



## Brief communication

## A nonsurgical protocol for management of postarthroplasty wound drainage

Michael S. Reich, MD, Kace A. Ezzet, MD \*

Division of Orthopaedic Surgery, Scripps Clinic, La Jolla, CA, USA

## ARTICLE INFO

## Article history:

Received 2 February 2017

Received in revised form

16 March 2017

Accepted 18 March 2017

Available online 20 July 2017

## Keywords:

Persistent wound drainage

Total joint arthroplasty

Benign wound drainage

Nonoperative treatment

## ABSTRACT

Persistent wound drainage after total joint arthroplasty can potentiate periprosthetic joint infection. Although current recommendations are to treat persistent wound drainage with surgical debridement, we believe nonoperative treatment may be successful in selected patients. We performed a retrospective analysis of 25 persistently draining hip and knee arthroplasty wounds treated with a protocol consisting of a combination of surgical site aspiration, closure of open wound edges, cessation of anticoagulants, activity modification, and antibiotics (in select patients). Wound drainage ceased in 24 of 25 wounds treated with this protocol. One patient who continued to drain for 3 more days was successfully treated with surgical debridement and evacuation of hematoma. No patient developed infection. We believe this protocol can be successful in many arthroplasty patients.

© 2017 The Authors. Published by Elsevier Inc. on behalf of The American Association of Hip and Knee Surgeons. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## Introduction

Persistent wound drainage has been shown to be a risk factor for development of periprosthetic joint infection (PJI) after total joint arthroplasty [1–4]. Although nonoperative treatment/passive observation of wound drainage may be successful in the early postoperative phase [4,5], persistent drainage is typically treated with surgical debridement. Although these generalities are well accepted, there lacks a consensus as to how long a draining wound can be safely observed. Additionally, data are lacking regarding the effectiveness of active nonoperative strategies for halting wound drainage in the early weeks following total joint arthroplasty.

Despite lacking good data, algorithms are still needed for managing postoperative wound drainage. The International Consensus Meeting on Periprosthetic Joint Infection recommended that surgical irrigation and debridement with modular component exchange be considered for wounds still draining for 5–7 days after

the index procedure. Although this represented the majority opinion of the expert panel, many participants did not agree with the consensus opinion, including 23% who did not agree that surgical intervention was required on wounds still draining for 5–7 days after surgery [5]. This lack of consensus suggests that even with the best available evidence, among experts within the field of arthroplasty there exists considerable variability in practices.

Although halting persistent wound drainage is a necessity, it is well recognized that surgical debridement is not a minor procedure and exposes the patient to the morbidity and costs of one or more additional operations, including the risk of infecting a wound that was not already infected. Here, we describe a single surgeon's experience with a nonoperative treatment protocol for patients with persistent postoperative wound drainage after total hip (THA) and total knee arthroplasty (TKA).

## Material and methods

Institutional review board approval was obtained for this study, which aims to document the effectiveness of a nonsurgical protocol for managing draining THA and TKA wounds. Our protocol included surgical site aspiration, closure of open areas of the wound in the office, cessation of anticoagulants, activity reduction, and select use of antibiotics in some patients. All patients in this study underwent TKA or THA by the lead author between 2008 and 2016 and presented in the acute postoperative period with persistent wound

One or more of the authors of this paper have disclosed potential or pertinent conflicts of interest, which may include receipt of payment, either direct or indirect, institutional support, or association with an entity in the biomedical field which may be perceived to have potential conflict of interest with this work. For full disclosure statements refer to <http://dx.doi.org/10.1016/j.artd.2017.03.009>.

\* Corresponding author. 10666 N. Torrey Pines Rd., MS 116, La Jolla, CA 92037, USA. Tel.: +1 858 554 9068.

E-mail address: [Ezzet.Kace@scrippshealth.org](mailto:Ezzet.Kace@scrippshealth.org)

<http://dx.doi.org/10.1016/j.artd.2017.03.009>

2352-3441/© 2017 The Authors. Published by Elsevier Inc. on behalf of The American Association of Hip and Knee Surgeons. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

drainage beyond postoperative day (POD) #5. Wounds that appeared grossly infected on clinical examination were not entered into this protocol.

