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Original Article

Wound Hygiene Practices After Total Knee Arthroplasty: Does It Matter?

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ABSTRACT

Background: Current literature is limited with regard to standardized postoperative surgical site hygiene after total knee arthroplasty (TKA). With little guidance from the literature, the timing of permissible postoperative cleaning is a decision made by the individual surgeon using anecdotal evidence. A standardized wound care regimen is of particular interest to minimize the risk of infection.

Methods: To examine what species of bacteria recolonize the surgical site postoperatively, a randomized controlled trial was performed of 16 TKA patients who were allowed to shower at 2 days postoperatively and of 16 patients who were asked to wait until 2 weeks postoperatively before showering after TKA. Culture swabs of skin adjacent to the incision were performed preoperatively, just after incision closure, at dressing removal, and at 2 weeks postoperatively. Bacteria were speciated and compared between groups. A swab of the contralateral knee was performed at 2 weeks as a control. A survey of patient's preference regarding early and late showering was also carried out.

Results: No difference was found between the groups in rate of colonization or bacterial type, and no patients developed infection. Patients overwhelmingly preferred early showering rather than late ($P = .28$-$.99$).

Conclusion: There is no difference in surgical site bacterial recolonization between early and delayed showering after primary TKA.

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Although much has been published regarding the efficacy of preoperative surgical site preparation in decreasing the risk of surgical site infection, little data exist regarding postoperative wound care regimens in orthopedic surgery. As a result, there is no uniform protocol for allowing patients to shower with a surgical wound [1]. With little guidance from the literature, the timing of permissible postoperative showering is a decision made by the individual surgeon, based largely on anecdote rather than on scientific data.

Re-epithelialization of approximated skin begins within hours after incision closure [2,3]. Completion of this process occurs between 2 and 7 days after closure [4-7]. Despite this fact, many surgeons do not allow incisions to get wet until sutures or staples are removed, typically around 2 weeks postoperatively. There is no research in the arthroplasty literature that addresses this question, but Sticha et al [8] surveyed 495 board-certified podiatric surgeons and reported that nearly 82% kept their surgical wounds dry for at least 10 days.

This practice of delayed showering is of particular interest after total joint arthroplasty because a possible surgical site infection may be the driving force behind the demand to keep wounds dry. However, this wound care regimen comes at the cost of patients' convenience because patients are forced to develop creative ways to bathe the rest of their body while keeping their incision dry. This can be particularly difficult after total knee and hip arthroplasties

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where patients may struggle with altered joint mechanics, weight-bearing, or balance control in the acute postoperative period.

Of the few studies that have addressed early vs delayed showering at the surgical site, none have found an increased incidence of infection with early showering [8-15]. However, these reports vary in terms of surgical discipline, sites, and types of procedures as well as the time interval allowed before showering. Furthermore, it is unknown what effect early or delayed showering has on potentially virulent bacterial species that may recolonize the wound.

The primary aim of this study is to describe what species of bacteria recolonize the surgical site postoperatively, at what rates, and how early (at 48 hours) vs delayed (approximately 2 weeks postoperatively) showering might affect this bacterial load after primary total knee arthroplasty (TKA). In addition, we sought to evaluate patients' preference regarding the ability to shower early. We hypothesized that there would be no difference in bacterial recolonization between patients allowed to shower early vs delayed, but patients would prefer the option to shower early if given a choice.

Materials and Methods

We elected to focus on primary TKA both for its clinical applicability and predictable perioperative course so as to minimize confounding variables such as surgical time, which has been shown to affect the risk of surgical site infection [14]. All procedures were performed by a single, fellowship-trained, arthroplasty specialist (HWR) via the standard midline incision and medial parapatellar arthrotomy. All incisions were closed with subcuticular monocryl suture and cyanoacrylate glue. Dressings included iodoform gauze over the surgical site followed by Webril and ACE bandages.

Patients were included if they were undergoing primary TKA for osteoarthritis. Exclusion criteria were revision TKA, TKA for inflammatory arthritis, prior midline approach to the operative knee (ie, previous quadriceps tendon repair), and previous midline approach to the contralateral knee within the last 2 months (ie, recent contralateral TKA). Numbers were too small in this pilot study so appropriate power analysis could not be performed.

