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Research Article

Persistent Wound Drainage in Hip and Knee Arthroplasty

Mohammed Harris Anwarali Khan[1]*, Fazlina Mustaffa[2], Muhamad Syahmi Abdul Rahman[1], Sasidaran Ramalingam[3], Leow Zhuan Sheng[1], Amar Ismail[1] and Kunalan Ganthel[3]

[1]Hospital Seberang Jaya, Pulau Pinang, Malaysia

[2]AIMST University, Bedong, Kedah

[3]Hospital Kuala Lumpur, Kuala Lumpur, Malaysia

***Corresponding Author:** Mohammed Harris Anwarali Khan, Hospital Seberang Jaya, Pulau Pinang, Malaysia.

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Abstract

Background: Persistent wound drainage remains a challenging and debatable topic. Perioperative morbidity and mortality are significantly higher in patients with periprosthetic joint infection. Early and prompt treatment is important in managing persistent wound drainage to reduce the risk of periprosthetic joint infection.

Materials and Methods: Using categorization from the Parvizi., *et al*. study, we performed a retrospective analysis of patients who presented with persistent wound drainage following total joint arthroplasty. Three of our patients underwent surgical debridement and joint washout and required an additional intravenous antibiotic. For wounds that are still draining five to seven days after the index surgery, the International Consensus Meeting (ICM) on periprosthetic joint infection advocates surgical drainage and debridement with a modular component exchange. In this work, we discuss two dressing options: PICO, a single-use, negative-pressure, wound therapy device; and OPSITE, a visible, waterproof, bacteria-proof, postoperative method.

Results: Leakage of the arthroplasty wound continued to cause ptients anxiety. In selected patients, careful clinical assessment in conjunction with close clinical surveillance is likely to lower the incidence of reoperation, as well as the related morbidity and cost.

Conclusion: Weighing risks and benefits is a crucial step in managing patients with persistent wound drainage. The best time to begin nonsurgical or surgical treatment has yet to be determined. Early identification is critical to reduce morbidity and complications.

Keywords: *Arthroplasty; Debridement; Intravenous Antibiotic; Joint Infection; Persistent Wound Drainage*

Introduction

Persistent wound drainage is under reported and remains a debatable topic [1]. Patients with persistent wound drainage following hip and knee arthroplasty are at risk of developing periprosthetic joint infection [2-4]. Perioperative morbidity and mortality are high in patients with periprosthetic joint infection [1]. Patients who have undergone first-stage and second-stage revision surgery are also at high risk of developing a recurrent infection [5]. The first ICM on periprosthetic joint infection, published in 2013, defines persistent wound drainage as more than 2 × 2 cm of leakage in the wound dressing more than 72 hours post-index surgery [6]. The definition is limited to 72 hours post-operation in the consensus to allow for early intervention that may prevent adverse consequences [7]. Parvizi., *et al*. [6] and Wagenaar., *et al.* [1] proposed a classification system for persistent wound drainage in 2018. To date, the ideal time to initiate nonsurgical

or surgical treatment in patients with persistent wound drainage is inconclusive. The literature shows that wound drainage persisting after five to seven days requires surgical treatment [8].

Aim of the Study

The aim of this paper is to outline the clinical features that could help orthopaedic surgeons manage persistent wound drainage in primary and revision hip and knee arthroplasty.

Materials and Methods

We retrospectively reviewed patients from 2020 to 2022 who presented with persistent wound drainage, using joint replacement unit records to identify them. Their surgeries included total hip arthroplasty, hip hemiarthroplasty, total knee arthroplasty, and revision. We included patients with complete records until the date of assessment and excluded patients with incomplete records and a lack of follow-up. We categorized the patients according to the classification of persistent wound drainage Parvizi., *et al*. describe [6]. As a general guide, we included all patients who presented with persistent wound drainage beyond five days. We identified a total of eight patients. In this paper, we describe all the patients who presented with persistent wound drainage and the management protocol at our institution. Based on the volume of drainage, the suggested classification splits wound drainage after total joint arthroplasty is divided into four distinct categories (Table 1).

Sl. No.	Category	Description
1	Mild	A stripe of blood in the wound dressing in the line of the wound or less than 2 × 2 cm in size
2	Moderate	More than 2 × 2 cm drainage in absorbent gauze or dressing but not requiring wound dressing modification (i.e., dressing is not fully soaked)
3	Excessive	One dressing change per day necessary due to soaked absorbent gauze or dressing
4	Massive	Two or more daily dressing changes necessary due to soaked absorbent gauze or dressing

Table 1: *Proposed categorization of chronic wound drainage following total joint arthroplasty according to the 2013 ICM.*

Results

This section describes the eight patients we studied. Figure 1-5 show the patients' compression dressings and classify the different dressing methods.