The initial step in the protocol consisted of aspirating the wound to rule out infection and decompress the pressure of the underlying hematoma. If the aspirate was positive for infection, the patient was dropped from this protocol and taken to surgery for operative debridement. For draining knees, a standard arthrocentesis was performed. For draining hips, the patient was placed in a lateral decubitus position and the subcutaneous hematoma was aspirated under any palpable area of fullness, or at the distal-posterior end of the incision if no areas of fullness were palpated, as this area tends to collect the most serosanguinous fluid. Small areas of wound dehiscence, if identified, were closed with nylon sutures and/or Steri-Strips (3M, St. Paul, MN). If no areas of wound dehiscence were identified, but a focal area of the incision appeared to be the source of drainage, we applied Dermabond (Ethicon, Somerville, NJ) to the area from which the drainage seemed to occur. In total, 17 patients had some method of facilitated wound closure as follows: Dermabond alone (4), Steri-Strips alone (3), sutures alone (2), sutures and Dermabond (2), sutures and Steri-Strips (1), Dermabond and Steri-Strips (4), sutures, Dermabond, and Steri-Strips (1).

Antibiotic prophylaxis was administered in 16 patients with drainage who either had a cloudy aspirate or had slight erythema suggesting possible cellulitis. Anticoagulants for deep vein thrombosis prevention were discontinued until the wound was felt to be stable (4 patients). Physical therapy was temporarily put on hold until the wound was dry (8 patients). Knee immobilizers were used for some draining TKAs at the surgeon's discretion. All patients were contacted the following work day. If the drainage had not ceased or substantially improved by 24 hours after administration of the measures listed, the patient was considered to have failed the protocol and was taken to surgery for wound debridement. For wounds that had substantial improvement but not full cessation of drainage after 24 hours, we continued daily telephone follow-ups or office visits until the wound was completely dry, up to 7 days. Patients' charts, including office notes and laboratory data, were retrospectively reviewed.

The patient cohort receiving this protocol consisted of 24 consecutive patients with 25 draining wounds. Mean age was  $67.7 \pm 10.4$  years and 66.7% patients were women. Average body mass index was  $34.3 \pm 7.5$  kg/m<sup>2</sup> and 29.2% had a BMI  $\geq 40.0$  kg/m<sup>2</sup>. There were 12.5% diabetic or prediabetic patients, 12.5% with chronic kidney disease, and 8.3% current smokers. Surgeries included 11 THAs, 13 TKAs, and 1 revision THA.

## Results

Mean time from surgery to clinic presentation for drainage was  $12.8 \pm 4.4$  days postoperatively. The earliest presentation to our clinic for persistent drainage was on POD #6 (N = 2). No patient treated with this protocol developed an infection, and 24 of the 25 wounds had cessation of drainage with this protocol. One THA patient had persistent bloody drainage 3 days after the protocol and was treated with a surgical debridement and subsequently did well. Among the 24 wounds that did not require surgery to stop the drainage, follow-up has ranged from 6 months to 8 years and no patient demonstrated clinical evidence of PJI or wound complication.

Although we sought to aspirate all wounds, due to logistical limitations and protocol violations, only 19 of the 25 wounds were aspirated. Although cell counts were obtained at the time of aspiration, because the patients are in the early postoperative period we did not find this test to be useful in guiding our management. Mean synovial white blood cell (WBC) count was 3383 WBC/ $\mu$ L (range,

234–20,600 WBC/ $\mu$ L). Polymorphonuclear leukocytes percentages ranged from 21% to 99%.

## Discussion

PJIs are a devastating complication and efforts aimed at minimizing their occurrence are warranted [5,6]. An area of controversy remains how best to manage persistent postoperative drainage so that it does not lead to infection. The current consensus indicates that surgical treatment be considered for drainage persisting more than 5–7 days [5,6], although the data set that generated this consensus opinion is sparse.

Here, we present an alternative treatment regimen. Although we agree that persistent drainage cannot be allowed to continue indefinitely, we do not believe that all draining wounds mandate a surgical solution. The literature has shown that persistent wound drainage is associated with increased risk of PJI [1–4] and that each day of continued drainage increases the risk of PJI after THA and TKA [1]. However, Jaber et al [4] demonstrated that the majority (72%) of 300 patients with wound drainage more than 48 hours postoperatively were successfully treated with local wound care and prophylactic antibiotics for 2 to 4 days. The authors also found that those who underwent more delayed surgical debridement (POD 22 vs POD 14) were more likely to require explant or chronic antibiotic suppression instead of retention of implants [4]. An important feature of our protocol which was not routinely adopted in the Jaber study and others looking at postoperative drainage was the inclusion of joint aspiration. By aspirating the wound, we have attempted to rule out infection in conjunction with our nonoperative treatment protocol. In the studies referenced above, and in most other studies that have evaluated draining wounds, infection was not ruled out with aspiration. We contend that many of those draining wounds in these other studies were probably infected while they were being observed, and this may account for the high proportion of treatment failures and subsequent infections in those other series, whereas we did not encounter that problem. Additionally, in our protocol we actively try to arrest the drainage through wound closure techniques, rather than simply observing the wounds.

