Primary total knee replacement: is suction a portal of infection?

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ABSTRACT

INTRODUCTION Pulsed lavage during a total knee replacement usually leaves a pool of fluid on the surgical drapes. It is common practice to suck away this fluid using the same suction device used intra-operatively. This could be a cause of direct wound contamination. We hypothesised that bacteria contaminate fluid that collects around the foot in total knee replacement surgery and that suction equipment could be a portal of contamination. We also hypothesised that bacterial count in the fluid is lower if chlorhexidine, rather than saline, is used in the pulsed lavage.

PATIENTS AND METHODS Forty patients undergoing primary total knee replacement were divided into two groups. The first group had pulsed lavage with normal saline and the second with 0.05% chlorhexidine.

RESULTS At the end of the operation, 20 ml of fluid, pooled on the surgical drapes was aspirated and cultured for bacterial growth. None of the fluid samples showed bacterial growth.

CONCLUSIONS Suction device used peri-operatively during knee replacement is unlikely to be a cause of wound contamination. Pulsed lavage with normal saline is as effective as lavage with chlorhexidine.

KEYWORDS

Total knee replacement – Infection – Lavage

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Total knee replacement is a commonly performed procedure for various conditions affecting the knee.¹ A certain percentage of patients have moderate-to-severe residual pain.² Infection is rare,⁵ but the clinical outcome of infected total knee replacement is poor and patient satisfaction is variable.⁴ Higher incidences of infection have been related to direct wound contamination.⁵

Measures that decrease intra-operative wound contamination include hats and face-masks,⁶ hand gloves,^{7,8} disposable gowns,⁹ disposable drapes,¹⁰ laminar flow¹¹ and theatre shoes.¹²

The authors have noted that, during total knee replacement, a pool of fluid collects on the drapes around the foot. This fluid comes from the use of pulsed lavage and other fluid used during the operation. Although it would be ideal to use a separate suction device for fluid collected externally, in clinical practice this is not routinely done. This fluid is often sucked-up using a suction device that is also used intra-operatively. This could be a potential cause of direct wound contamination.

We hypothesised that:

1. Bacteria contaminate fluid that collects around the foot

in total knee replacement surgery and that suction equipment could be a portal of contamination.

2. Bacterial count in the fluid is lower if chlorhexidine rather than saline is used in the pulsed lavage.

Patients and Methods

The study comprised of two groups of patients undergoing primary knee replacement, under two consultant-led teams. It was routine practice for one of the consultants to lavage the knee with 0.05% chlorhexidine (Parkfields, Wolverhampton, UK), during the procedure. The other consultant routinely used 0.9% saline for this purpose. Twenty patients were included in each group. From the pool of fluid, collected by the foot, on the disposable drape, 20 ml was aspirated with a sterile syringe into a sterile plastic container. The samples were subjected directly to Gram stain. Culture was performed with one drop of fluid pipetted onto a plate of chocolate blood agar and one drop onto anaerobic blood agar (Oxoid, Basingstoke, UK) and incubated at 37°C in air for 48 h. Enrichment culture of the same fluid was performed with Bactec blood culture for 5 days. They were then inspected for colony forming units.

Table 1 Mean age and mean tourniquet times

	Mean age of patient (years)	Mean tourniquet time (min)
Saline lavage (<i>n</i> = 20)	67 (SD 6.82)	68 (SD 7.92)
Chlorhexidine lavage (<i>n</i> = 20)	71 (SD 8.08)	63 (SD 8.67)

All patients had antibiotic prophylaxis peri-operatively with cefuroxime.

Results

Forty patients undergoing primary knee replacement were recruited into the study. Two consultant-led teams performed all knee replacements. Of the operations, 28 were performed by the consultants and 12 by registrars. Patients who had chlorhexidine lavage had a sub-vastus approach to the knee and the other group had a medial para-patellar approach. Tourniquet was used in all patients and mean tourniquet time was 66 min (SD 8.28 min). All patients had their patella re-surfaced. Patients in whom the suction tubing had to be changed for any reason were excluded from the study.

Mean age and mean tourniquet time are shown in Table 1. The suction equipment used was a disposable plastic Yankaeur sucker (Kendall, Tyco Healthcare UK Limited, Gosport, UK).

None of the 40 fluid aspirates showed organisms on Gram stain. All samples were negative for growth after 5 days of incubation.

Discussion

Total knee replacement is a commonly performed procedure throughout the UK. When a prosthetic knee becomes infected, the consequences are disastrous for the patient and costly to the healthcare system.¹³

Different lavages are available for the purpose of washing out the knee joint prior to the implantation of the prosthesis. Sterile saline and chlorhexidine are commonly used in most units. Although there are no studies looking into the efficacy of saline and chlorhexidine in the joint, there is evidence to suggest that saline and chlorhexidine are similar in reducing infections in other body cavities, such as the abdomen.¹⁴

Another potential source of infection is the drapes where fluid pools before it is disposed of by the suction catheter. At the Avon Orthopaedic Centre, the drapes used are total knee procedure packs (Pennine Healthcare Limited, Derby, UK). The drapes are made of latex-free, non-woven, synthetic material which is not impregnated with any bactericidal

agent. The material is a mix of Sontara and SMS, which together provide the ability to absorb and repel fluids at the same time.¹⁵ It has been demonstrated that, although disposable, non-woven drapes are very resistant to bacterial penetration, they are not completely impermeable.¹⁶

All the fluid samples in our study were negative for microbial growth, indicating that there was no significant bacterial growth in the fluid pooled on drapes during a total knee replacement. Our study confirms that using the same suction device in the knee and to dispose of fluid collected on the drapes is unlikely to cause direct bacterial contamination of the wound. Chlorhexidine lavage does not appear to offer any further benefit compared to normal saline.

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