

# Similar 30-Day Complications for Septic Knee Arthritis Treated With Arthrotomy or Arthroscopy: An American College of Surgeons National Surgical Quality Improvement Program Analysis

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**Purpose:** The purpose of the current study was to use the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) to determine whether there were differences in 30-day perioperative complications between open arthrotomy and arthroscopy for the treatment of septic knees in a large national sample. **Methods:** Patients who were diagnosed with a septic knee and underwent open arthrotomy or arthroscopy were identified in the 2005-2014 NSQIP data sets. Patient demographics and perioperative complications were characterized and compared between the 2 procedures. **Results:** In total, 168 patients undergoing knee arthrotomy and 216 patients undergoing knee arthroscopy for septic knee were identified. There were no statistically significant differences in demographic variables between the 2 groups. On univariate analysis, the rate of minor adverse events (MAEs; 15.48% vs 8.80%,  $P = .043$ ) was higher in the open arthrotomy treatment group, while the rate of serious adverse events (SAEs; 37.50% vs 26.19%,  $P = .019$ ) was higher in the arthroscopic surgery treatment group. On multivariate analysis, which controlled for patient characteristics/comorbidities and used the Bonferroni correction for multiple comparisons, there were no statistically significant differences in risk of any adverse events (relative risk [RR] = 0.851; 99% confidence interval [CI], 0.598-1.211;  $P = .240$ ), MAE (RR = 1.653; 99% CI, 0.818-3.341;  $P = .066$ ), SAE (RR = 0.706; 99% CI, 0.471-1.058;  $P = .027$ ), return to the operating room (RR = 0.810; 99% CI, 0.433-1.516;  $P = .387$ ), or readmission (RR = 1.022; 99% CI, 0.456-2.294;  $P = .944$ ) between open compared with arthroscopic surgery. **Conclusions:** Univariate analysis revealed a lower rate of MAE but a higher rate of SAE in the arthroscopic surgery treatment group. However, on multivariate analysis, similar perioperative complications, rate of return to the operating room, and rate of readmission were found after open and arthroscopic debridement for septic knees. Based on the lack of demonstrated superiority of either of these 2 treatment modalities for this given diagnosis, and the expectation that most differences in perioperative complications for this diagnosis would have declared themselves within the first 30 days, deciding between the studied treatment modalities may be based more on other factors not included in this study. **Level of Evidence:** Retrospective comparative study, Level III.

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Acute nongonococcal septic arthritis is considered to be a surgical emergency with delayed recognition and treatment being associated with articular cartilage destruction and potential sepsis.<sup>1,2</sup> Surgical intervention is the treatment of choice, as patients have been found to have worse outcomes with medical treatment alone, and repeated aspiration has been found to be inferior to formal surgical intervention.<sup>3,4</sup> Thus, the standard treatment of this diagnosis is considered to be irrigation and debridement followed by a course of systemic antibiotics.<sup>1</sup> For the knee, which is the most frequently involved joint in adults,<sup>5</sup> there is a lack of consensus as to whether debridement is best

addressed through open arthrotomy or arthroscopic surgery.<sup>5</sup>

Several prior studies have retrospectively compared open arthrotomy and arthroscopic surgery for the diagnosis of septic knee, but these have been limited by small sample sizes.<sup>6-8</sup> In 2001, Wirtz et al. performed a retrospective review of 27 patients treated by arthroscopic knee lavage and debridement and compared them with 24 patients treated with open knee arthrotomy with subtotal synovectomy.<sup>8</sup> These authors suggested a lower recurrence of infection in the arthroscopy treatment group (2/27 vs 4/24), but this was not analyzed for statistical significance. Further, the authors noted better functional outcomes and earlier recovery in the arthroscopy group. In 2015, Bohler et al. retrospectively evaluated 70 consecutive patients with bacterial monoarthritis of the knee: 41 were treated arthroscopically and 29 with open arthrotomy.<sup>6</sup> In their study, the patients who were treated with arthroscopy had significantly lower reinfections that required a second surgical procedure than those treated with arthrotomy (2/41 vs 6/29). Reinfections were within 3 months, but the time frames within that window were not defined in the paper. In addition, the authors identified better postoperative range of motion in patients who underwent arthroscopic surgery.

Building on these studies, a small, prospective, randomized clinical trial by Peres et al. randomized 11 patients with septic knee arthritis to knee arthrotomy and 10 patients with septic knee arthritis to arthroscopic knee debridement.<sup>7</sup> In this study, there were no complications or harmful effects of surgery in either group, but 2 patients of the arthrotomy group had recurrence of infection in the first week after admission and had to receive another surgical intervention. Complications such as reinfection requiring reoperation have similarly been shown to usually occur in the first week after surgery in an all-arthroscopically treated group of patients.<sup>9</sup>

However, prior studies comparing open and arthroscopic debridement of septic knee arthritis have been limited in size and may lack sufficient statistical power. Therefore, the purpose of the current study was to use the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) to determine whether there were differences in 30-day perioperative complications between open arthrotomy and arthroscopic surgery for the treatment of septic knees in a large national sample. We hypothesized that there would be no difference in perioperative complications between patients who underwent open or arthroscopic debridement after controlling for differences in patient characteristics and comorbidities.

## Methods

### Data Source

The NSQIP database, which began in 2005, collects over 300 patient variables from over 500 participating

institutions in the United States.<sup>10</sup> Trained clinical reviewers abstract patient information from patient interview, medical records, and operative reports through the 30th postoperative day regardless of hospital discharge.<sup>11</sup> Previous studies have shown that most perioperative complications following open or arthroscopic treatment of septic knee arthritis occur within this time period.<sup>7,12</sup> The number of orthopaedic studies using NSQIP has continued to increase in recent years.<sup>13-15</sup> Our institutional review board granted an exemption for studies using this data set.

### Patient Population

This is a retrospective comparative study. Patients who had septic arthritis of the knee between 2005 and 2014 were extracted from the NSQIP database using the International Classification of Disease 9th Revision (ICD-9), 711.06, which does not include gonococcal arthritis. Patients who underwent open arthrotomy were identified using the Current Procedural Terminology (CPT) code 27310, while patients who underwent arthroscopic surgery were identified using CPT code 29871. Cases involving implants (7 cases), concurrent arthrotomies performed at another joint (6 cases), concurrent arthroscopies performed at another joint (2 case), or revision knee arthroplasty (1 case) were excluded. On the basis of these criteria, 168 patients who underwent open arthrotomy and 216 patients who underwent arthroscopic surgery for septic knee arthritis remained for analysis.

Patient characteristics available from NSQIP include age, gender, height and weight (which can be used to calculate body mass index [BMI]), functional status prior to surgery, and American Society of Anesthesiologists (ASA) classification. The ASA score, which has been found to correlate well with perioperative events following various other orthopaedic procedures, was used as a marker of comorbidity in this study.<sup>16-18</sup>

The NSQIP database also provides operative time and postoperative length of hospital stay (LOS). The former is defined as the total operation time in minutes. The latter is defined as the LOS after operation to discharge. The maximum LOS in this study is limited to 30 days.

### Perioperative Outcomes and Readmission

The NSQIP database tracks patients for the occurrence of individual adverse events through the 30th postoperative day, regardless of discharge. The database also records the time, in days, after principal operative procedure to occurrence of the adverse event. In this study, individual adverse events were used to generate 3 aggregate groupings of adverse events.

The occurrence of a minor adverse event (MAE) was defined as the occurrence of any of the following: blood transfusion, pneumonia, wound dehiscence, urinary tract infection, and renal insufficiency. The occurrence of a serious adverse event (SAE) was defined as the

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