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Short Communication

Treatment in Total Knee Arthroplasty infection. Can we dare to DAIR?

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The incidence of Periprosthetic joint infections (PJI) ranges from 1-to 2%, [1,2]. and they represent one of the major causes of prosthesis revision over time [3], being among the most complex complications in joint surgery. They are known for being devastating for both patients and their doctors, generating an explosive increase in healthcare costs, a severe impact on the quality of life, and increased morbidity and mortality [4,5].

While there are several different surgical options for the management of PJI, component retention is always well accepted by both patients and doctors. Its surgical indications and techniques are subjects of constant controversy.

The management of PJI varies based on a variety of factors such as host comorbidities, fixation and functional status of the implants, infecting organisms, and the chronicity of the infection. [6] The most common alternatives are debridement and antibiotics with implant retention (known as "DAIR" in the English literature) and component revision in one or two stages. Other salvage options (resection arthroplasty, arthrodesis, and amputation) are only for patients with persistent PJI or at high risk of failure to undergo a revision or re-revision [7].

In general terms, DAIR has historically been reserved for acute and hematogenous post-operative infections with symptoms for a short time. In contrast, component revision is indicated for chronic infections with methicillin-resistant Staphylococcus aureus, multiple organisms, sepsis, and negative cultures [8]. Before choosing the best treatment for a particular patient, it is of paramount importance to determine the timing of the infection, being critical to determine if a PJI is "acute". Different cutoff points have been published in the literature, like the one from Tsukayama [9] who defines it as lower than three months. However, for most authors, an acute infection occurs before one month of surgery [10].

DAIR is an attractive alternative for patients and doctors as it is much less invasive, causes lower bone stock loss, better functional outcomes, and less morbidity [11]. Nonetheless, it requires a good indication because the patient may face a future revision with a significant increase in risks and costs. The success rate varies greatly, from 18 to 94% [12]. As a result, the surgeon must appropriately study the factors of a patient who is a good candidate for implant retention.

New concepts

Initially, DAIR was reserved for "very early" PJI (before 10 to 14 days after surgery). However, the indication regarding the timing of the surgery index has changed over time. Some groups consider DAIR before four weeks or even before three months. Furthermore, it is possible to consider hematogenous infections with less than two weeks of symptoms, when biofilm presence should not be significant [8].

Some current studies demonstrate the DAIR performance within three months of surgery has acceptable success rates. For instance, De Vries., et al. [13]. achieved an 84% rate of component retention. However, these authors mentioned the fundamental role of a stable component, an identified and treatable organism, symptoms for less than three weeks, and intact soft tissues. Van der Ende., *et al*. published a Dutch series comparing DAIR effectiveness in patients operated on before four weeks of the index surgery (group 1) or four to 12 weeks (group 2) after the index surgery. These authors defined "success" as the absence of component revision 12 months post-DAIR. They demonstrated that hip prostheses success

in groups 1 and 2 were 92 and 91% respectively. Meanwhile, the success rate in knee prostheses was 91 and 83% in groups 1 and 2, respectively [14]. Although we could see the increased knee prosthesis failure as "significant," we believe that an 83% success rate should make one consider component retention since it is an acceptable result that would prevent a large proportion of prosthetic revisions and their consequences.

In recent years, studies showed the experience with the "Double-DAIR" treatment promoted by the Mayo Clinic group [15]. This procedure involves a two-staged debridement, initially increasing costs. However, success rates are higher, ultimately resulting in cost savings by implant retention in a higher number of cases. The first stage of this procedure consists of thorough debridement and cleansing, obtaining culture samples, cleaning the insert on the working table, repositioning it, and placing cement beads with an antibiotic agent. The second stage, four to seven days later, consists of bead removal, new cleaning, and changing the insert for a new one. In the case series of this Mayo Clinic group, the "Double-DAIR" procedure achieved a 94% success rate for primary prosthesis infections, warranting its recommendation [16]. It is worth noting that all cases from these studies only include patients operated on less than four weeks after the index procedure. To our knowledge, the success rate of this intervention in patients operated on four to 12 weeks after the index procedure has not been published. The effectiveness of the classic DAIR versus the "Double-DAIR" procedures has been studied with a Markovian model, showing a higher cost-effective ratio for the "Double-DAIR" group in terms of health utility (QALYs) and final costs [17].

Our Recommendation

Our group tries to retain the components whenever possible in acute infections (progressing to "less than three months" postoperatively) or hematogenous infections with symptoms for less than two weeks, as long as the pathogen is identified and treatable, there are no signs of component loosening, and the soft tissues are adequate. We began to consider the "Double-DAIR" procedure this year (as described by the Mayo Clinic group but changing the insert in the first and second stages, not in the second stage alone). So far, we have had good outcomes, and we believe prosthetic component retention is a valid treatment alternative.

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