

Total knee replacement surgery and surgical site infection: a prospective audit

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Between October 2001 and October 2002 at Abdulaziz Medical City, Jeddah, a prospective audit of surgical site infections (SSIs) was undertaken of all CDC (US Centers for Disease Control and Prevention) class 1 total knee replacement procedures carried out. This centre serves a military population and their dependants in the Western Province of Saudi Arabia. Over the 13 months of the study, a total of 40 prostheses were implanted into 38 patients, 2 having both knees replaced. The population was elderly (average age, 64 yr); 63% were female; and 26% were diabetic. Osteoarthritis was the usual cause of the joint disease.

The hospital guidelines for perioperative prophylaxis recommend a 1-gram dose of cephazolin or ceftriaxone to be given no more than 2 hours before the procedure. The study patients were followed daily by the surgical team until discharge from hospital at 6 weeks post-operatively, and then reviewed at 3-month intervals for 1 year. SSIs were diagnosed on the basis of CDC criteria.¹

Follow-up to September 2003 has revealed a total of 5 infections (3 superficial and 2 deep), with no deep organ or synovial-space infections. This represents an infection rate of 12%. CDC class 1 or NNIS (National Nosocomial Infection Surveillance) class 1 or 2 surgery ought to be associated with a rate under 2%.¹

When the records of the operating room (OR) were reviewed, it was found that patients did not receive their pro-

phylactic agent until they were in the OR suite. In only 3 cases was the antibiotic given 30 minutes or more before tourniquet inflation on the limb. For 22 patients, this interval was less than 10 minutes, including 5 where the cuff was inflated before the drug was administered. All 5 infections were observed in this group of 22 (infection rate, 23%). Upon statistical analysis using Fisher's exact test for discontinuous variables and the Student's *t* test for continuous variables, 2 factors were found to be associated with infection: late administration of prophylaxis, and failure to "top it up" during procedures longer than 4 hours.

The timing of antibiotic administration in surgery play a critically important role in reducing SSIs.²⁻⁴ Papaioannou and colleagues³ have shown that optimal antibiotic tissue levels in total knee replacement surgery are found when the interval from drug administration to cuff inflation is at least 20 minutes. Clearly, the practice of administering the prophylactic agent only after the patient is in the operation suite does not, in most cases, permit adequate time for antibiotic distribution and diffusion. Burke's group,⁴ faced with the issue of timing, developed a policy that resulted in compliance with the correct procedure in more than 97% of cases.

As a result of this experience, we recommended in the division of orthopedic surgery that a top-up dose of antibiotic be administered when surgery exceeds 4 hours and that Burke's recommendations

for prophylaxis⁴ be applied, to include a preoperative routine to identify patients for whom prophylactic antibiotics are indicated; standing orders for drug, dose and timing for these persons; and orders to nursing staff in the preoperative holding area to obtain intravenous access and to administer the drug.

The current practice of antibiotic drug administration in the OR suite results in chemoprophylaxis being too late in more than 50% of cases and is associated with an unacceptable risk of SSIs.

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References

1. Wong ES. Surgical site infection. In: Mayhall CG, editor. *Hospital epidemiology and infection control*. 2nd ed. Philadelphia: Lippincott Williams & Wilkins; 1999. p. 189-210.
2. Classen DC, Evans RS, Pestotnik SL, Horn SP, Menlove RL, Burke JP. The timing of prophylactic administration of antibiotics and the risk of surgical wound infections. *N Engl J Med* 1992;326:281-6.
3. Papaioannou N, Kalivas L, Kalavritinos J, Tsourvakas S. Tissue concentration of third generation cephalosporins (ceftazidime and deftriaxone) in lower extremity tissues using a tourniquet. *Arch Orthop Trauma Surg* 1994;113:167-9.
4. Burke JP. Maximizing antibiotic prophylaxis for surgical patients: an update from LDS Hospital, Salt Lake City. *Clin Infect Dis* 2001;33:S78-83.

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