The treatment protocol presented is admittedly controversial. Antibiotic use for draining wounds has been discouraged due to concerns of obscuring an indolent infection [5,6], as many draining wounds are draining precisely because they are already infected. However, by aspirating the site before starting antibiotics, we believe the risk of missing a true infection is low, especially if the protocol is only applied to wounds that clinically appear not infected. Additionally, there is data documenting a benefit in prescribing antibiotics to postoperative patients with superficial infections, in an effort to prevent deep infection [7]. We similarly contend that when evaluating a draining wound with mild to moderate erythema, it can be impossible to differentiate cellulitis from benign postsurgical reactive erythema, and antibiotics seem reasonable in such cases after aspiration.

Our study does have limitations. Although we advocate aspiration before any antibiotics, this is not always feasible as some patients may have been evaluated by another physician and provided antibiotics before the surgeon has had a chance to aspirate the surgical site. Recent antibiotics can increase the risk of false-negative cultures [8], and surgeons will need to take this into account. Although aspirating the knee joint is straightforward, aspirating the true hip joint requires fluoroscopy, which is generally not available in an outpatient setting. Therefore, when we aspirated the hips in this protocol, we aspirated the subcutaneous hematoma/seroma and make the assumption that all fluid collections under the skin are in confluence. Additionally synovial fluid WBC

counts are generally not helpful in determining presence of infection as they are known to be high immediately postoperatively. Nonetheless, it has been proposed that a total neutrophil count (synovial fluid WBC multiplied by polymorphonuclear leukocytes percentage) >25,000 is highly suggestive of infection acutely after TKA [9].

There are other limitations inherent to this study. Although this is one of the largest studies to evaluate treatment of noninfected draining arthroplasty wounds, the sample size is relatively small. Therefore, the success we report should be viewed accordingly. Additionally, the protocol evolved over the 8 years under investigation. In the early years of this protocol, closure of any open wound edges required sutures, which are cumbersome, or Steri-Strips, which are less effective. In later years, Dermabond became available. Therefore, all 3 of these adjuncts were used at different time points. Antibiotics were prescribed at the discretion of the surgeon on a case-by-case basis. Additionally, as this is a multifaceted protocol, it is not possible to determine the additive benefit of each step in the protocol. Lastly, although no clinically apparent infections developed in these patients, we recognize that some infections may present years after surgery.

### Conclusions

The draining arthroplasty wound remains a vexing problem. Careful clinical evaluation coupled with this protocol along with

close clinical follow-up may be appropriate in select patients to help reduce the incidence of reoperation and the associated morbidity and cost.

### References

- [1] Patel VP, Walsh M, Sehgal B, et al. Factors associated with prolonged wound drainage after primary total hip and knee arthroplasty. *J Bone Joint Surg Am* 2007;89(1):33.
- [2] Saleh K, Olson M, Resig S, et al. Predictors of wound infection in hip and knee joint replacement: results from a 20 year surveillance program. *J Orthop Res* 2002;20(3):506.
- [3] Surin VV, Sundholm K, Backman L. Infection after total hip replacement. With special reference to a discharge from the wound. *J Bone Joint Surg Br* 1983;65(4):412.
- [4] Jaber FM, Parvizi J, Haytmanek CT, Joshi A, Purtill J. Procrastination of wound drainage and malnutrition affect the outcome of joint arthroplasty. *Clin Orthop Relat Res* 2008;466(6):1368.
- [5] Ghanem E, Heppert V, Spangehl M, et al. Wound management. *J Arthroplasty* 2014;29(2 Suppl):84.
- [6] Parvizi J, Gehrke T, Chen AF. Proceedings of the International Consensus on Periprosthetic Joint Infection. *Bone Joint J* 2013;95-B(11):1450.
- [7] Guirro P, Hinarejos P, Pelfort X, et al. Long term follow-up of successfully treated superficial wound infections following TKA. *J Arthroplasty* 2015;30(1):101.
- [8] Malekzadeh D, Osmon DR, Lahr BD, Hanssen AD, Berbari EF. Prior use of antimicrobial therapy is a risk factor for culture-negative prosthetic joint infection. *Clin Orthop Relat Res* 2010;468(8):2039.
- [9] Christensen CP, Bedair H, Della Valle CJ, et al. The natural progression of synovial fluid white blood-cell counts and the percentage of polymorphonuclear cells after primary total knee arthroplasty: a multicenter study. *J Bone Joint Surg Am* 2013;95(23):2081.