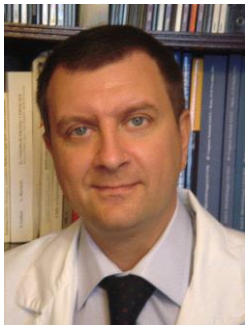
June, 30 2019 –The Woice

IS 1 = 2 ?

THIS IS WHAT WAS ASKED TO TWO VALUED WAIOT CO-FOUNDERS AND MEMBERS



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Question 1. Do you think one-stage joint revision after infection is a good option to treat PJI ?

CR: In the past decades we have been managing PJI preferentially with a two-stage approach, but in the last years our philosophy has progressively changed and **one-stage approach has gradually become the first option to be proposed to many of our patients**. This is the result of the most recent systematic reviews and meta-analysis, that failed to demonstrate a clear superiority of two-stage compared to one-stage revision. The current knowledge of the pathogenesis of implant-related infections clearly points out that**, whenever you are able to obtain a complete removal of infected biomaterials and of devitalized contaminated tissues the chance of success is equivalent for one- or two-stage revision**.

HW: I strongly believe **one stage revision is the best option for treating an infected joint replacement**. As the Consensus meeting in Philadelphia confirmed with an 89% consensus "*The potential advantages of a one-stage exchange arthroplasty are multiple, including a decrease in surgical morbidity and mortality, earlier functional return, decrease in healthcare and global economic costs as well as an increase in health-related quality adjusted life years*." "A meta-analysis performed by Nagra et al. in 2016 on five cohort studies compared one-stage and two-stage exchange arthroplasty in 231 patients. • No significant differences in risk of reinfection following one- or two stage exchange arthroplasty (OR -0.06, 95 % confidence interval -0.13, 0.01). • In studies published since 2000, one-stage procedures have significantly lower reinfection rate. • Conclusion: One-stage exchange arthroplasty can lead to better clinical and functional outcomes, but patient selection criteria need to be defined."

Question 2. What are the main requirements to be successful?

CR: Even if, on average, the results of one- and two-stage are comparable, according to the most recent literature, we must keep in mind that one-stage revision is a **"one-shot" procedure**, that does not allow a second look and a second debridement, so to go for it **in a given patient we must be reasonably sure**

1. to be able to **remove** all foreign materials and infected tissues in a single procedure;
2. to be able to immediately **reconstruct**, this means i. That the patient can sustain a procedure longer that receiving a simple spacer, ii. That you have on the shelf the necessary implants for revision; iii. That you have the necessary know-how to perform a revision surgery that may reveal to be more complex than expected pre-operatively.
3. to be able to **protect** the new implant with targeted and effective systemic and local antibacterial therapy, especially in the first days after surgery;
4. that the **patient and his/her family do understand the possible risk of failure**. In fact, it may be more difficult for a patient to accept the failure of a revision implant, than that of a spacer, than may be considered as a part of the treatment and not as the definitive solution.

HW: One stage revision **should be done in specialized Centres with an interdisciplinary team**. The team should be aware that the infection is mediated by biofilms. Main requirements for success can be summarized in **five steps** to be followed consecutively:

1. **Detection**: localise infected sites as exactly as possible by using available imaging techniques (CT, Bone scan, if possible Pet-Scan). Detect the causative pathogen by using adequate culturing techniques (mimimum two weeks
2. **Debridement**: drastically reduce bioburden and bacterial means of livelihood by removing all identified dead material as radically as possible;
3. **Disruption**: disturb the living community of residual biofilm colonies by mechanically disrupting their established structures as thoroughly as possible; This may be achieved by meticulous abrasion of surfaces of remaining sclerotic bone
4. **Dead space management**: obliterate possible colonisation foci by filling dead space with inaccessible material as completely as possible;
5. **Decontamination**: eliminate sessile bacteria inside remaining fragments using local antimicrobial substances in concentrations as high and as consistent as possible. For that purpose adequate carriers are required, providing a sustained release of Antibiotics in biofilm adjusted concentrations. Local and accompanying systemic antibiosis should follow the resistance patterns of identified microbes.

Question 3. What is the role of local antibacterial protection of the implant?

CR: According to the current knowledge on the pathogenesis of implant-related infection, **the destiny of an implant is decided at the very time of surgery**, when bacteria may adhere on its surface and immediately form the biofilm, which makes them nearly invulnerable. In line with this view, any effort should be made in one-stage surgery to use the appropriate systemic antibiotic(s) coupled with local antibacterial protection. **Various studies have shown both in animal models and in clinical trials the beneficial protection offered by**

some antibacterial coatings of implants and by some local antibiotic delivery systems. To be effective, these technologies should be able to protect all the implant, including of course the intra-medullary parts of the prosthesis. However, It should be stressed that **any systemic and local antibacterial protection may not overcome high local bacterial loads or biofilm(s) that may remain after inadequate surgical debridement**.

HW: A new implant shall be protected by **adequate coating and by high local antibiotic concentrations in the surrounding,** active against remaining biofilm remnants after thorough debridement.

Question 4. What is your preferred technique? do you prefer cemented or cementless fixation?

CR: There is **no proven superiority of cemented versus cementless one-stage revision**, according to our recent review of the literature. **I prefer to go cementless whenever possible for the hip and hybrid (cement only in the methaphyseal region) in the knee, using a resorbable antibacterial coating**. This allows easier re-revision, in case of early failure; moreover, proper cementing can be difficult to achieve when you face smooth cortical bone or in the presence of fissures or holes in the diaphysis due to infection, previous surgeries or to the necessary debridement.

HW: Cement is an ideal substrate for biofilm adhesion and such should be avoided whenever possible. **Cementless implants may provide a further advantage as they may be removed easier in case of a failure, like a spacer, but may provide more stability and can become permanent in case of success.**

Question 5. Are there any limitations?

CR: Given its "one-shot" nature, single stage approach is of course more easily proposed to patients with higher chance of success, that is not-immunocompromised hosts, with primary implants and pre-operatively identified pathogen. **Generalized sepsis**, **severe co-morbidities** that may pose a risk for a long and complex revision procedure, **large soft tissue defects** that may not be managed safely at the time of the infected implant removal **may be a contraindication to a one-stage procedure**.

HW: Only limitation is a **patient in generalized septic condition**. In such case removal and debridement may be a lifesaving procedure with re-implantation as soon as the patient has recovered. **Another limitation may be found in bad soft tissue conditions if a plastic surgeon should not be readily available for covering with flaps**. All other conditions are candidates for one stage exchange**. Difficult to treat pathogens and other conditions are difficult both in one stage and two stage revisions and such are no reason for switching to multiple stages. The more risk factors are present the less favourable results will be - but that applies both for one and two stage protocols**.