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## Septic arthritis following intra-articular steroid injection of the knee – a survey of current practice regarding antiseptic technique used during intra-articular steroid injection of the knee

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**Abstract** Septic arthritis is a potential catastrophic complication of intra-articular steroid injection. There is lack of evidence regarding the precautions that should be taken to avoid such a complication, as well as how often it is encountered. The aim of this study was to evaluate the antiseptic precautions taken during intra-articular steroid injection of the knee in the United Kingdom (UK), and estimate how often septic arthritis is encountered by health professionals in the UK following steroid injection of the knee. A questionnaire was posted to 100 orthopaedic surgeons, 100 rheumatologists and 50 general practitioners (GPs), asking them about the cases of septic arthritis following intra-articular steroid injection of the knee that they encountered during their practice and the precautions they take when injecting knees. The response rate was 76.4%; 57.6% of the respondents used alcohol swabs to clean the skin, and the remaining 42.4% used chlorhexidine or Beta-dine. Only 16.3% used sterile towels to isolate the injection site. There were 32.5% of respondents who routinely used sterile gloves when injecting, and a total of 46.6% used either sterile or non-sterile gloves. Also, 91.1% changed needles between drawing the steroid and injecting it into the joint. Only 24 respondents (12.6%) had encountered septic arthritis after steroid injection of the knee (18 once, 3 twice, 2 three times, 1 several times). We concluded that septic arthritis post intra-articular steroid injection of the knee is probably rare. There is a wide variation in the precautions taken to avoid such a complication. However, the trend seems to be towards minimal use of antiseptic techniques. Further large

prospective studies are needed to determine how frequently septic arthritis of the knee is encountered post steroid injection, and the exact precautions that should be taken to avoid it.

**Keywords** Knee · Precautions · Septic arthritis · Steroid · Survey

### Introduction

Septic arthritis is a potential catastrophic complication following intra-articular steroid therapy. It may be due to direct inoculation of bacteria by the injection, to haematogenous seeding of the percutaneous injection tract, or to activation of quiescent infection by the injected steroid. The most common organism encountered is *Staphylococcus aureus*, with occasional involvement of other organisms, including coagulase-negative staphylococci and anaerobes [1]. Infections with rarer organisms such as *Candida* have also been described.

There is little information in the literature regarding the exact precautions that should be taken to avoid septic arthritis post steroid injection. Skin cleansing with antiseptic agents, use of isolation towels, change of needles, use of sterile gloves, and even injection in theatre have been proposed. Similarly, there is little information available about how common this complication is. The reported incidence of post-injection septic arthritis is 1:3000–1:50000, according to large reported series [2, 3, 4, 5, 6, 7], mainly in the United States. Most of these series, however, included soft tissue injections, involved injections performed in different settings (out-patients clinic, operating theatre) and in different anatomical sites, and the precautions taken to avoid sepsis were not always clearly defined. Knowledge of the sepsis risk is important in dictating what precautions should be taken in performing steroid injections of the knee, and also for medicolegal reasons when such a complication occurs.

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We performed this study to evaluate the precautions of antiseptics taken when steroid intra-articular knee injections are performed by orthopaedic surgeons, rheumatologists and general practitioners in the UK. Furthermore, we attempted to estimate how often septic arthritis of the knee is encountered following steroid injection.

## Materials and methods

Questionnaires were posted to 100 rheumatologists who were members of the British Society of Rheumatology, 100 consultant orthopaedic surgeons identified through the 2001 Directory of Operating Theatres and Departments of Surgery (CMA Medical Data), and 50 general practitioners (GPs) identified through the telephone directory of the Manchester Royal Infirmary. The included rheumatologists and orthopaedic surgeons were practising throughout the United Kingdom, whereas the GPs were practising in the northwest region of England. The orthopaedic consultants, rheumatologists and GPs were selected using computer-generated random numbers. As all health professionals in the three groups were randomly selected we believe they were representative of all rheumatologists, orthopaedic surgeons and GPs in the UK. The questionnaire referred to steroid injections of the knee performed in the outpatients' clinic, or in the case of the GPs in their surgeries. We asked how often they administered steroid knee injections, how many cases of septic arthritis following injection in the outpatients clinic they encountered in their practice, and what precautions they routinely took to avoid such infections (with regard to skin cleansing, use of sterilised towels to isolate the injection field, wearing of gloves, and change of needles between drawing up the steroid and injecting into the knee). Questionnaires were returned in a provided self-addressed envelope.

