Authors: Plamen Kinov, Akos Zahar, Thorsten Gehrke, Markus Rossmann

QUESTION 4: Does changing the drapes during debridement, antibiotics and implant retention (DAIR) affect the rate of success?

RECOMMENDATION: The impact and effectiveness of changing the drapes during DAIR has not been investigated and therefore it can be performed at the surgeon's discretion.

LEVEL OF EVIDENCE: Consensus

DELEGATE VOTE: Agree: 94%, Disagree: 5%, Abstain: 1% (Super Majority, Strong Consensus)

RATIONALE

DAIR is a viable and effective option for the management of acute periprosthetic joint infections (PJIs) [1,2]. Published success rates for patients responding to DAIR treatment range from 14 to 100% [3,4]. However, as stated by Tsang et al., published rates improved after 2004 with a pooled mean proportion of success of about 72% [3]. The reason for improvement of success of DAIR is certainly multifactorial and includes a better understanding of the importance of performing a thorough debridement. Numerous factors that influence the outcome of DAIR have been identified including the timing of surgery, the number of procedures, the responsible microorganism, the duration of antibiotic treatment, the exchange of removable components and other factors [3,5–9].

In a review article on DAIR treatment, the only statistically significant determinants of outcome were an early timing of debridement (with a median of < 7 days from the onset of symptoms of infection) and the exchange of removable components [3].

Even though some papers consider the question [10], there are no studies that assess the impact of changing the drapes during DAIR. After a systematic review of 51 papers, only one study was identified that mentioned the use of clean draping during the surgical procedure [11]. Other studies on one-stage exchange after PJI also mention redraping after implant removal and completion of debridement [12].

Changing the drapes during DAIR can be performed at the surgeon's discretion. Further studies are needed to investigate their role and effectiveness in the treatment of early PJI.

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Authors: Jeffrey Granger, Gustavo A. Garcia, Michel Malo, Moneer M. Abouljoud

QUESTION 5: Does the use of separate instruments for each side reduce the rate of subsequent surgical site infections/periprosthetic joint infections (SSIs/PJIs) in patients undergoing simultaneous bilateral total hip or knee arthroplasties (BTHA or BTKA)?

RECOMMENDATION: No. The use of separate instruments for each side does not appear to reduce the rate of subsequent SSIs/PJIs in patients undergoing simultaneous BTHA or BTKA.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 72%, Disagree: 19%, Abstain: 9% (Super Majority, Strong Consensus)

RATIONALE

The proportion of one-stage bilateral total joint arthroplasty (BTJA) to unilateral total joint arthroplasty is increasing in the United States. This trend may be driven by the epidemic of obesity and its contribution in the progression of osteoarthritis and the expansion of total joint arthroplasty (TJA) to younger, healthier and more active patients [1–3]. All of these factors result in a higher demand for the procedure. Advances in anesthesia, surgical technique and perioperative care may further contribute to the increase of one-stage BTJA [4].

One-stage BTJA is a relatively safe procedure, especially following appropriate patient selection [5,6]. The benefits of one-stage BTHA include a single anesthesia and single hospital stay, resulting in cost reduction [7] and shorter overall hospital length of stay (LOS) [8,9]. Some studies advocate BTHA as they have demonstrated that rates of perioperative complications are similar between one-stage BTHA and unilateral total hip arthroplasty (THA) [10,11]. On the other hand, opposing studies have found that one-stage BTHA poses greater risks to patients, including increased transfusions, greater adverse events and suboptimal functional outcomes [12–15]. Most studies focus on mortality, pulmonary embolism (PE), deep venous thrombosis (DVT) and cardiovascular complications, but data on SSIs or PJIs is limited in the literature.

SSI/PJI is a significant problem and is associated with increased morbidity, mortality and medical expenditures [16–22]. Increased surgical duration, blood loss and need for allogeneic blood transfusion are risk factors for SSI/PJI [23,24]. The literature is divided with respect to wound infection rates following one-stage BTKA and unilateral total knee arthroplasty (TKA). Authors who have observed a higher infection rate in one-stage BTKA surgery blame the longer operative times, increased number of medical personnel in the operating room and a lack of rescrubbing, redraping and instrument changes for the second arthroplasty [25]. Others have reported rates of SSIs after one-stage BTKA and BTHA to be no higher than those following procedures performed unilaterally or staged. This may be due, in part, to the younger, healthier patient population selected for these procedures [26,27].

A potential source of SSI unique to one-stage BTJA is the use of the same set of instruments in both joints. The procedures may be completed using one or two surgical teams, as well as one or two sets of instruments. Reduced SSI/PJI following BTJAs using separate instruments for each side has not been demonstrated. There is currently limited and inconclusive evidence in the literature [28–31].

