

# Prevention and treatment of infectious complications after urogenital prosthesis surgery

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## ***Introduction:***

Prostheses are widely used in urogenital surgery for many decades and have gained a fundamental role in the management of multiple diseases with good results in terms of functionality, aesthetic outcomes and patients' satisfaction.

It is remarkable that prosthetic device vary in term of mechanical sophistication, costs and surgical implantation techniques ranging from simple device widely used in urological practice like testicular prosthesis to highly sophisticated devices as Inflatable Penile Prosthesis (IPP) and Artificial Urinary Sphincter (AUS). Despite continuous implementations of the devices and improvements of surgical implantation techniques infective complications are still fearful and not uncommon events<sup>1</sup>. Incidence of infections reported by high volume centers range from 1% to 2% for AUS<sup>2 3</sup> and from 2% to 8% for IPP<sup>4 5</sup> and growth further in case of revision surgery<sup>6</sup>. Risk of infection depends on patients' individual features, perioperative strategies, implantation techniques and prosthetic devices. Prevent these complications is imperative because the management of prosthesis infection requires removal of the device in most cases.

## ***Patients features:***

The importance of patients' features in the development of infective complication is often underestimated in clinical studies such as in clinical practices.

Before prosthetic implantation, patients should be categorized in relation to the presence of general and specific endogenous or exogenous risk factors for infective complications such as general health status according to American Society of Anaesthesiology (ASA) score, diabetes mellitus, older age, impaired immune system, malnutrition, obesity, history of urogenital infection, indwelling catheters, bacterial burden, previous instrumentation, genetic factors.

Some of these individual features are not modifiable, but some others are at least partially corrigible.

Habous et al recently demonstrated a strong correlation between levels of glycated haemoglobin (HbA1c) and the risk of infective complications in a cohort of patient that undergone implantation of IPP for erectile dysfunction. Infection rates were: 1.3% for patients with HbA1c <6.5%, 1.5% with HbA1c 6.5-7.5%, 6.5% with HbA1c 7.6-8.5%,

14.7% with HbA1c 8.6-9.5% and 22.4% with HbA1c >9.5% ( $p < 0.001$ )<sup>7</sup>. PROPPER study collected 1,019 patients from 11 medical centers in North America that underwent penile prosthesis implantation for erectile dysfunction, 20% of patients in this cohort were diabetic<sup>8</sup>. Lots of patients that require penile prosthesis for erectile restoration are diabetics. However diabetes mellitus (DM) is a heterogeneous condition and some patients present a well controlled DM while others present the most severe manifestations of the disease.

Nowadays the blood level of glycated haemoglobin is still the best available marker for long-term DM control. Implant surgeons should know the importance of uncontrolled DM as risk factor of infective complications of urogenital prosthesis surgery and should screen patients with evaluation of HbA1c. Furthermore surgeons should discuss with patients about the risks of infective complications connected with uncontrolled diabetes and should consider not proceeding with an implant procedure if glycosylated haemoglobin is more than 8,5%.

DM should be considered an individual modifiable risk factor of infective complications of surgery and, therefore, should be corrected before an elective surgical procedure.

### **Perioperative strategies to prevent infective complications of prosthetic urogenital surgery.**

Many perioperative strategies have been proposed in order to reduce the risk of infective complication after urogenital implant surgery. These strategies include the skin preparation, the behaviour protocols for all the surgical team components and the antibiotic prophylaxis.

#### **Skin preparation**

Most of infective complications after urogenital prosthesis implantation are surgical site infection due to skin-related staphylococci. For this reason is mandatory to reduce the microorganisms' presence on the skin at the time of surgery, therefore reducing the risk that the surgical wound will become contaminated and infected. Patients should shower or bathe (full body) with antimicrobial soap or an antiseptic agent on at least the night before the operative day<sup>9</sup>. Intraoperative a penile, scrotal and perineal scrub with an alcohol-based antiseptic agent should be performed. Yeung et al demonstrated that chlorhexidine-alcohol was superior to the traditionally used povidoneiodine in eradicating the skin flora at the surgical skin site before genitourinary prosthetic implantation<sup>10</sup>. Moreover, many experts sustain that the scrub procedure should last at least 10 minutes<sup>10</sup>.

