CASE REPORT

Total Hip Replacement Interrupted by Intraoperative Arrest with a Final Component in Place: A Case Report

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Abstract

No consensus recommendations exist as to the management of implants exposed during an interrupted total hip arthroplasty (THA). Given the infrequency of such events, documentation of successful outcomes in single case reports aids in decision-making. A 71-year-old male with a history of coronary artery disease and a BMI of 39.5 went into ventricular fibrillation half-way through a THA, after placement of a cementless acetabular component but before femoral preparation could begin. Continuation of the planned arthroplasty was aborted, the patient's wound was packed with sterile sponges and covered with an iodoform dressing, and he was flipped supine for CPR. He returned to the OR 6-hours following his arrest and his arthroplasty was completed with the original acetabular implant left in place. The patient was placed empirically on 2 weeks of IV vancomycin and 3 months of oral doxycycline based on infectious disease recommendations, and healed uneventfully. While validation of our strategy is challenging due to the infrequent nature of this event, it is hoped that this description and discussion may provide a template to those who encounter a similar challenging situation.

Level of evidence: V

Keywords: Antibiotic prophylaxis, Arthroplasty, Contaminated implants, Intraoperative arrest

Introduction

While intra-operative resuscitation strategies are known, the surgical management of an open wound and exposed implants during a surgery interrupted by cardiac arrest is not. This is particularly important when the interruption is following the placement of a final implant and complex, time-consuming wound closure is needed. The increased risk of complication posed by a potentially contaminated implant must be weighed against the patient's comorbidities, the reason for the intra-operative interruption, and the potential for easy hardware retrieval vs. revision surgery in the future.

Here we present the case of a patient who had an intraoperative cardiac arrest without new cardiac pathophysiology, permitting the same day completion of his surgery.

Case presentation

A 71-year-old male with a past medical history of stable coronary artery disease and a BMI of 39.5 had a long history of right hip pain and end-stage osteoarthritis that failed conservative treatment. The patient had previously been much heavier, but had lost a significant amount of weight to qualify for surgery (required BMI < 40). He could tolerate >4 METs, but his hip pain severely limited his daily activities. The patient was consented for a right total hip arthroplasty (THA) after a discussion of the risks and benefits of the surgery, which included cardiac complications.

Epidural anesthesia was used. The surgical approach for a modified Hardinge THA was uneventful, without excessive blood loss. The hip was dislocated, the femoral neck cut, the acetabulum reamed and a final cementless acetabular component was placed. The patient's

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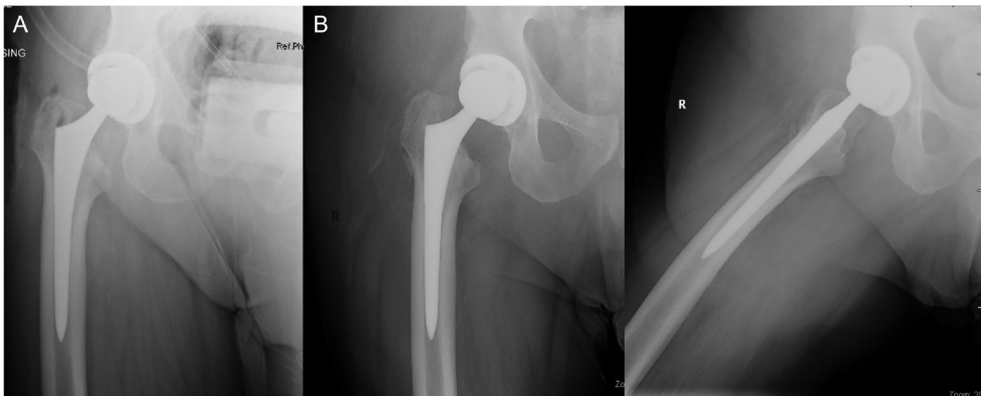

Figure 1. (A) AP X-ray immediately following the completion of the patient's THA compared with (B) 18-month post-operative AP and lateral X-rays. There was no evidence of implant subsidence, asymmetric wear or loosening at this time-point.

periacetabular bone quality was poor, but a good press fit was achieved. Femoral canal preparation and implant placement had not yet begun. The anesthesiologist then notified the surgeons that the patient's heart was in ventricular fibrillation, and his blood pressure was dropping precipitously. The patient's habitus and the position of his Stulberg stabilizers precluded chest compressions in the lateral decubitus position, so the patient needed to be immediately placed supine for CPR (1, 2). The surgical wound was packed with sterile lap sponges, a large iodoform sheet (ioban, 3M, St. Paul MN, USA) was used to cover the wound, and CPR was started within 1 minute of the start of the arrhythmia. The patient was intubated for respiratory support. A single defibrillation was successful at restoring normal sinus rhythm. The patient's blood pressure returned to a normal range, and he was taken intubated to the ICU in stable condition.

A thorough acute cardiac work-up was performed given the patient's cardiac history, which included an EKG, echocardiogram, serial troponins, and CT angiography to rule out a pulmonary embolism. The patient's cardiac rhythm and ejection fraction did not differ from baseline, no wall motion artifacts were noted, and there was minimal concern for pulmonary embolism based on imaging and the lack of a ventilation/perfusion mismatch. During this period the patient was hemodynamically stable, intubated but not sedated and following commands appropriately. Four hours after surgery was aborted the orthopaedic surgeons were notified that the patient could return to the OR to complete his procedure. Options at this juncture were to remove the acetabular implant and debride the wound with or without the placement of an antibiotic spacer, or to complete the procedure and begin prophylactic antibiotics. These options were discussed with the patient and his daughter, who understood that the wound was likely contaminated and there would be a higher risk of infection if the procedure was completed. The patient was mentating appropriately and chose irrigation and debridement followed by completion of the procedure with the placement of final implants.