Case 1: A 68-year-old male presented with aseptic loosening of bipolar hemiarthroplasty. The patient underwent a single-stage revision of right total hip replacement. During the femur stem implantation, an undisplaced fracture at the apex of the prior stem was discovered. To fix the fracture, an additional incision was done and a cable plate was employed. The patient's bandage was constantly saturated on day 10 following revision surgery. There was no discharge when the thigh was milked, and it was not tender when palpated. Three intramuscular hypoechoic collections were discovered during an ultrasound examination of the thigh. Because the wound dressing was soaked persistently, the patient underwent surgical debridement and implant retention. Postoperatively, the wound was dry and healed at three weeks. The antibiotic was continued as the infectious disease team advised. Figure 1 shows the wound compression dressing, which was more than 2 × 2 cm in size. It was a routine OPSITE dressing, Gamgee, or gauze. Compression was used while securing it.

Case 2: A 60-year-old female with underlying rheumatoid arthritis and a long history of steroid usage for eczema presented with bilateral knee osteoarthritis. She underwent a left total knee replacement in 2020 and a right total knee replacement in 2021. On day

Figure 1: *Compression dressing.*

five after the right total knee replacement, the patient presented with persistent wound drainage. Her dressing was one-third soaked and required daily changing. Because of the risk of developing a periprosthetic joint infection, the patient underwent joint debridement and insert exchange on day seven. The wound healed completely after two weeks; however, after two months the patient presented again with swelling and pain over the right knee. Right knee aspiration showed evidence of periprosthetic joint infection, and the patient later underwent two-stage revision total knee arthroplasty. The antibiotic was continued as the infectious disease team advised. Figure 2 shows the category 1 wound, which is defined as a stripe of blood in the wound dressing that is less than 2 × 2 cm in size.

Figure 2: *Category 1 wound.*

Case 3: A 65-year-old male presented with a right neck femur fracture. He underwent a right total hip replacement. On postoperative day five, his dressing was soaked and required daily changing. PICO dressing was applied under a sterile technique. However, on day ten the wound was persistently soaked with PICO dressing. Ultrasound examination of the right hip and thigh showed a collection of fluid at the thigh. The patient later underwent debridement and a right hip joint washout. Postoperatively, the patient was put on PICO dressing for two cycles. On week three, the patient's wound healed well. An antibiotic was given following the infectious disease team's advice.

Case 4: A 75-year-old female presented with periprosthetic joint infection post-right hip bipolar hemiarthroplasty. The patient underwent first-stage revision hip arthroplasty. On day five post-surgery, her dressing was mildly soaked. However, she did not require any regular changes in dressing. Her dressing was then converted to PICO dressing. In week two, her wound healed well, and she underwent for second-stage revision surgery after completion of antibiotics and no evidence of infection clinically and hematologically. The antibiotic was continued as the infectious disease team advised.

Case 5: A 78 year-old-male with underlying eczema and hyponatremia presented with a left supracondylar femur fracture with cement spacer in situ. He previously underwent first-stage revision knee arthroplasty for periprosthetic joint infection. On day three after the second-stage revision surgery, the patient's dressing had a stain measuring 2 × 1 cm and 1 × 1 cm. His dressing did not require regular changing. On day five, a PICO dressing was applied, and at two weeks, the wound had healed well. The patient was able to ambulate well, and the range of movement of the knee was satisfactory. Figure 3 shows the category 2 wound with a PICO bandage. A category 2 wound has more than 2 × 2 cm leakage in the absorbent gauze or bandage but does not require changing of the dressing because the dressing is not soaked.

Figure 3: *Category 2 wound with PICO dressing.*

Case 6: An 83-year-old female presented with a right neck femur fracture. She underwent a right Thompson hemiarthroplasty. She was allowed full weight bearing with walking frame ambulation on day one of post- surgery. During wound inspection on day three, the dressing and wound were dry. However, on day five, a 2 × 2 cm blood stain was noted. The patient was planned for alternate-day dressing for the next four days, with normal OPSITE dressing. On day ten post-surgery, the dressing was dry, and at week two, the wound was completely healed.

Case 7: A 56-year-old female presented with periprosthetic joint infection following right total hip replacement. She underwent first-stage revision hip surgery, implant removal, and cement spacer insertion. On day three post-surgery, her dressing was fully soaked. Her dressing was then changed to vacuum-assisted dressing. On day eight post-surgery, her vac dressing was dry, and no stains were noted. She was then changed to regular dressing until the wound healed. Figure 4 shows the category 3 wound, which requires one bandage change per day because the dressing is soaked.

Figure 4: *Category 3 wound.*

Case 8: A 65-year-old female presented with a right neck femur fracture. She underwent a right total hip replacement. On day four post-surgery, her dressing was soaked 2 × 3 cm. Her dressing was changed once. After that, the dressing was dry until the suture removal date. The patient did not require any additional dressing changes. An antibiotic was given for one week. Figure 5 shows the category 4 wound, which requires two or more dressing changes per day.

Figure 5: *Category 4 wound.*

Table 2 shows the plans and outcomes of a novel surgical approach for total hip and knee arthroplasty replacement surgery with persistent wound drainage.

