



Infection in knee replacements after previous injection of intra-articular steroid

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We reviewed 231 patients who had undergone total knee replacement with an AGC (Biomet) implant over a period of 2.5 years. After applying exclusion criteria and with some loss to follow-up, there were 144 patients available for study. These were divided into two groups; those who had received intra-articular steroid in the 11 months before surgery and those who had not.

There were three deep infections, all of which occurred in patients who had received a steroid injection. The incidence of superficial infection was not significantly different in the two groups. Five patients had undergone investigation for suspected deep infection because of persistent swelling or pain and all of these had received an intra-articular injection pre-operatively. We conclude that the decision to administer intra-articular steroids to a patient who may be a candidate for total knee replacement should not be taken lightly because of a risk of post-operative deep infection.

Intra-articular injections of corticosteroids have been used for the treatment of osteoarthritis of the knee for more than 30 years by orthopaedic surgeons, rheumatologists and general practitioners, but with little evidence to support any lasting beneficial value.¹⁻⁶ However, adverse effects have been reported,⁷⁻¹¹ particularly regarding articular cartilage, tendon rupture and the host immunosuppressive response. Infection may also be introduced at the time of injection, especially since a rigorous antiseptic technique is now seldom applied.¹² A recent paper by Kaspar and De V de Beer¹³ suggested that a single intra-articular steroid injection to the hip before total hip replacement significantly increased the risk of post-operative infection.

There have been no studies of the rate of post-operative infection in patients undergoing total knee replacement (TKR) who had received one or more intra-articular injections of steroid before surgery. We therefore carried out a retrospective study to determine the rate of infection in patients who had undergone TKR and to correlate this with the pre-operative use of intra-articular steroids.

Patients and Methods

Initially, we performed a pilot study. We studied the medical records of all cases of recorded deep infection after TKR between February 2002 and October 2004. Of 420 patients who

had received a TKR six were identified with a deep infection (1.4%). Of these, five had received an intra-articular injection of steroid (Depo-Medrone; Pharmacia & Upjohn, Crawley, UK) before surgery (Table I). We therefore examined the prevalence of previous steroid injections in patients undergoing TKR to determine whether there was a link between receiving intra-articular steroid and the likelihood of developing an infection.

We subsequently obtained the details and studied retrospectively all 231 patients who had undergone an AGC (Biomet Ltd, Swindon, UK) TKR in our hospital between February 2002 and October 2004. The data were collected by reviewing the hospital records, consultation and referral letters, operating and physiotherapy notes, microbiology and notes of surgical site infection (SSI) and, when necessary, radiographs. Laboratory investigations such as the measurement of C-reactive protein, the erythrocyte sedimentation rate, the full blood count and bone scans for possible infection were also noted. A total of 20 sets of patient notes was unavailable; these were excluded from the study. Other exclusion criteria were previous surgery on the affected knee (other than arthroscopy), a diagnosis of inflammatory arthritis, immunosuppression, a previous history of infection around the knee, smoking and diabetes. The application of these criteria excluded a further 67 patients. The

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Table I. Details of the six patients with deep infections after three different types of total knee replacement (AGC, IBII, Scorpio) as described in the pilot study of 420 patients

Case	Age (yrs)	Gender	Diagnosis*	ASA grade†	Grade of lead surgeon‡	Type of implant	Date of operation	Dates of steroid injection	Time from injection to operation (mths)
1	71	F	OA	2	Ass. Sp.	AGC (Biomet Ltd)	23/5/02	14/2/00 16/7/01	10
2	80	F	OA	3	Staff grade	AGC (Biomet Ltd)	31/5/02	16/8/00 27/6/01	11
3	54	M	OA	1	Cons.	AGC (Biomet Ltd)	18/7/02	Multiple, last: 5/12/01	8
4	59	M	OA	2	Ass. Sp.	IBII (Zimmer)	2/11/02	8/11/01	12
5	74	F	OA	2	Ass. Sp.	IBII (Zimmer)	7/1/03	10/11/00	25
6	72	M	OA	2	Staff grade	AGC (Biomet Ltd)	22/8/03	NA [§]	NA

* OA, osteoarthritis

† ASA, American Society of Anaesthesiologists

‡ Ass. Sp., Associate Specialist; Cons., Consultant

§ NA, not applicable

remaining 144 were separated into two groups; these formed the basis of our study.

Group I (n = 54) consisted of those patients who had received one or more intra-articular injection of steroid in their operated knee in an orthopaedic clinic, rheumatology clinic or general practice setting before surgery. Group II (n = 90) comprised those patients with no record of having received an intra-articular injection of steroid before surgery.

For all patients, the clinical details, the grade of surgeon, dates, the number of intra-articular injections, post-operative infections, investigations for possible infection and the time between injection and surgery were recorded. In all cases the steroid injections were administered for management of pain, either because the symptoms were not sufficient at the time of injection to justify a TKR or to provide analgesia while the patient waited for a TKR.