All patients participated in a methicillin-sensitive *Staphylococcus aureus* (MSSA), methicillin-resistant *Staphylococcus aureus* (MRSA), and urinary tract infection screening and decolonization protocol preoperatively which is standard at our institution. The surgical site skin was cultured using flocked swabs (Becton, Dickinson and Company ESwab Collection and Transport System, Sparks, MD) with a longitudinal stroke 1-2 cm medial and lateral to the surgical incision at the following time points: (1) 0-10 days preoperatively, (2) intraoperatively immediately after closure, (3) postoperative day 2 (POD 2) immediately after dressing removal, and (4) 10-14 days postoperatively. Additionally at time point 4, a culture was obtained of the nonoperative knee as a control and a brief survey assessing the subject's preference for showering after surgery vs abstaining from showering was administered. This survey was not validated. A single, blinded laboratory technician prepared and read the cultures and recorded which bacterial species grew and in what quantities.

The subjects were randomized into 2 groups: The early group was allowed to begin showering their wounds after dressing removal on POD 2, whereas the delayed group was instructed to keep their wounds dry and not shower at all until after time point 4.

Results

Thirty-two patients (11 male, 21 female) with an average age of 60.5 and body mass index of 35.0 enrolled in this study (Table 1). The percentage of culture-positive subjects by time point was as follows: (1) 97%, (2) 0%, (3) 31%, (4: operative knee) 84%, and (4: nonoperative knee) 88%. At time point 4 (operative knee), the early group grew the following: 13% *S aureus*, 56% *Staphylococcus epidermidis*, 13% *Propionibacterium acnes*, 69% other gram positives, 13% gram negatives, 0% fungus. Conversely, the delayed group grew the following at (4: operative knee): 0% *S aureus*, 50% *S epidermidis*, 6% *P acnes*, 75% other gram positives, 19% gram negatives, and 6% fungus (a complete listing of the organisms comprising the gram-negative and other gram-positive groups can be found in the Appendix; Table 2). All *S aureus* growth was methicillin sensitive (MSSA). There was no difference in growth between the groups ($P = .48$-$.99$). Furthermore, there was no difference in growth between the operative and nonoperative knees at time point 4 ($P = .50$-$.99$; Table 3). At time point 2, 1 patient from the delayed group and 7 patients from the early group did not have samples available for analysis. No patients developed a surgical site infection in our study period.

Table 1
Comparison of Organisms Cultured at 10-14 Days Postoperatively.

10-14 d Postoperative (Surgical Knee)	No Shower (N = 16)	Shower (N = 16)
Staphylococcus aureus	0	2 (100%) (13%)
Staphylococcus epidermidis	8 (47%) (50%)	9 (53%) (56%)
Propionibacterium acnes	1 (33%) (6%)	2 (67%) (13%)
Other gram positives	12 (52%) (75%)	11 (48%) (69%)
Fungus (*Rhodotorula*)	1 (100%) (6%)	0
Gram negatives	3 (60%) (19%)	2 (40%) (13%)

There was no difference in growth based on smoking or alcohol status, a history of diabetes, preoperative MSSA/MRSA or urinary tract infection screening results, or discharge destination (home vs rehab or skilled nursing facility) with the exception of gram-positive growth in the diabetic population ($P = .02$; Table 4). This result is likely due to the small sample size of our study.

Before surgery, 69% of the early group subjects and 75% of the delayed group subjects (Table 4) reported that they felt the ability to shower their wounds early was important. After surgery, 94% of the early group and 81% of the delayed group reported that early showering was important and that they would have preferred to shower if given a choice. There was no statistical difference in the survey responses between the 2 groups ($P = .28$-$.99$).

Discussion

Several preoperative interventions to decrease the risk of surgical site infection are well described and supported. Preventive measures such as the use of chlorhexidine-based soaps, preincisional antibiotics, sterile draping, and proper hand hygiene and gloving have been shown to significantly decrease the risk of surgical site infection [1,16-20]. However, there is no consensus on postoperative surgical wound care or whether it has any influence on clinical outcomes.

Several studies have evaluated the effect of early vs delayed wound cleaning on surgical site infection risk. However, they have all concluded that there is no increased risk of infection with early

Table 2
Organisms Cultured From Surgical Knee Early Group 10-14 Days Postoperatively.

Staphylococcus aureus	2
Staphylococcus epidermidis	9
Propionibacterium acnes	2
Other gram positives	11
Fungus (*Rhodotorula*)	0
Gram negatives	2