In 2006, Gonzalez Della Valle et al. [28] considered the hypothesis that the prevalence of early deep infection would be lower on the second side when a completely new set of sterile instruments was used for the second side. The authors retrospectively reviewed the prevalence of deep infection in 271 consecutive cases using two different sterile setups (group 1) and 289 cases using the same setup (group 2). In group 1, there was one deep infection affecting the first side, while there were no deep infections in group 2. In group 2, one patient developed a superficial infection on the second side requiring readmission and intravenous antibiotics. Given the very low prevalence of deep infection of the first and second side (0.2% and 0%, respectively), the study was underpowered to detect a difference – 2,300 patients would be needed in each group to achieve statistical significance. The results of this study should be considered with caution, as they are the result of experienced surgical teams specialized in hip arthroplasty surgery, operating in laminar flow rooms, and using body exhaust suits. Without these conditions, the rate of infection in single-stage bilateral hip arthroplasties performed with the same set of instruments may be higher. Based on this experience, the use of the same set of instruments for the second side in the operating conditions described in this study appears to be safe [28].

The remaining three studies compared outcomes of bilateral to unilateral TKAs. Two of the three studies used separate instrument sets in the bilateral procedures and observed infection rates of 0% in 227 patients [29] and 2.7% in 92 patients [30]. The final study used the same set of instruments in the bilateral procedures and observed an infection rate of 3.5% in 72 patients, attributing possible sources of infection to prolonged operation time, increased number of assistants in the operating room, not redraping and rescrubbing and not changing instruments [31]. The latter conflicts with the conclusion reached by Gonzalez Della Valle et al. which posited that use of the same instruments is considered safe [28]. Three of the four studies found one-stage BTJA to be generally safe [28–30], with the exception of Luscombe et al. [31] who concluded that staged bilateral procedures may be safer.

There is currently not enough clinical evidence to show that the use of separate instruments for each side during simultaneous BTJA reduces the rate of subsequent SSI/PJI. While the retrospective study from Gonzalez Della Valle et al. did find no difference in infection rates between same and separate instrument procedures, its retrospective nature and lack of statistical power are not strong enough to reach a clinical conclusion regarding standard of practice for using one or two instruments sets. The use of one instrument set does appear to be safe with the available evidence.

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Authors: Marie-Jacque Reisener, Adrian van der Rijt, Jorge Manrique

QUESTION 6: Does routine use of a new set of surgical instruments and equipment following debridement and before reimplantation reduce the risk of surgical site infections/periprosthetic joint infections (SSIs/PJIs) recurrences? Is it necessary to change all surgical fields before the final reimplantation in septic revision surgery?

RECOMMENDATION: The change of the surgical field following debridement of an infected joint leads to a reduction in the bioburden and stands to improve outcome of surgical intervention and should be considered.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 90%, Disagree: 7%, Abstain: 3% (Super Majority, Strong Consensus)

RATIONALE

There are no specific studies that have addressed the levels of contamination of instruments in infected revision surgeries. Different studies have addressed surgical instrument contamination in orthopaedics and other specialties with no definite recommendations. Some have shown a level of surgical instrument contamination in contaminated and infected operations, implying the instruments will be contaminated by the surgery itself [1,2]. Furthermore, studies have shown that instruments also become contaminated during what are considered to be clean procedures [3].

Pinto et al. showed that in clean orthopaedic surgeries, 47% of the instruments were contaminated. In the same study, an even higher rate of 70% had positive cultures in contaminated surgeries and up to 80% in infected cases [4]. They concluded that there was a significant difference in microbial growth between the clean and contaminated surgeries and between the clean and infected surgeries. In a different study, Evangelista dos Santos et al. evaluated patients undergoing gastrointestinal surgery and found that the surgical wound classification significantly affected the microbial load recovered on instruments [5]. Microbial loads were higher on instruments used for contaminated procedures.

Not all studies share the same results. There is a contradictory report from Nystrom which found that regardless of the classification of orthopaedic operations as clean, contaminated or infected, similar contamination rates were observed in splash basins (75%, 80% and 71% respectively) [6]. They concluded that the data did demonstrate a relatively higher correlation between splash basin contamination and contaminated and infected cases but this was not significant.

When evaluating correlation between contaminated instruments and infection risk, only one study was identified. Dancera et al. showed post sterilization contamination of surgical instruments was linked with an increased rate of deep SSIs in orthopaedic and ophthalmological patients [2]. This seems to link contamination of surgical instruments to increased risk of infection.

In joint arthroplasty surgery literature, Davis et al. showed that in 100 consecutive primary hip and knee arthroplasty operations under laminar flow, instruments get contaminated. 11.4% of suction tips, 14.5% of light handles, 9.4% of skin blades and 3.2% of deep blades were seen to have positive cultures [7]. In conclusion, 63% of operations showed contamination in the field of operation. In a different study evaluating electrocautery tips, Shahi et al. found in 100 consecutive primary total hip arthroplasties (THAs) and aseptic revision THAs that up to 6% of tips were contaminated [3]. None of these patients continued to have a PJI/SSI. Robinson et al. also found that 41% of suction tips had evidence of bacterial colonization in THA surgery undertaken in ultraclean air operating rooms [8]. Furthermore, few studies have focused on elements of the surgical field other than the instruments. Beldame et al. found a surgical