Superficial incisional infection was defined as an SSI which occurred within 30 days of surgery and involved only the skin or subcutaneous tissue around the incision. One of the following criteria had to be met: 1) purulent drainage from the incision; and 2) cultured organisms from a swab or tissue biopsy from the superficial wound layers.

Deep infection was defined as an SSI involving the deep tissues and occurring within one year of surgery, provided that the infection appeared to be related to the surgical procedure, and met at least one of the following criteria: 1) purulent drainage from the depths of the incision; 2) microbiological culture from aseptically-aspirated fluid, a swab or a tissue biopsy from the deep-tissue layers or pus cells present on microscopy; 3) a deep incision which spontaneously dehisced or was deliberately opened by a surgeon when the patient had a temperature above 38°C, localised pain or tenderness; 4) an abscess or other evidence of infection involving the deep incision which was found by direct examination, during re-operation, or by histopathological or radiological examination; and 5) diagnosis of a deep incisional SSI by an attending clinician.

Statistical analysis. The data were analysed using the chi-squared test.

Results

A total of 12 patients in group I and ten in group II were found to have received antibiotic treatment for a microbiologically-proven (six from group I, 4 from group II) or clinically suspected (six from group I and six from group II) superficial wound infection. There was no significant difference (p = 0.1) between the groups for the prevalence of superficial infection.

In group I, three patients were found to have had a deep infection and required long-term antibiotic treatment and revision surgery (cases 1, 2 and 3, Table I). All three had received a steroid injection within 12 months before surgery (mean 9.6 months; 8 to 11); no deep infections were documented in patients from group II. Subsequent statistical analysis showed a significant link between administration of steroid and the development of a deep infection (p < 0.025).

In addition to those patients with confirmed deep infections, five others had post-operative investigations for suspected deep infection because of symptoms of persistent swelling or pain. All had received an intra-articular injection of steroid pre-operatively (Table II).

We were not able to find any relationship between the number or timing of injections and the risk of post-operative infection.

Discussion

Intra-articular steroids are widely used for the management of patients with osteoarthritis. A survey from the USA has suggested that more than 95% of rheumatologists use them and 53% do so frequently.¹⁴ The efficacy of intra-articular steroids in osteoarthritis is based on contradictory data, in particular because of a powerful placebo response to injection.² In one study, both the placebo and treated groups showed a significant decrease in pain for the duration of the study.⁶ Several have shown that the intra-articular injections were more effective than the placebo but improvement was typically short-lived, lasting from only one to four weeks.^{3,6}

While the efficacy of intra-articular injections of steroid is debatable, numerous potential adverse effects have been

Table II. Details of the five patients who had post-operative investigations for suspected deep infection

Case	Age (yrs)	Gender	Diagnosis*	ASA grade†	Grade of lead surgeon‡	Time from injection to operation (mths)	Symptoms	Investigations§	Outcome
1	73	F	OA	3	Ass. Sp.	10	Persisting swelling	FBC, ESR, CRP	Not proven infection. Settled within 8 months after operation
2	76	F	OA	2	Ass. Sp.	19	Persisting swelling	FBC, ESR, CRP	Not proven infection. Settled within 6 months after operation
3	79	F	OA	2	Ass. Sp.	4	Activity related pain	FBC, ESR, CRP	Not proven infection. Conservative management
4	65	M	OA	2	Cons.	18	Activity related pain and swelling	FBC, ESR, CRP, bone scan, knee aspiration	Not proven infection. Awaiting revision surgery
5	47	F	OA	2	Cons.	9	Activity related pain	FBC, ESR, CRP, bone scan	Not proven infection. Conservative management

* OA, osteoarthritis

† ASA, American Society of Anaesthesiologists

‡ Ass. Sp., Associate Specialist; Cons., Consultant

§ FBC, full blood count; ESR, erythrocyte sedimentation rate; CRP, C-reactive protein

reported in the literature. In 1969, Bentley and Goodfellow⁸ commented that “the case against multiple injections is so strong that the practice should, in our opinion, be discarded, which implies that even a single injection requires strong justification”. The fact that most injections are administered with a token aseptic technique rather than full sterile precautions¹² makes the practice even less appealing.

In our study, of the 54 patients who received intra-articular steroid injection pre-operatively 22.2% were found to suffer from wound complications after surgery. In the control group, this rate was only 11.1%. As mentioned by Kaspar and De V de Beer,¹³ we do not know which component of the injection may be responsible for this difference. The length of time between injection and subsequent post-operative infection leads us to speculate that the steroid agent may not fully dissolve and becomes trapped within the soft tissues or cystic areas of degeneration within the knee. Anecdotally, there are reports of certain insoluble steroid agents remaining visible within the tissues many months after injection. Perhaps such steroids may become 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.¹⁵⁻¹⁷

Our study has the inherent limitations of any retrospective review. It is relatively small, but does allow us to conclude that the decision to administer intra-articular steroids to a patient who may be a candidate for TKR should not be taken lightly. A larger prospective study would shed more light on these issues.

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