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CORR Insights®: The Role of Highly Selective Implant Retention in the Infected Hip Arthroplasty

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Where Are We Now?

Periprosthetic joint infection (PJI) is among the most devastating complications after hip replacement surgery [2, 6]. In chronic PJI, a removal of all implant components, débridement, and a subsequent revision arthroplasty (either as a one-stage or a two-stage procedure) is recommended [2, 7, 9, 14, 16] since débridement and component retention alone is associated with a high likelihood that the infection will persist. However, removal of well-ingrown

implants can result in substantial bone defects, making subsequent reimplantation difficult. For this reason, we must consider whether indeed we need to remove all implant components for patients with PJI.

The answer appears clear if the symptoms of PJI are acute and found early after the index procedure. In the latest consensus conference held in 2013, there was an 84% consensus agreement that incision and drainage with component retention can be performed for early postoperative infections occurring within 3 months of index primary arthroplasty with less than 3 weeks of symptoms [14].

members are on file with the publication and can be viewed on request.

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Partial revision hip arthroplasty is somewhat of a compromise between incision and drainage with component retention and total revision arthroplasty. In contrast to the classic incision and drainage indication, partial revision hip is intended for patients with a chronic PJI [4, 11]. Ekpo and colleagues [4] reported on 19 patients with PJI in which a two-stage partial revision hip arthroplasty, including complete acetabular component removal, retention of well-fixed femoral stems, placement of an antibiotic-laden cement femoral head, and delayed reimplantation was performed. Of the 19 patients, two with prior failure of two-staged treatment of infection failed secondary to recurrence of infection at an average of a little more than 3 years [4]. In another study, Lee and colleagues evaluated 19 patients with a PJI and cementless stems [11] in which acetabular components and femoral heads were removed, but stems were left in situ if they could not be removed easily or were well-ingrown. Of those 19 patients, 17 received a second-stage reimplantation and 15

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patients showed no evidence of infection after a minimum of 2 years followup [11].

El-Husseiny and Haddad now take this concept further, by progressing from a two-stage partial to a one-stage partial hip arthroplasty. The authors note that the short-term results are reassuring, but we still need long-term data before this technique can become more widely adopted.

At first glance, the results of the study by El-Husseiny and Haddad appear promising. While the authors suggest that the technique should not be widely adopted until or unless larger groups of patients with longer-term data have been studied, they also note that their results reaffirm that partial implant retention and joint débridement can be an alternative for some highly-selected patients with PJI.

Where Do We Need To Go?

Still, there are several concerns that will require future research. For example, in the current study, 18 out of 293 (6%) patients who underwent surgery for PJI were treated with a partial one-stage revision hip arthroplasty. This small number of patients treated with a partial one-stage revision indicates that the study results may not apply broadly in typical practices and that further research is

necessary to develop criteria for identifying patients who could benefit from this procedure.

A clear definition of the underlying type of PJI and its detailed description is necessary. This includes, for example, the reporting of preoperative joint aspirates and if the cultures of intraoperative specimens yielded the same microorganism, as well as the reporting of the histopathological examination results [3].

The current study also brings to light an interesting topic—partial revision of PJI of the hip appears to control infection in a majority of patients who met the study's indications. This is somewhat astonishing, and contradicts previously published studies on biofilms [6, 13, 16]. Biofilms make it difficult to diagnose and treat PJI [2]. While the precise frequency of biofilms in chronic PJI is not known, it has been reported that chronic infections “are present mostly in a biofilm state” [2]. Following the argument that biofilm formation cannot be adequately addressed in partial revision arthroplasty, it is commonly believed that the risk of recurrent infection is increased if all implants are not removed [6, 15]. One author even stated that “any surgical treatment will ultimately fail if that treatment does not adequately remove the biofilm at the infection site” [2].

How can we reconcile the results of the current study and our knowledge

regarding biofilms? Were the majority of cases from El-Husseiny and Haddad free of biofilm, perhaps because of patient selection? Is a partial revision arthroplasty indeed sufficient in treating a chronic PJI, or are biofilms more infrequent than initially suspected? If the latter was the case, then it could be worthwhile to rethink performing complete exchanges for every patient with chronic PJI.

How Do We Get There?

While it is always easy to call for multicenter randomized controlled trials to address the efficacy of partial versus total revision hip arthroplasties in PJI, I think it would be more prudent to build off of the results of the current study. The authors reported on the 18 patients who were treated for PJI (out of 293 patients in the study); it would be helpful to report on the results of these remaining patients, so that the treatment results can be compared. Currently, we do not know if the long-term results of these 18 patients who underwent a single-stage partial revision are better or worse than the results of the rest of the 293 patients who were treated for the same disease. Although there will be selection bias, I think this type of analysis is important before subjecting patients to such a randomized controlled trial.

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Moreover, we should anticipate difficulties regarding sufficient patient recruitment for such a randomized controlled trial. The authors were able to recruit 18 patients during an 11-year period, resulting in one patient every seven months. Even if five centers with an identical numbers of referrals would take part in such a multicenter study, there still would be less than one case per month fulfilling the inclusion criteria, outlining the problems in performing such a multicenter study. In addition, we do not know the effect size for the treatment result from single stage partial revision versus complete revisions. Therefore, at the current stage, we cannot perform a power analysis to calculate the numbers of patients that would be necessary to recruit for such a multicenter study.

Other means of data collection regarding the results of such therapies should be sought. In this respect, joint replacement registries offer substantial resources to document cases that were treated with a single-stage partial revision versus other procedures. Such national joint registries have been established in several countries [12] and also the American Joint Replacement Registry has more than 250,000 cases registered [1]. In addition, there are several regional and hospital registries in the United States. If partial-revision arthroplasty for infection

becomes a more-popular treatment, it will be important that coding in the various national registries allow the tracking of the results of this approach.

As long as the registry is capable of identifying patients with a partial hip revision, the concept of the registry-embedded study [5] is probably the most-realistic tool for getting answers regarding the efficacy of partial hip revision in PJI. In registry-embedded studies, both an observational design and a randomization design [10] are possible. These designs facilitate the followup of selected patients and they also provide access to the data of otherwise eligible patients, but who were treated outside of studies [8]. However, as the partial revision does not meet the definition of a revision arthroplasty [12], registry leaders are encouraged to confirm whether their registries can identify these cases.

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