#### **Antibiotic prophylaxis**

Antibiotic prophylaxis is only one of several measures to prevent infections and can never compensate for poor hygiene and operative technique. As known, antibiotics should never be used in fixed dosage but every antibiotic regimen both prophylactic and therapeutic should be individualized and tailored on patients' features and surgical procedure. Given these previous considerations, good usage of antibiotic prophylaxes seems to reduce incidence of infective complications after urogenital prosthesis implantation. Most of infective complications are caused by skin-related staphylococci, because of that antibiotics used for prophylaxis must be chosen to target these bacteria as cephalosporin group 2 or 3 or Penicillin (penicillinase stable). Use of gentamicin in association to the

previous reported antibiotics seems to improve prophylactic efficacy before inflatable penile prosthesis (IPP) implantation. According to best evidence, gentamicin should be administered once a day at 5 mg/kg. Durations of perioperative antibiotic prophylaxis has not yet been adequately addressed, however antibiotic regimens reported in high volume series last for about one week<sup>11</sup>.

Gross et al collected data from 25 centres of wound cultures retrieved at the time of explant/revision surgery for infected penile prosthesis. They identified a total of 204 organisms, 11% of these were *Candida* species<sup>12</sup>. According to these findings, implant surgeon should consider to enrich antibiotic prophylaxis with antifungals both locally and systemically.

### **Others intraoperative strategies**

According to many experts, minimize foot traffic through the theatre can decrease risk of infective complications. Furthermore, the vigorous washing of the cavity before device placement with antibiotic solutions is considered very important to both flush out and/or kill any present bacteria<sup>13</sup>.

### **Surgical procedure:**

Implantation techniques of urogenital prosthesis are still evolving and, in order to reduce the risk of infection in implant surgery, some surgical strategies have been described. First of all it is mandatory to decrease operative time as much as possible in order to reduce risks of device contamination and surgical site infection. As a matter of fact, skilled high volume surgeons present lower incidence of infective complications. Secondly, it is imperative, during surgical implantation, to avoid any passage of microbe from the skin to the surgeons; the instruments, the devices and the tissue where the prosthesis is going to be placed. Many strategies have been proposed, but the most effective seems the “no-touch technique” described by Eid<sup>14</sup>. Basically, the “no touch technique” consists in covering the perineal and genital skin with a sterile drape before the skin incision, then applying a second sterile drape onto the surgical field once the book fascia has been exposed. This technique, combined with the substitution of all the gloves and the surgical instruments before the setting of the second sterile drape, minimize the risk of contaminations. In a large series of patients who underwent IPP implantation using the “no touch technique” the incidence of infective complications reported was less than 0.46%<sup>14</sup>.

### **Devices features:**

From their introduction prosthetic devices are evolving in order to achieve not only better aesthetic and functional outcome, but also to reduce the risks of contamination and infective complications. IIPs are probably the most sophisticated prosthetics device used in urogenital surgery. The main manufacturers are AMS (American

Medical Systems, Minneapolis, MN, USA) and Coloplast (Coloplast, Minneapolis, MN, USA). Both these companies developed technologies to reduce risk of prosthesis contamination during implant surgery. In 2001 AMS introduced a penile implant impregnated with rifampin and minocycline (Inhibizone®). This technology permits a continuous antibiotic release from the surface of the device with bactericidal effects towards the majority of contaminating bacteria the implant surface and the surrounding tissue. In 2002 Mentor (now Coloplast) introduced a penile prosthesis precoated with hydrophilic polyvinyl pyrrolidone (Titan®). This hydrophilic coating is designed to inhibit

bacterial adherence on the surface of the penile implant. Both these technologies have resulted in the decrease of infective complications. Titan<sup>®</sup> systems could be coated with different antibiotic solutions, however the most effective in reducing infectious complication is the associations of rifampin and gentamicin<sup>15</sup>. The superiority of one system over the other has not yet been demonstrated

### **Treatment of infective complications after urogenital prosthesis surgery.**

Conservative management of infective complications is almost never possible. Bacteria that contaminated the device produce a slime-like material called biofilm. Biofilm is an exopolysaccharide and plays an important role in the pathogenesis of infection. It provides nutrition to the bacteria, interferes with phagocytosis, blocks response to antibiotics and facilitates adhesion, aggregation, and polymicrobial interaction. When the biofilm deposition begins, the colonization of the device is not reversible. Because of that treatment of infections, complications require an early diagnosis, the prompt start of antibiotic therapy and the removal of the prosthesis.

### **Conclusion:**

Prosthetic surgery represents an important treatment option of multiple urologic conditions. Risk of infective complication after urogenital prosthetic surgery depends on patients' individual features, perioperative strategies, implantation techniques and prosthetic devices. Many strategies have been developed to prevent colonization of the device and to reduce the risk of infections. Centres that plan prosthetic implantations should based on these strategies protocols in order to prevent as far as possible infective complications.

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