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Update article

Infection after total knee replacement: diagnosis and treatment☆

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ABSTRACT

Infection after total knee replacement (IATJ) is a rare complication. It is associated with increased morbidity and mortality increasing the final costs. Gram positive *coccus* and *Staphylococcus coagulase-negative* and *Staphylococcus aureus* are the most common isolated germs (>50% of the cases). Conditions related to the patient, to the surgical procedure and even to the post op have been identified as risk factors to IATJ. Many complementary methods together with clinical symptoms are useful to a proper diagnosis. Treatment for IATJ must be individualized but generally is a combination of systemic antibiotic therapy and surgical treatment. Prosthesis exchange in one or two stages is the first choice procedure. Debridement with prosthesis retention is an option in acute cases with stable implants and antibiotic sensible germs.

Infecção em artroplastia total de joelho: diagnóstico e tratamento

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RESUMO

Infecção após artroplastia total do joelho (IATJ) é complicação incomum. Está associada a aumento da morbimortalidade e dos custos de internação. Cocos gram-positivos, sobretudo *Staphylococcus coagulase-negative* e *Staphylococcus aureus*, são os germes mais comumente isolados (> 50% de todos os casos). Condições ligadas ao paciente, ao procedimento cirúrgico e mesmo ao pós-operatório têm sido identificadas como fatores de risco para IATJ. Vários são os métodos complementares que se somam à investigação clínica para o diagnóstico infeccioso e melhor caracterização do quadro. O tratamento para a IATJ deve ser individualizado,

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mas geralmente envolve a combinação da antibioticoterapia sistêmica com o tratamento cirúrgico. A troca do implante em um ou dois estágios é o procedimento de escolha. Desbridamento com retenção da prótese é opção em casos agudos, com implantes estáveis e com germes sensíveis aos agentes antimicrobianos.

Introduction

Infection after total knee arthroplasty (TKA) is a topic of great interest for orthopedists and infectologists. Alternatives for diminishing the TKA infection rate have long been sought, given that these rates continue to be between 0.4% and 2% after primary arthroplasty and between 3.2% and 5.6% after revision arthroplasty.[1–5] Long-term follow-up has shown a periprosthetic infection rate of 1.55% over the first two years after TKA and 0.46% per year after this period, until the tenth year.[6,7] TKA is a procedure performed worldwide, with 600,000 surgical procedures per year in the USA and a mean survival rate of 95% over 15 years.[8–10] Kurtz et al.[10] predicted that there would be an increase in the demand for TKA of 673% by 2030. Although the TKA infection rate may seem low, the number of such injuries tends to increase with increasing numbers of procedures.

Clinical complications and increased costs associated with TKA injuries have been of growing concern. The mortality rate among patients over the age of 65 years who were awaiting a surgical procedure for treating TKA infection has ranged from 0.4% to 1.2%, and between 2% and 7% among patients aged over 80 years.[11] The mean cost of treating TKA infections has been estimated as 50,000 dollars per patient and 250 million dollars per year, in the United States.[12,13]

The microorganisms most commonly encountered in TKA infection cultures are coagulase-negative *Staphylococcus* (30–43%) and *Staphylococcus aureus* (12–23%), followed by contamination due to mixed flora (10%), *Streptococcus* (9–10%), Gram-negative bacilli (3–6%) and anaerobic bacilli (2–4%). No germ is isolated in around 11% of the cases.[14,15]

This review had the aim of discussing the diagnosis and treatment of patients with a condition of TKA infection.

Risk and prevention factors

TKA infection has been correlated with a number of risk factors: diabetes, malnutrition, smoking, use of steroids, poor control over anticoagulation, obesity, cancer, alcoholism, urinary tract infections, multiple blood transfusions and revision surgery. The current guidance is that such factors should be identified and multidisciplinary intervention should be implemented before performing any procedure, with the aim of getting the patient into a better condition.[16]

Use of antimicrobial prophylaxis, care in preparing the patient's skin before the operation and use of laminar flow in surgical theaters have reduced the intraoperative contamination rates. Forty years ago, for every 10 patients who underwent TKA, one would develop infection.[17,18]

Malinzak et al.[19] reported that the infection rate was 0.51% among 8494 hip and knee arthroplasty procedures. They found that the risk factors for infection were obesity, early age and diabetes mellitus. Patients with body mass index greater than 40 and those with diabetes presented a 3.3 and 3.1 times greater chance of TKA infection, respectively. Glycemic control has been a topic greatly discussed. The benefits of rigorous control, both before and after the operation, were reported by Marchant et al.[20] and Van den Berghe et al.[21]

Obesity is a risk factor and is also correlated with wound complications, as demonstrated by Winiarsky et al.,[22] in a study in which 22% of the obese group of patients presented infection of the surgical wound and higher prevalence of deep infection. Obesity is not necessarily synonymous with nutrition, and evaluating transferrin, albumin and leukocytes has been important in these cases.

Persistence of drainage during the postoperative period and wound complications are also factors associated with infection. Galat et al.[23] reported that the infection rate was higher in the group of patients in whom there was hematoma formation. This was also reported by Parvizi et al.,[24] who indicated that the infection rate was higher in cases with persistent drainage through the surgical wound and in patients who presented RNI > 1.5.

Clinical presentation and diagnosis

The evaluation and management of patients with TKA infection should follow a logical, clear and reproducible sequence. The American Academy of Orthopedic Surgeons (AAOS) has developed clinical practice guidelines for this process (Figs. 1–3).

TKA infections can be temporally divided into three types: acute (less than three months), subacute (three to 24 months) and chronic (>24 months).[25,26] The time period analyzed relates to the start of the infectious condition and is important in determining the treatment. The first two forms of presentation are linked to the surgical procedure and the last to bacteremia, generally relating to the skin, teeth or genitourinary tract.[27] Acute infections are characterized by pain, edema, heat, erythema and fever, commonly caused by virulent germs such as *S. aureus* and Gram-negative bacilli. Patients with subacute conditions (coagulase-negative *Staphylococcus* and *P. acnes*) usually have signs and symptoms that are non-evident and may present persistent pain, implant loosening or both, which makes aseptic loosening a differential diagnosis.[14] The chronic condition has variable presentation, with signs and symptoms that are similar to those reported in the acute and subacute conditions. From the assessment and the clinical history, it can be defined whether the patient has