## Results

Of 250 questionnaires 199 were returned. Of these, 191 were completed, 76.4% of the total. Completed questionnaire response rate varied among the three groups contacted (74% for orthopaedic surgeons, 89% for rheumatologists and 56% for GPs). Most respondents (122/191, 63.9%) administered one to five knee steroid injections in the outpatients' clinic per week (see Table 3).

**Table 1** Incidence of septic arthritis following steroid injection of the knee encountered by consultant orthopaedic surgeons, rheumatologists and GPs in the UK

Have you encountered septic arthritis post steroid injection of the knee?	GPs (n = 28)	Rheumatologists (n = 89)	Orthopaedic surgeons (n = 74)	Total (n = 191)
No	26	79	62	167
Yes – once	2	7	9	18
Yes – twice	–	2	1	3
Yes – three times	–	1	1	2
Yes – several times	–	–	1	1

## Precautions taken to avoid post-injection septic arthritis

The precautions taken to prevent septic arthritis are summarised in Table 3. The majority of respondents use alcohol-based swabs to clean the skin, but a significant proportion – 81 out of 191 (42.4%) – use either Betadine or chlorhexidine. Most do not use sterile towels to isolate the injection field. There was a clear division regarding the use of gloves during injection, with 53.4% of respondents not wearing gloves. The majority of respondents (174 of 191, 91.1%) changed needles between drawing the steroid and actually injecting the knee.

## How often is septic arthritis encountered?

As shown in Table 1, the majority of respondents (167, 87.4%) had never encountered post-steroid injection septic arthritis of the knee. Only 24 (12.6%) had encountered it (18 once, 3 twice, 2 three times, and one orthopaedic surgeon stated 'several times' but did not specify further). The number of septic arthritis cases encountered was similar in the three groups of respondents. The infection rate respondents expected to encounter following steroid injection of the knee mostly ranged from 0 to < 5% (Table 2).

## Discussion

Septic arthritis is a major complication following intra-articular steroid injections, as bacterial arthritis of any cause is associated with up to 15% mortality and residual impairment of joint function in up to 50% of the survivors [8, 9]. The incidence of bacterial arthritis is 2–6 per 10 000 per year [9], and the main risk factors are joint surgery, pre-existing joint disease (especially rheumatoid arthritis), diabetes mellitus, the presence of prosthetic or osteosynthetic material, skin defect or infection, advanced age and immunosuppressive medication [10, 11]. Although there are several reported cases of septic arthritis following intra-articular steroid injection in the literature, our knowledge regarding its actual incidence comes mainly from several large reported series of steroid injections in the United States. In an early series [2] an infection rate of 1/3000 was reported. Hollander [3] reported 18 cases of septic arthritis following 250 000 steroid injections. At the University of Miami School of Medicine only two infections were

**Table 2** The incidence of septic arthritis post steroid injection of the knee that orthopaedic surgeons, rheumatologists and GPs in the UK expect to encounter

