SAVING TOTAL HIP ENDOPROSTHESIS IN CASE OF SOFT TISSUE INFECTION BY ACINETOBACTER BAUMANNII. CASE REPORT

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Abstract: *Acinetobacter baumanii is known as the second most common cause of hospital-acquired infections, following the Pseudomonas aeruginosa. Demand for total articular replacement is increasing rapidly in every year, so we can aspect an exponential growth of rate of periprosthetic joint infection. This paper is a case report of a patient treated in our septic department, wearing a total hip endoprosthesis and reoperated several times in another surgical ward. The resulting infection was superficial, we could manage it with a proper debridement and targeted antibiotherapy. At the long term check-ups, the patient was complaint-free, with no further signs of infection. It is expected that this type of infections to increase in the future. The difficulty of this treatment is given by the rapid development of antibiotic resistance.*

INTRODUCTION

The number of total articular replacements is increasing rapidly worldwide. Kurtz et al. have projected that by 2030, more than 570.000 primary total hip arthroplasties and nearly 3.5 million primary total knee arthroplasties will be performed annually only in the United States.(1) Contemporary studies report an incidence of periprosthetic infection of 0.5–4% (2), becoming a huge burden in the elective orthopaedic surgery.

Acinetobacter baumannii is a multidrug-resistant pathogen, mostly involved in nosocomial infections and considered a real threat for the patients acquiring implants.

In this paper, we would like to discuss the clinical course of our case of soft tissue infection with *Acinetobacter baumannii* after total hip replacement.

CASE REPORT

The 72-year-old female patient has been admitted to the Clinic of Orthopaedics and Traumatology of Mureş County Hospital in November 2011, accusing pain in the right trochanteric region. Her history included trauma of the right hip in 2005, with subsequent development of progressive hip arthritis. In January 2010, she underwent a successful right cemented total hip arthroplasty by direct lateral approach. in another orthopedic ward. After surgery, the patient was asymptomatic for twenty months, then in September 2011, a painful swelling occurred on the surgical scar.

She went to surgical examination to another hospital, where on 22nd of September, 2011 a punction was carried out, sending the sample to bacterial testing, the result being sterile, without bacterial growth. The complaints persisted, with intensifying pain. Therefore, the surgical unit decided to admit her on the 12th October 2011 and re-opened the hip, but no bacterial growth was reported. Even so, the patient received empiric antibiotic therapy with: 2x1.5 g cefuroxime intravenously in monotherapy for 7 days; followed by 2x300 mg Dalacin per os for another 7 days. After suture removal, the patient was symptom-free for a week, then suddenly, another painful swelling appeared on the original scar line, with minimal erythema and without fever. Due to the re-emergence of the symptoms, the wound was reopened in the same unit and another epifascial collection was drained.

At the request of the patient and her relatives, on the 7th of November, 2011, she was transferred to the septic department of our clinic.

The clinical status at the admittance: gait only with crutches, limping on her right lower limb, above the right hip joint a dry, secretion-free, clean bandage and underneath the 20 cm long, posterior curved incision in the proximal half, with sutures still in place The skin on the middle part of the wound was shiny and apparently tight. The X-rays showed a good positioned endoprosthesis without any signs of loosening.

Recorded lab results: C-reactive protein (CRP) 21.5 mg%, fibrinogen 440 mg%, erythrocyte sedimentation rate 45/90 mm/h, leukocytes 7 900/mm^3, blood smear 70.5% neutrophils, 24.2% lymphocytes, monocytes, eosinophils and basophils 5.3%, normal kidney and liver function, total protein 7.26% mg, blood sugar 96 mg%, nasopharyngeal secretions and uroculture were sterile.

After proper preparation, on the 9th of November, 2011, we proceeded to surgery and 18-20 ml of blood serous liquid was drained out, directly from the subcutaneous connective and fat tissue. The fascia was well-sealed and intact. Intraoperative tissue biopsies and samples from the drained liquid were obtained for microbiologic culture and histopathology. The wound was abundantly rinsed with physiologic and betadine solution, an extensive tissue debridement was performed removing all membranes and necrotic tissues, then the wound was closed over a draining tube. Following surgery, an empirical prophylactic antibiotherapy was started with 2x600 mg intravenous Clindamycin. On day 4, after surgery, the drain was removed and the end of the tube was sent to bacterial examination.

Microbiologic culture revealed the presence of A.baumannii. The drains end proved to be sterile, no bacterial

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activity/growth even on the 14th day after surgery, despite the fact that the atibiotherapy was not targeting the A. baumannii

Subsequently, the antibiotic therapy was adjusted properly to antibiogramm results, adding 2x80mg Gentamicin and 2x 2.000.000 UI Colistin. During treatment, the patient did not present any pain, 14 days after surgery, sutures were removed, clinical examen revealed the resolution of infection, the absence of pain, erythema, warm or swelling, well-functioning joint and she was discharged from the hospital with dry, clean scar.

