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Prosthetic Joint Infections and Prevention

Davide Frumento[1,2]*

[1]*Department of Health Sciences, DISSAL, University of Genova, Genova, Italy*

[2]*Department of Biomedical and Clinical Science L. Sacco, University of Milan, Italy*

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***Corresponding author:** Davide Frumento,Department of Health Sciences, DISSAL, University of Genova, Genova and Department of Biomedical and Clinical Science L. Sacco, University of Milan, Italy, Infectious Diseases Unit, Hospital San Martino, Largo Rosanna Benzi 10, 16132 Genova (GE), Tel: +393334310322; E-mail: davide.frumento@edu.unige.it

Abstract

Prosthetic joint implantation became a broadly diffused surgery routine due to its life quality enhancement potential, but it carries the intrinsic risk of infection that all surgeries have. Currently, millions of devices are being successfully implanted every year worldwide. Although surgical techniques have been optimized and prostheses are safe and built with germ free materials, prosthetic joint infections are a sanitary burden that often leads the patient to death or serious complications. With this in mind, it is clear that new ideas are needed in order to limit this phenomenon and give to this surgical area a life-saving plan. This opinion paper aim is in fact to elaborate a fresh preventive perspective to reduce as much as possible the prosthetic joint infections incidence.

Introduction

Joint replacement is a life quality-ameliorating surgery for several millions of people all over the world each year. Successful procedures outcomes are function recovery, pain relief and deambulation independence. Although already a routinely performed operation, the incidence of prosthetic joint implantation is expected to continuously rise in the future. For instance, in 2010 United States registered 719,000 total knee and 332,000 total hip arthroplasties [1] and these numbers are expected to hit 3,480,000 and 572,000 by 2030 for knees and hips, respectively [2]. Interestingly, in Europe, an even larger number of individuals resort to primary hip arthroplasty than knee arthroplasty [3,4] and it is has to said that nowadays, in addition to hip and knee replacement, ankle, elbow and shoulder arthroplasties are available too. The majority of joint replacements give pain-free functions but a small fraction of patients experience device failure and will require additional interventions. Aseptic failure include, among other events, fracture of the prosthetic material itself, loosening at the bonecement interface and periprosthetic fracture. Prosthetic joint infection (PJI) is known to be an infection that involve the joint prosthesis and near tissues.

Infection Pathogenesis

Typically, prosthetic joint infections (PJI) happening within one year by surgery occur thanks to a bacterial contamination during surgery and this can be through either aerosolized or direct contact contamination. Once in contact with the surface of the implant, microorganisms colonize the surface of the implant. A pivotal factor in this phenomenon is the very low bacterial load needed to cause an infection if prosthetic material is present. It has been reported that less than 10^2 CFU (Colony Forming Units) of *Staphylococcus aureus* are needed to start an infection if inoculated at during hip hemiarthroplasty in a rabbit model, compared with 10^4 CFU in control with no implant placed [5,6].

New Perspectives for Prevention

Although a broad range of solutions were developed to fight prosthetic joint infections (PJI), caused by either gram-positive bacteria, gram-negative bacteria, fungi and mycobacteria, this paper proposal are mainly two. The first one is possibility to irrigate the area to be treated with broad range antibiotics, antifungals and antimycotics at low concentrations, both prior and after prosthesis implant. The second and more tricky one is a device enhancement idea, i.e. the attempt to dip the prosthetic in a cocktail solution containing all the above cited drugs (at low concentrations) right before the implantation. Of course, a combination of the two proposals could be efficient.

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