconfirm the safety of using intra-articular steroid injections.

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