We proposed to continue the treatment at home with 2x2.000.000 UI Colistin and 2x80 mg Gentamicin intravenously for another 14 days, followed by 2x2.000.000 UI Colistin orally in monotherapy for 21 days. Inflammatory markers on release data were the following: CRP 16.2 mg%, fibrinogen 330 mg%, erythrocyte sedimentation rate 36/70 m/h, leukocytes 7450/mm³, peripheral smear 53% neutrophils.

Results: clinical follow-up until today is encouraging, per primam healed wound, no local reaction, radiologically stable prosthetic components. The patient has no complaints.

DISCUSSIONS

This microorganism was first isolated and described in 1911 by the Dutch microbiologist Beijerinck.

Acinetobacter baumannii can be found throughout nature. Microbes belonging to the genus Acinetobacter are presumed to be ubiquitous; they can be isolated from almost all soil and water samples. Recent studies have shown however, that the infection with *Acinetobacter baumanii* is more likely nosocomially acquired, thought to be the second most common source of hospital-derived infections, after Pseudomonas aeruginosa, likely due to its ability to persist on artificial surfaces for extended periods.(3)

The Acinetobacter genus currently includes 26 named species and 9 genomic species. Four of these, *Acinetobacter baumanii*, *Acinetobacter calcoaceticus*, Acinetobacter genomic species 3 and Acinetobacter genomic species 13TU are difficult to distinguish due they phenotypic similarities and as such are often referred to as the *Acinetobacter calcoaceticus*-complex. Along with Acinetobacter baumanii, the Acinetobacter genomic species 3 and 13TU are implicated in both community-acquired and nosocomial infections, while Acinetobacter calcoaceticus apparently is not involved in clinical diseases.(4)

A. baumannii has also been reported to be one of the ESKAPE pathogens (***E**nterococcus faecalis*, **S**t*aphylococcus aureus*, ***K**lebsiella pneumoniae*, ***A**cinetobacter baumannii*, ***P**seudomonas aeruginosa*, and ***E**nterobacter* species), a group of organisms with a high rate of multidrug-resistance, thereby very difficult to control or eradicate.(4,5)

Particular relevance of *A. baumannii* is given by its implication in victims of natural disasters and in severely war-wounded soldiers (6,7), earning it the popular designation of "*Iraqibacter*".

Acinetobacter baumannii is round-shaped, pleomorphic, strictly aerobic, non-motile (the Greek "akinetos," means non-motile), Gram-negative coccobacillus, with non-fermenting, catalase-positive, oxidase-negative features. Under microscope the rods occur in pairs.(3)

Acinetobacter infections are not very common but, if they appear, usually involve organ systems that have a high fluid content (e.g., respiratory tract, peritoneal fluid, urinary tract). *Acinetobacter baumannii* is found only rarely as part of the normal skin microflora, only 0,5-3% (at most) of the population are colonized by the bacterium (4,8). Even so, it can be typically an opportunistic bacterial pathogen, specifically targeting moist tissues, such as mucous membranes (e.g. respiratory system, urinary tract) or exposed areas of the skin, either through accident or surgery. Skin and soft tissues infected initially resemble with "peau d'orange" (skin of an orange), followed by a sandpaper-like presentation which eventually gives way to clear vesicles on the skin.

Once the presence of Acinetobacter baumanii is suspected, we should expect the presence of other copathogens like Candida albicans, Enterococcus species, especially Enterococcus faecalis or even Klebsiella pneumoniae, contributing to more dramatic outcomes.

Acinetobacter infection has no known predilection for age, gender or race. Patients who acquire artificial devices (such as catheters, sutures, ventilators), those who spend prolonged period of time in Intensive Care Unit (ICU) wards (chronically ill, immunocompromised patients), or undergone dialysis or antimicrobial therapy are at risk of developing *Acinetobacter baumannii* infections. The eyes, skin, surgical wounds respiratory system, urinary tract, blood and pleural fluid may be sites for colonization.(4)

Acinetobacter baumannii has the ability to form biofilms on abiotic (e.g articular prosthesis) and/or biotic (i.e. epithelial cells) surfaces, a feature that poses great diagnostic and therapeutic difficulties. A complete blood count (CBC) is nonspecific, and leukocytosis, even with a left shift, cannot be used in diagnostics. Culture of the appropriate body fluid that is properly transported, plated onto Sheep Blood Agar or CHROMagar and incubated is conclusive (9). Meanwhile we must not forget that the culture may be affected by contamination, leading to a false positive result, or by many other factors, including formation of a biofilm, previous antibiotic administration, inadequate environment or growth medium to isolate rare microorganisms which could mislead us to false negative results.

