Knee Arthroscopy: Surgical Site Infections and the need for Prophylactic Antibiotics

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Citation

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Abstract

Objective: To determine the incidence of superficial and deep infections after routine arthroscopy of the knee with and without preoperative prophylactic parenteral antibiotics.

Method: A retrospective review of 302 arthroscopic knee surgeries was performed. The cases were evaluated with respect to the incidence of superficial and deep infections, and whether prophylactic antibiotics were used or not.

Results: There were five (1.65%) infections: four superficial (1.32%) and one deep (0.33%). Of the 302 patients, 14 patients (4.6%) received prophylactic antibiotics, and 288 patients (95.6%) did not. None of the 14 patients developed postoperative infections. Five of the 288 patients (1.7%) developed infections. Using the Phi coefficient, there was a weak to non-existent association between antibiotic use and the rate of postoperative infection.

Conclusion: There is no clinically important relationship between antibiotic use and the rate of postoperative infection. Inclusion of superficial infections increases the incidence of infection, which however still remains very low.

INTRODUCTION

Superficial site infections (SSIs) following arthroscopy have been reported to range from 0.01% to 0.48% ([1,2,3,4,5,6,7]). A review of the literature revealed that many of the documented infections included only intra-articular (deep) infections, and culture-positive aspirates ([4, 7,8,9,10]). The rate of infection was increased to 1.13% when superficial infections were included ([6]). Prophylactic preoperative intravenous antibiotics continue to be used routinely for arthroscopy of the knee despite the lack of any documented clinical or scientific evidence that the usage of antibiotics reduces infection rates ([4, 11, 12]).

The purpose of this study was to determine the incidence of superficial and deep infections after routine arthroscopy of the knee with and without preoperative prophylactic intravenous antibiotics.

PATIENTS AND METHODS

A retrospective review was undertaken of the medical records of the knee arthroscopies performed from June 1994 to June 2008 at the University Hospital of the West Indies, Jamaica. The inclusion criteria were: arthroscopic meniscectomies, arthroscopic debridement, arthroscopic meniscal repair, arthroscopic shaving and microfracture, removal of loose bodies, arthroscopic synovectomy, arthroscopic lateral retinacular release and diagnostic arthroscopic. The study population consisted of 302 patients. The procedures were performed by five orthopaedic surgeons whose practices consisted of general orthopaedics. The following information was recorded for each patient: age, gender, diagnosis, type and date of the procedure, type of anaesthetic, whether prophylactic antibiotics were used or not, tourniquet time, the presence and type of SSI, co-morbid conditions, treatment of the SSI, and follow-up.

Definitions of SSI were based on the National Nosocomial Infections Surveillance System (NNIS) definitions distinguishing between superficial and deep infections.([13]), (Table 1)

Table 1: National nosocomial infections surveillance system criteria for defining a surgical site infection

Superficial incisional SSI

Infection occurs within 30 days after the operation and the infection involves only skin or subcutaneous tissue of the incision and at least one of the following:

- Purulent discharge, with or without laboratory confirmation, from the superficial incision
- Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision
- At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness, or heat and superficial incision is deliberately opened by surgeon, unless the incision is culture-negative
- Diagnosis of superficial incisional SSI by the surgeon or attending physician

Deep incisional SSI

Infection occurs within 30 days after the operation when no implant is left in place, or within 1 year when the implant is in place and the infection appears to be related to the operation and infection involves deep soft tissues (e.g. fascial and muscle layers) of the incision and at least one of the following:

- Purulent drainage from the deep incision but not from the organ/space component of the surgical site
- A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of following signs or symptoms: fever (>38°C), localized pain, or tenderness, unless the site is culture-negative
- An abscess or other evidence of infection involving the deep incision is found on direct examination, during revision, or by histopathologic or radiologic examination
- Diagnosis of a deep incisional SSI by a surgeon of attending physician

Organ/space SSI

Infection occurs within 30 days after the operation if no implant is left in place, or within 1 year if the implant is left in place and the infection appears to the related to the operation and infection involves any part of the anatomy (e.g, organs, spaces), other than the incision, that was opened or manipulated during an operation and at least one of the following:

- Purulent drainage from a drain that is placed through a stab wound into the organ.space
- Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ.space
- An abscess or other evidence of infection involving the organ/space that is found on direct examination, during revision, or by histopathologic or radiologic examination
- Diagnosis of an organ/space SSI by a surgeon or attending physician

Patients who were administered prophylactic antibiotics were given a single dose of antibiotics intravenously one hour prior to surgery. Patients on whom a tourniquet was not used had 1cc of adrenalin inserted into each 1 litre bag of normal saline which was infused into the knee joint. All patients were followed up for at least 30 days or until they became asymptomatic. All the patients who developed infections were treated appropriately and followed up until there was resolution of the infection.

RESULTS

Of the 302 patients, 175 (57.9%) were males and 127 (42%) were females. The average age was 37.5 years (range 9 – 82 years). A tourniquet was used in 129 patients (42.7%) and the average tourniquet time was 62.7 minutes (range 12 – 180 minutes). Of the 302 arthroscopies, 181 (59.9%) were performed under a general anaesthetic, 118 (39%) had a spinal anaesthetic, and 3 (0.9%) were performed under local anaesthesia. There were five (1.65%) infections: four (1.32%) were superficial and one (0.33%) was deep. No cultures were taken from the patients with superficial infections, and all were treated empirically with a seven days course of oral augmentin. There was complete resolution of the superficial infections after the course of oral antibiotics. The patient with the deep infection (septic arthritis) had a negative culture, and treatment consisted of arthroscopic lavage, insertion of a suction irrigation system and intravenous clindamycin. At follow-up, there was complete resolution of the deep infection. None of the five infected cases received prophylactic antibiotics and there were no comorbid conditions in any of these patients. A tourniquet

was used in all five patients and the average tourniquet time was 91 minutes (range 60 to 180 minutes)(Table 2).

