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## Do Periarticular Joint Injections Present an Increase in Infection Risk?

*To the Editor*—Joint replacements are projected to be the most common elective surgical procedures in the coming decade.<sup>1,2</sup> Effective management of postoperative pain associated with joint replacement surgery improves surgical outcomes by increasing postoperative mobility and reducing the duration of hospitalization.<sup>3</sup> Many surgeons have recently incorporated local analgesia into pain management regimens for patients undergoing joint replacement surgery.<sup>4,5</sup> The benefits of using periarticular injections (PAIs) include decreasing opioid consumption and its associated side effects, facilitating earlier mobilization, and decreasing hospital length of stay.<sup>6</sup> Most PAI techniques involve infiltration of a high-volume, long-acting local anesthetic solution into the surgical incision and surrounding tissues prior to skin closure. A wide variety of medications is used in these injections.<sup>7</sup> However, based on our hospitals’ experiences, these injections frequently include epinephrine, ketorolac, opioids, or steroids.

The Duke Infection Control Outreach Network (DICON) recently identified the use of PAIs as a potential risk for infection during 4 investigations of clusters of SSIs associated with total hip replacements (THRs) and total knee replacements (TKRs). We surveyed hospitals within our network to gather more information about PAI practices. Of 42 hospitals, 20 (48%) participated in the survey. Of these 20 hospitals, 16 (80%)

reported routine use of PAIs in patients undergoing joint replacement surgery. All 16 hospitals used PAIs in patients undergoing TKRs; 14 hospitals also used PAIs in patients undergoing THRs. In 5 hospitals, PAIs included a combination of bupivacaine, morphine, and ketorolac. The remaining 11 hospitals used highly variable combinations of medications. In 12 hospitals, PAIs were prepared in the operating room (OR), while in the other 4 hospitals, PAIs were prepared in the pharmacy. Among the 4 clusters of SSIs we investigated, all prepared PAIs in the OR.

The current literature regarding the relative infection risk associated with periarticular injection use compared to other modalities of pain control is inconclusive. Marques et al<sup>8</sup> performed a systemic review and meta-analysis of 2,348 patients undergoing joint replacement surgery (909 THR, 1,439 TKR).<sup>8</sup> Only eight cases of deep infection requiring surgical debridement or revision occurred in the cohort (overall infection risk, 0.34%). In patients with THRs, four deep infections occurred in patients who received PAIs, and one deep infection occurred in the control group (Peto OR 3.47; 95% CI 0.58, 20.81;  $P=0.17$ ). In patients with TKRs, two deep infections occurred in patients who received PAIs compared to one deep infection that occurred in the control group (Peto OR 1.85; 95% CI 0.19, 17.83;  $P=0.59$ ). Thus, the increased number of infections in the PAI groups was not statistically significant. The six patients with deep infection after PAIs received their PAI through a postsurgical catheter that remained in place following surgery.

Jiang et al<sup>9</sup> performed a meta-analysis that included an analysis of wound complication rates following TKA and THA in which PAIs were administered. This study showed no statistically significant difference in wound complication rates for either surgery type among patients who received PAIs compared to those who did not. Wang et al<sup>10</sup> performed a meta-analysis of ten studies that compared pain control in patients who received PAIs after TKA and patients who received a nerve block. Of these studies, 3 reported that wound complications were not significantly increased in the PAI group (odds ratio, 1.57; 95% CI, 0.40–6.16;  $P=.52$ ). Although the preceding studies suggest that rates of infection-related complications in patients undergoing PAIs are low, most of the previous studies were underpowered or included an inadequate duration of follow-up to detect an association between PAI and SSI risk.

From a theoretical and practical perspective, the use of PAIs has numerous potential risks for the introduction of bacteria into the joint space or incisional tissues. For example, PAIs are usually compounded in the OR without the use of a sterile hood. Furthermore, OR personnel who lack formal training in drug compounding are typically responsible for preparing these injections. Bacteria may also be introduced through the skin at the time of drug injection, especially if

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external catheters are used to infuse analgesic medications. Finally, many surgeons include corticosteroids as an adjuvant medication in these injections, which may increase the risk of infection.

Our survey of community hospitals revealed widespread use of PAIs without standardization of drug composition, compounding techniques, and method of administration. We were unable to prove that PAIs were responsible for the 4 clusters of SSI reported above. These outbreaks stopped after a number of interventions were undertaken, including standardization of compounding techniques or discontinuation of PAIs. The use of PAIs and the associated risks of infection may lead to sporadic occurrences or clusters of SSIs at other hospitals. However, it is difficult to determine the cause of small clusters of SSIs, and publication bias may limit evaluation of PAI safety. Therefore, hospital epidemiologists and surgeons should be aware of these potential risks, especially if an increase in rates of SSI following joint replacement surgeries occurs at their institution.

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