It should be mentioned that advanced molecular diagnostic methods were developed to identify and differentiate the acinetobacter species e.g. ribotyping, tRNA and rRNA sequence analysis and others.

Although in our case the infection has not reached the prosthetic components, we suggest that microbiologic investigations are indispensable, even when prosthetic joint infection (PJI) is not suspected on clinical and laboratory findings or imaging studies. It is mandatory to establish if the symptoms are caused by septic failure of the prosthesis. Surgeons worldwide use various set of diagnostic criteria in they attempt to detect periprosthetic joint infection, including:

- assessment of local infection – joint fluid aspiration, synovial fluid biomarkers, synovial fluid white cell count and differential, synovial membrane histology,
- systematic signs of inflammation – blood cell count, erythrocyte sedimentation rate, C-reactive protein,
- imaging studies – radiology, computed tomography (CT), magnetic resonance imaging (MRI), bone scintigraphy, positron emission tomography,
- microbiologic investigation, culture, Gram stain.(10)

The Workgroup of the Musculoskeletal Infection Society (MSIS) presented in 2011 a new definition of PJI. Definite PJI exists when:

1. There is a sinus tract communicating with the prosthesis; or
2. A pathogen is isolated by culture from at least two separate tissue or fluid samples obtained from the affected prosthetic joint; or
3. Four of the following six criteria exist:
   - 3.1 Elevated serum erythrocyte sedimentation rate and serum C-reactive protein concentration,
   - 3.2 Elevated synovial leukocyte count,
   - 3.3 Elevated synovial neutrophil percentage (PMN%),

3.4 Presence of purulence in the affected joint,

3.5 Isolation of a microorganism in one culture of periprosthetic tissue or fluid, or

3.6 Greater than five neutrophils per high-power field in five high-power fields observed from histologic analysis of periprosthetic tissue at × 400 magnification.

PJI may be present if fewer than four of these criteria are met.(11)

Acinetobacter baumannii has always been considered multidrug-resistant. Antibiotics to which this bacterium is usually sensitive are: Amikacin, Minocycline, Tigecycline Meropenem, Colistin, Polymyxin B, Rifampin. Tigecycline was found with high bone penetration, and with promising in vivo activity against biofilm-forming bacteria adherent to implants. In general, penicillins, macrolides, the first-, second-, and third-generation cephalosporins have little or no anti-*Acinetobacter* activity, their use may predispose to *Acinetobacter* colonization. Monotherapy and combination therapy have been used successfully (e.g., amikacin, minocycline, or colistin ± rifampin).(12,13,14)

At the same time, it is especially important to evaluate and diminish the surgical risks associated with operating such as: prolonged hospitalization, ASA score less than 3, earlier surgical intervention on the affected hip, prolonged surgery, elderly patient – older than 75 years, confounding diseases, poor social conditions, NNIS Risk Index bigger than 1, low-volume hospital, surgeons with insufficient experience.

The elderly patient should be thoroughly screened for cardio-vascular, pulmonary, renal disorders, for chronic or acute infections of the urinary system, oral cavity, pulmonary system and dermatologic system. Most of the specialist recommends performing the total hip replacement under spinal anesthesia. Compared with general anesthesia, this approach minimizes pulmonary complications, reduces blood loss, and reduces the risk of thromboembolic complications.(15)

CONCLUSIONS

Acinetobacter baumannii is an emerging opportunistic pathogen that can involved in serious nosocomial infections. Residency in an ICU, immunucompromised status, artificial devices, open wounds, dialysis or prolonged antimicrobial therapy predispose to colonization/infection.

Its pathogenic potential includes the ability to adhere to surfaces, form biofilms, display antimicrobial resistance and acquire genetic modifications, making it a difficult pathogen to control and eradicate. There is currently no agreement on a gold standard for diagnosis, but the use of intraoperative culture of the proper sample can be conclusive.

The optimal treatment for *Acinetobacter baumannii*, especially nosocomial infections, remains to be established. Monotherapy and combination therapy seems to be efficient.

We described the successful treatment of an acute soft tissue infection from multidrug-resistant *Acinetobacter baumannii* with debridement, eligible antibiotic therapy and retention of the total hip arthroplasty, using combination of Colistin and Gentamicin. This case queries the general conception, that all orthopedic-devices will require hardware removal in case of infections due to multidrug-resistant gram-negative organisms.

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