Figure 1

Table 2: Data of infected cases

Case	Age (years)/ Gender	Diagnosis	Arthroscopic Procedure/Date	Prophylactic Antibiotics	Tourniquet Time (Minutes)	Type of Infection	Treatment
1	36/M	Torn meniscus	Partial menisectomy/1994	No	90	Superficial	Augmentin P.O.
2	33/M	Torn meniscus	Partial menisectomy/1994	No	60	Superficial	Augmentin P.O.
3	71/M	Osteoarthritis	Debridement/1995	No	60	Deep	Arthroscopy & Suction Irrigation Clindamycin I.V.
4	18/M	Torn meniscus	Partial menisectomy/2001	No	180	Superficial	Augmentin P.O.
5	40/F	Torn meniscus	Partial menisectomy 2004	No	65	superficial	Augmentin P.O.

Of the 302 patients, 14 patients (4.6%) received prophylactic antibiotics and 288 patients (95.3%) did not. None of the 14 patients developed postoperative infections. Five of the 288 patients (1.7%) developed infections. The 14 patients who received prophylactic antibiotics had an average tourniquet time of 64.6 minutes (range 21 – 120 minutes).

The dataset on Table 3 shows that the Phi coefficient is very small and is not statistically significantly different from a zero. That means there is no clinically important relationship between antibiotic use and the rate of postoperative infection.

Figure 2

Table 3: Symmetric Measures

		Value	Asymp. Std Error(a)	Approx. T(b)	Approx. Sig.
Nominal by Nominal	Phi	-.029			.619
	Cramer's V	.029	.009	-.497	.619
Measure of Agreement	Kappa	-.025			.619
N of Valid Cases		302			

a Not assuming the null hypothesis
b Using the asymptotic standard error assuming the null hypothesis

DISCUSSION

The reported incidence of deep SSIs following arthroscopy ranges from 0.01% to 0.48% (1-7). A prospective, randomized, double-blind study by Wiech et al ($_5$) of 437 patients who underwent arthroscopic procedures revealed only on superficial infection and no deep infections. Only one other study reported on superficial and deep SSIs ($_6$). Babcock et al ($_6$) reported deep infection rates of 0.92% and 0.72%. Inclusion of superficial infections increased the rates to 1.13% and 1.09% respectively. In our series, the incidence of deep infections was 0.33% and the combined rate was 1.65%. Reports on tourniquet use have suggested that a tourniquet time greater than two hours is associated with greater complications ($_{14}$). Sherman et al ($_{10}$) found that the patient's age and tourniquet time was statistically significant risk factors for major complications in arthroscopy. The authors reported that the high-risk patient was at least 60 years old, and tourniquet time was greater than 60 minutes. The average age of the five patients in our series who developed SSIs was 39.6 years (range 18 – 71 years). The single patient who developed the deep infection was 71 years. The average tourniquet time was 91 minutes (range 60 – 180 minutes). D'Angelo and Ogilvie-Harris ($_4$) also concluded that increased tourniquet time was a factor which contributed to postoperative infection.

Of the 302 patients in the study, 14 (4.6%) received prophylactic antibiotics, and 288 (95.3%) patients did not. There were 5 (1.7%) SSIs in the patients who did not receive prophylactic antibiotics and no SSIs in the 14 patients who were given prophylactic antibiotics. D'Angelo and Ogilvie-Harris ($_4$) found a deep SSI rate of 0.23% in patients who has arthroscopic procedures without prophylactic antibiotics. The authors concluded that it may be cost beneficial to use antibiotic prophylaxis to reduce hospital cost and patient morbidity when performing arthroscopic surgery. In a study by Wieck et al ($_5$), 199 patients received prophylactic antibiotics, and 238 were given placebo. There were no deep infections, and the one superficial infection was in the group which did not receive prophylactic antibiotics. The authors concluded that the routine use of prophylactic antibiotics is not indicated for patients undergoing arthroscopic surgery. Bert et al ($_7$) also concluded that there was no value in administering antibiotics before routine arthroscopic meniscectomy to prevent joint sepsis. However, only deep infections were included in their study.

Despite the lack of scientific evidence that the usage of prophylactic antibiotics reduces the SSI rates following arthroscopy, most orthopaedic surgeons appear to continue to use prophylactic antibiotics for routine arthroscopic procedures ($_{11}$). The main concern is the fear of potential litigation if an infection developed 00postoperatively. Kurzweil ($_{12}$) recommended prophylactic antibiotics in contemporary arthroscopic procedures, since many procedures are not performed exclusively arthroscopically, and may be prolonged, often involving the use of implants. Due to the low incidence of infection in arthroscopic surgery, extremely large, randomized, controlled trials would be required to show any statistical difference between the groups (low P value). In this study, the authors used the Phi coefficient because it is the clinical strength of the association between prophylactic antibiotic use and the occurrence of infection postoperatively that is what matters most. The Phi coefficient was very small and this meant that

there was no clinically important relationship between the two groups. The authors believe that a significant increase in the sample size would not alter this non-existent relationship.

Despite the fact that this is a retrospective study with a small sample size, the authors believe that this paper has efficiently demonstrated that there is a weak relationship between antibiotic use and the rate of postoperative infection. This study confirms that there is no value in administering antibiotics before routine arthroscopy of the knee to prevent surgical site infections.

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