What do you think is the rate of septic arthritis post steroid injection of the knee?	GPs (n = 28) (%)	Rheumatologists (n = 89) (%)	Orthopaedic surgeons(n = 74) (%)	Total (n = 191)(%)
Nil	–	–	5.4	2.1
≤ 1/1000	3.6	61.8	36.5	43.5
≤ 1/200	–	11.2	2.7	6.3
≤ 1/100	57.1	20.2	39.2	33
≤ 2/100	7.1	2.2	2.7	3.1
≤ 5/100	14.3	–	4.1	3.7
> 5/100	3.6	–	–	0.5
Reply not clear	–	1.1	5.4	2.6
No response	–	1.1	1.4	1
Don't know	14.3	2.2	2.7	4.2

encountered after 100 000 intra-articular injections [4]. Their aseptic technique included thorough alcohol swabbing. Gloves, masks and drapes were not used. Using identical precautions, only one case of septic arthritis was encountered after 46 000 intra- and peri-articular injections over a 12-year period in a private rheumatology group practice in Massachusetts [4]. No infections were encountered at the Mayo Clinic, where 3000 intra- and periarticular steroid injections are performed annually, using rigid aseptic techniques [5]. At Guy's Hospital in London, UK, an infection rate of 5/50 000 injections was reported, but the precautions taken were not specified [6].

Overall, we had a good response rate to the questionnaire (76.4%). This was higher among rheumatologists (89%) than among the orthopaedic surgeons (74%) and GPs (56%). There is nothing to suggest that the respondents were not a representative sample of the population we addressed, in terms of their clinical practice. Our findings suggest that septic arthritis post intra-articular steroid injection of the knee is probably rare, as only 12.6% of our respondents (who were senior rheumatologists, orthopaedic surgeons and GPs) encountered it, with the majority doing so only once in their practice. Only 6 of 191 respondents encountered septic arthritis more than once. Post-injection septic arthritis is considered to be a rare event among doctors performing steroid injections in the UK, as most respondents reported an expected incidence for this complication of less than 1/1000. In our study we only addressed septic arthritis of the knee, and thus our results can only be applied to this joint.

A limitation of this study is that it depends on the participants' memories regarding the above figures. However, it is unlikely that a catastrophic complication such as septic arthritis of the knee would be forgotten.

There was a wide variation in the precautions taken to prevent infection. Twenty-five (13%) respondents used a complete antiseptic technique (use of disinfectant, sterile towels to isolate the injection field, sterile gloves, change of needle between injections), whereas the remainder took some but not all precautions. None of the respondents took no precautions at all. Owing to the wide variation of precautions taken and the small

number of respondents using a full antiseptic technique we could not determine whether there was any relationship between the precautions used and the occurrence of septic arthritis.

When examining the individual precautions taken, there was a clear division between using an alcohol swab on its own and using a disinfectant such as Betadine or chlorhexidine. Of the respondents, 57.6% used alcohol-based swabs only, whereas the remainder used Betadine or chlorhexidine. There seems to be no evidence in the literature to support that iodine or chlorhexidine offer an advantage over sealed alcohol swabs in reducing the risk of septic arthritis [12]. There are also no available studies supporting the use of sterile towels. Despite guidelines by the American College of Rheumatology [13] that gloves should be worn during intra-articular injection, 53.4% respondents do not do so. Sterile gloves are used more often than non-sterile gloves (Table 3). Although the use of gloves has been suggested to reduce the incidence of infection during minor surgical procedures such as skin wound suturing [14, 15], there is no evidence that gloves can reduce intra-articular sepsis during joint injection. Changing the needles between drawing the steroid and actually injecting was common practice among 174 of 191 respondents, although there is similarly no available evidence to support this practice.

Overall, there does not seem to be any clinical or experimental evidence in the literature to suggest that anything other than skin cleansing with alcohol swabs should be employed in performing steroid injections of the knee in the outpatients' clinic. In two large series where the rate of infection was 2:100 000 and 1:46 000 the only antiseptic technique used was alcohol swabbing [4]. No gloves, masks or drapes were used.