Six hours after the surgery was aborted the patient returned to the OR. Surgical preparation was staged to minimize the risk of contamination. The iodoform sheet covering the patient's open surgical wound was initially left in place while the surrounding skin was surgically prepped with betadiene. The wound was then exposed and the skin margins were prepped as well. The lap sponges were then removed and the skin and soft tissue margin around the incision was prepped. The wound was irrigated with 3 L of normal saline with added gentamicin with pulse lavage, then treated with a chlorhexidine cleansing system (Irrisept, Lawrenceville GA, USA) per the manufacturer's instructions. The surgery was completed without further complication. The chlorhexidine cleansing system was used again after all final implants were placed. The wound was closed in layers using 0 and 2-0 PDS. The skin was closed with staples. No drain was placed.

The patient was extubated on the first day after surgery and ambulated on post-operative day 2. He was given aspirin 81 mg BID as thromboprophylaxis. The infectious disease service at our institution was consulted. It was initially decided that the patient's surgical wound would be considered contaminated and the patient would therefore receive 6 weeks of IV antibiotics. However, there was concern that the patient's habitus would make maintaining a therapeutic vancomycin level difficult. The patient was therefore treated with 2 weeks of IV vancomycin 2 g BID followed by 3 months of oral doxycycline 100 mg BID. Culture samples were obtained after the wound was irrigated during the second stage of the surgery, but no growth was recorded. The patient's post-operative course was complicated by prolonged wound drainage that required an incisional VAC for 48 hours starting on post-operative day 3. Following VAC removal, the surgical wound was clean, dry and healing well. Eighteen months after surgery the patient has no hip pain, his wound is fully healed, and he walks without an assistive device [Figure 1].

Discussion

Intraoperative cardiac arrest is uncommon, occurring in 0.03-0.07% of all non-cardiac surgical cases (3,4) prediction and mortality outcomes of intraoperative and postoperative cardiac arrest requiring cardiopulmonary resuscitation (CPR. It is more common in patients who are morbidly obese and have a history of heart failure or a prior cardiac intervention. Survival after intraoperative arrest is nearly twice as likely as that after a post-operative arrest , possibly due to immediate anesthesia response or the presence of a reversible etiology (4,5)524 perioperative cardiopulmonary arrests were identified from 234 hospitals. The overall rate of survival to discharge was 31.7% (799/2,524. Newland et al. attribute perioperative cardiac arrests to largely preventable etiologies, including poor central venous access, improper airway management and medication reaction (6). While the incidence of intraoperative cardiac arrests has gone down significantly over the past decade, few guidelines exist as to how to proceed from a surgical standpoint once the patient has been stabilized (3).

The decision to complete this patient's surgery and preserve his existing implant was multifactorial. The safest course for this patient from an infectious standpoint would have been to remove his potentially contaminated acetabular component and "fight another day". The patient could be left with an antibiotic spacer, which would permit some function while he was re-optimized for a revision procedure. However, there were several concerns about what would have essentially been a two-stage revision strategy: 1) given the patient's cardiac and arrest history, would he be able to tolerate a third surgical procedure (given that additional surgery would be needed to place a spacer regardless)? 2) Would the patient's poor bone quality permit the explant of his acetabular component and later his antibiotic spacer without a high risk of fracture? And 3) would the patient be able to tolerate a spacer given his habitus, and for the same reason would the patient be considered a viable revision candidate in the future? The patient and his daughter had similar concerns, particularly regarding the final point (7, 8). The patient had to go back to the OR for at least one more procedure given his open wound. If this was the case, it was the patient's preference that an attempted definitive hip replacement be performed.

Neither the Musculoskeletal Infection Society (MSIS) nor the Infectious Disease Society of America (IDSA) have developed guidelines for the management of interrupted surgery with exposed primary implants, nor did our infectious disease team have experience with similar situations. While this patient had no evidence or diagnosis of a prosthetic joint infection, given the lack of experience with contaminated implants we chose to follow the IDSA recommendations for antibiotic coverage following single-stage revision arthroplasty for infection, which recommended 2-6 weeks of IV antibiotics followed by a total of 3 months of oral therapy (9). We also relied on institutional preference for intraoperative care, which indicated the use of gentamicin in the irrigation and a post-implantation chlorhexidine soak, both of which have inconclusive efficacy in the setting of total joint arthroplasty(10).

This patient ultimately did not become infected. While we believe that our decision-making made this outcome more likely, this cannot be confirmed in a single case report. It is also possible that the short duration of implant exposure (6 hours) in this patient's case was not long enough for biofilm formation (11). While intraoperative arrests are rare and the occurrence of such events following the implantation of arthroplasty prostheses before the wound is closed is even less common, we believe that this report describes a reasonable course of action should a patient who arrests midway through an arthroplasty procedure be better served by procedure completion rather than staged reimplantation.

Conflicts of Interest: The authors declare that they have no conflict of interest to be reported.

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