Case	Age/ sex	Primary diagnosis	Primary surgery	Surgical approach	Day of presentation	Category	Plan	Outcome
1	68/M	Aseptic loosening bipolar	Revision total hip replacement	Posterior	10	3	Debridement and implant retention	Wound healed completely
2	60/F	Osteoarthritis	Right total knee replacement	Medial parapatellar	5	4	Debridement and insert exchange	Later underwent two-stage revision knee
3	65/M	Neck of femur fracture	Right total hip replacement	Posterior	5	4	Debridement and implant retention	Wound healed completely
4	75/F	Peri-prosthetic joint infection	Removal of implant and cement spacer	Posterior	5	2	PICO dressing	Wound healed
5	78/M	Peri-prosthetic joint infection	Second-stage revision surgery	Medial parapatellar	3	1	PICO dressing	Wound healed
6	83/F	Neck of femur fracture	Right Thompson hemi-arthroplasty	Posterior	5	1	Regular dressing	Wound healed
7	56/F	Peri-prosthetic joint infection	First-stage revision right hip	Posterior	3	3	Vac dressing	Wound healed
8	65/F	Neck of femur fracture	Right total hip replacement	Posterior	4	3	Regular dressing	Wound healed

Table 2: *Plans and outcomes of novel surgical approach for total hip and knee arthroplasty replacement surgery.*

In this table, M indicates the male patients. F indicates the female patients.

Discussion

The diagnosis and management of persistent wound drainage are significant, contentious, and poorly understood topics in the field of joint arthroplasty. Persistent wound drainage following hip arthroplasty is related to an increased risk of periprosthetic joint infection [9]. No universally accepted definition of wound drainage or when it should be called persistent exists. The ICM declarations define chronic wound drainage as a wound leaking more than 2 × 2 cm for more than three days, stating this time period allows for earlier management and may decrease detrimental repercussions [10]. The proposed classification of persistent wound drainage following total joint arthroplasty delineates four categories of wound drainage (Table 1). In a study by Wagenaar., *et al.* [1,11], an early procedure was carried out within seven days of the index operation, even though effective removal of tissue, antibiotics, and prosthetic retention rates occurred at an average of 14 days (ranging from 4 - 32 days) after the index surgery. Based on these results, the ICM recommends surgical treatment begin if wound leakage persists for more than five to seven days following index surgery [1].

Absorbent coverings, pressure dressings, and interim joint immobility are common in nonsurgical management of recurrent wound drainage [12]. Researchers have reached consensus in discouraging antimicrobial therapy. Nutritional counseling and anticoagulant and metabolic abnormality repair must be addressed [13]. The scientific literature infrequently describes chronic drainage of wounds; hence, solid scientific data on the multiple factors linked to prolonged wound drainage after joint replacement and first-stage revision procedures is lacking [14]. Because of the absence of data, significant variation exists in medical care and diagnosis, which are frequently based purely on the surgeon's preferences. The reported prevalence of recurrent wound leakage ranges from 0.2% to 21% [3,11], with higher rates after a second operation. Parvizi., *et al.* [6] suggest debridement and antibiotic if there is any clinical suspicion of infection or wound drainage for more than 10 days.

Three of our patients underwent surgical debridement and joint washout and required an additional intravenous antibiotic. We selected them for debridement and joint washout because we suspected a possibility of future periprosthetic joint infection [15]. One of these patients required further surgery, which included two-stage revision arthroplasty. Two patients required normal dressing, and another two patients were put on PICO dressing. Following conventional hip and knee arthroplasties, incisional negative-pressure wound therapy dressing appeared to continually enhance wound drainage and healing, reduce wound complications, and reduce the duration of stay. PICO is a container-free design with a laminated dressing element that transmits negative pressure over the skin and relies on absorption and evaporation to control the wound fluid [16].

We suggest surgeons consider surgical debridement and joint washout if the wound persistently soaks after 10 days, or earlier if there is any clinical suspicion of infection. Open, deep resection and extensive washing with six to nine liters of saline delivered via low-pressure pulsating jet lavage could be used as surgical therapy [17]. Irrigation with weak povidone-iodine is an option. When possible, the modular parts could be switched because they provide a greater opportunity for thorough debridement and deep irrigation. Furthermore, we suggest the modular component substitute because infections might invade the polyethylene element (acetabular liners or tibial implant) [18]. The soft tissue should be cautiously wrapped with several layers [10,19]. Intraoperative clinical judgment is necessary in deciding postoperative drain requirements.

Inappropriate use of continuous wound drainage techniques for hip and knee arthroplasty can cause a delay in wound healing, spreading of tissue infections to adjacent tissues, development of sepsis, and an increase in patient morbidity index. It can also produce seroma, haematoma, purulent discharge from the wound surface, and fever.

Conclusion

Weighing risks and benefits is a crucial step in managing patients with persistent wound drainage. The best time to begin nonsurgical or surgical therapies has yet to be determined. Early identification is critical to reduce morbidity and complications.

Human Subjects

Consent was obtained or waived by all participants in this study.

Animal Subjects

All authors have confirmed that this study did not involve animal subjects or tissue.

Conflicts of Interest

In compliance with the ICMJE uniform disclosure form, all authors declare the following:

- **Payment/Services Info:** All authors have declared that no financial support was received from any organization for the submitted work.
- **Financial Relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.
- **Other Relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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