The extent of precautions that should be taken during steroid injections of the knee must be considered in the context of the rarity of this complication and the additional cost that strict antisepsis may impose. The employment of all precautions examined in our study (use of Betadine or chlorhexidine, change of needles, sterile gloves, sterile towels) versus the employment of minimal precautions (use of alcohol-based swabs, non-sterile gloves, no change of needles, no sterile towels) could potentially add an extra cost of 50.05p per steroid

**Table 3** Precautions taken to prevent septic arthritis post steroid injection of the knee by orthopaedic surgeons, rheumatologists and GPs in the UK

Question	Response			
	GPs ( <i>n</i> = 28) (%)	Rheumatologists ( <i>n</i> = 89) (%)	Orthopaedic surgeons ( <i>n</i> = 74) (%)	Total ( <i>n</i> = 191) (%)
How often do you inject knees?				
1. < 1–5 a week	35.7	2.2	8	9.4
2. 1–5 a week	53.6	64	67.6	63.9
3. 6–10 a week	3.6	24.7	12.2	16.8
4. > 10 a week	7.1	9	12.2	9.9
What cleansing method do you use?				
1. Alcohol only	64.3	61.8	50	57.6
2. Chlorhexidine only or Betadine only	28.6	27	41.9	33
3. Alcohol + (chlorhexidine or Betadine or both)	7.1	9	5.4	7.3
4. Chlorhexidine + Betadine	–	2.2	2.7	2.1
5. No antiseptic	–	–	–	0
Do you use sterile towels to isolate the injection field?				
1. Yes	17.9	11.3	21.6	16.3
2. No	82.1	86.5	78.4	82.7
3. Sometimes	–	1.1	–	0.5
4. No answer	–	1.1	–	0.5
Do you use gloves?				
1. Yes – sterile	32.1	23.6	43.2	32.5
2. Yes – non-sterile	25	15.7	6.8	13.6
3. No gloves	42.9	60.7	48.6	53.4
4. Sometimes	–	–	1.4	0.5
Do you change needle before injecting?				
1. Yes	92.9	89.9	91.9	91.1
2. No	7.1	10.1	6.8	8.4
3. Sometimes	–	–	1.3	0.5

injection (the costs used to calculate this are shown in Appendix 1). About 1.5 million steroid injections are given annually in the UK (Pharmacia & Upjohn, personal communication), and up to 60% of these may be administered into the knee. Assuming these figures are correct, the use of full antiseptic techniques could add an additional £450 500 to the cost of health care. However, this figure must be considered against the potential cost of septic arthritis, which would include hospitalisation (£200 per day in our institution), arthroscopic washout (£250 per theatre visit in our institution), intravenous antibiotic treatment (about £20 per day) and oral antibiotic treatment (about £2.5 per day). In addition to these financial costs the high risk of mortality (up to 15% [8, 9]) and morbidity (residual impairment in up to 50% of infected joints [8, 9]) must be taken into account. National guidelines for the precautions to be taken when administering intra-articular injections may be of particular value. Such guidelines are not currently available in the UK.

In summary, we have seen that there is wide variation in current practice concerning the precautions taken to reduce the risk of intra-articular sepsis. Nevertheless, the trend seems to be away from a complete aseptic technique. Furthermore, intra-articular sepsis following steroid injection into the knee is probably a rare event, as reported by orthopaedic surgeons, rheumatologists and general practitioners in the UK. Further large prospective studies are needed to determine how frequently septic arthritis of the knee post steroid injection

is encountered, and the exact precautions that should be taken.

### Appendix 1

Cost for minimally antiseptic technique (cost of steroid not included)

One needle	1.55p
One 10 ml syringe	5.38p
One pair of non-sterile gloves	4.58p
One alcohol swab	0.91p
Total	12.42p

Cost for full antiseptic technique (cost of steroid not included)

Two needles	3.1p
One 10 ml syringe	5.38p
One pair of sterile gloves	22.00p
50 ml of Betadine	12.8p
Small sterile towel	7.76p
Small sterile container (for Betadine)	1.43p
Sterile cotton wool pack of four (used to apply Betadine)	10.00p
Total	62.47p

The above costs were obtained from the Autumn 2001 NHS logistics catalogue and from the accounting department of the Manchester Royal Infirmary. The cost of local anaesthetic is not included in either estimate.

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