Important infections for orthopedics services

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ABSTRACT
Among the great challenges of current medicine, the prevention and containment of damage related to infections are increasingly highlighted, so that these have a strong impact on the quality of care provided, as well as on the development of the entire rehabilitation of those undergoing surgical procedures of any origin. In this sense, studying infections within the orthopedic perspective is extremely important, since the affected structure and the causative agent of infection impact the quality of life, economic and morbidity and mortality of patients. The current literature is increasingly looking for methods to minimize and predict the occurrence of infections, studying foci, potential patients and conditions that lead to infections in orthopedics. Analyzing and detecting the emergence of infections early also deserves to be highlighted, unraveling an arduous path for health services to combat the problems arising from an infection in the bone structure of individuals. Thus, it is understood that prevention, recognizing potential aggravating factors and knowing how to act in the face of infections that affect the bones are extremely important for the quality of life and recovery of patients.

Keywords: Infections, Orthopedics, Surgical procedure.

1 INTRODUCTION

For Rundgren et al (2020) whenwe refer to orthopedic procedures, factors such as the clinical state of the patient, the energy involved in the trauma, fracture alert us to complications further increase the problem suggested by this study, which is infections after surgical procedures, and can thus lead the surgical site (place of the body where the surgery was performed) to have a greater chance of being affected by an infection. This infection can present in the first 24 hours after surgery (acute) or it can happen late, and can manifest weeks or even years after surgery.

Infection may be suspected by the presence of edema and redness around the surgical incision, with the presence of purulent discharge output. The proposed treatment is usually, at first, a surgical cleaning with collection of material for culture of possible bacteria present and identification of which antibiotic will be the most appropriate.

In the specialty of orthopedics, surgical site infections can compromise the treatment initially proposed, resulting mainly in aggressive debridement, polymicrobial infections, implant removal, replantation and arthrodesis.

Postoperative infections in orthopedics are considered serious and devastating complications that generate economic, clinical, and social impacts, and that lead to subsequent hospitalizations and new surgical interventions. The entire multidisciplinary team should be involved in order to previously recognize the conditions and risk factors already identified in the literature. (TORRES et al., 2015)

In the study by TORRES et al (2015), it was observed in the global context of readmissions the predominance of readmissions related to surgery services when compared to clinical ones. Postoperative complications were responsible for 70.5% of readmissions related to surgical discharges. Surgical site infection was also the most frequent type of infection, with a predominance of those classified as deep; and events related to the orthopedic site were the main reason for readmissions (TORRES et al., 2015).

Morelli (1996) reported that there is no single causal factor. We can say that the occurrence of infection is a consequence of the interrelationship between host, agent and the way in which the agent comes into contact with the surgical wound.

Host – A factor of great importance, so that healthy individuals are known to have a lower incidence of infection. Malnutrition, the association of systemic diseases, the length of hospitalization before surgery, the presence of previous infections in the urinary tract, lungs, catheters, and skin are all factors that play an important role in the appearance of surgical infection (MORELLI, 1996)

Agent – The incidence of infection is directly related to the number of bacteria and the frequency of contacts, so that for the infection to occur, the agent must necessarily exist (MORELLI, 1996)

Regarding the modes of contact – We have listed five ways to introduce bacteria into surgical wounds:

1) Coming from the patient himself, his skin and mucous membranes. Which become pathogenic in different sites. Here we should draw attention to patients with wounds close to the incisions (bedsores or accidents with skin lesions) and to patients previously hospitalized for a long

period before the interventions (significant changes in the normal intestinal flora are reported after 48 hours of hospitalization), or submitted to antibiotic therapy that, due to a decrease in normal flora and inhibition of competition, facilitates the proliferation of pathogenic organisms. Hematogenous dissemination of existing foci of infection, urinary, pulmonary, integumentary, etc.

Although there is a lack of clear definitions, there is a broad accepted classification scheme for Infections after fracture fixation.

They are basically classified into three groups: those with early onset (less than 2 weeks), delayed onset (2–10 weeks), and late-onset infection (more than 10 weeks)

This classification has been widely used, especially when it comes to influencing the treatment decisions made by specialists.

Early infection (<2 weeks) is often a clinical diagnosis, since the patient usually presents with classic signs of infection (flushing, warmth, pain, tumor, and function), disturbances in wound healing, large bruising, and concomitant systemic signs of infection such as fever and lethargy. Highly virulent organisms, such as Staphylococcus aureus, are frequent causative agents of early infection. Within this period, it is commonly considered that the bacteria may have already formed a biofilm, although this biofilm may still be in an "immaturity" phase.

With regard to bone involvement and healing, preclinical studies have shown that one week after inoculation, the bone shows no signs of osteomyelitis or osteolysis, despite the presence of bacteria. In addition, bone healing is in the "inflammatory or soft callus stage", and thus there will be no stability of the fracture at this early stage. Pathophysiological conditions (active infection without radiographic signs of fracture stability) have significant treatment and consequences due to the importance of fracture healing for successful treatment outcomes.

Late infection (2-10 weeks) Patients with late infections may present with symptoms consistent with early or late infections. For example, bruising, which can be expected in early stages, may still be present after 3 weeks, or alternatively, a fistula may also present after 9 weeks, which may be more often associated with infections.

There are several important distinctions of early infections. Late infections are typically due to less virulent bacteria, such as Staphylococcus epidermidis, and as the duration of infection extends, the biofilms mature and become more resistant to antibiotic therapy and host defenses.

In terms of fracture healing, preclinical studies show that bone healing typically takes up to 10 weeks, with a "hard callus" stage that lies between 3 and 16 weeks. In the case of infection, this changes significantly. Bacterial bone invasion and inflammation ('osteomyelitis') usually occurs within 2 to 10 weeks.

Late infection (> 10 weeks) Many patients with late infections may present with subtle symptoms, impaired functionality and stress-dependent pain, localized swelling and erythema, or a draining sinus tract, mostly without systemic manifestation. In patients presenting with impaired functionality and stress-dependent pain, infection with low-virulence microorganisms should always be considered as a possible cause (a clinically silent infection). Late, as late.

Infection associated with fixatives and wires is mainly caused by low virulence microorganisms such as S. Epidermidis. Impaired fracture healing is a frequent observation in infections and although bone healing may have occurred in some cases, severe inflammation and osteolysis with osteomyelitis lead to instability of osteosynthesis. New periosteum bone formation around the periphery of the infected area produces a casing that further protects the infection. These often require extensive and repeated debridement, resulting in bone defects

2) By means of surgical instruments, when the care of cleaning and asepsis of the material is not adequate; It is an uncommon route and should be considered as an almost always avoidable way.

3) Through the surgeon, assistants, instrumentators and anesthesiologists.

4) Through particles suspended in the air, a pathway whose importance is controversial, but which well-conducted studies show to be a possible way and that should be considered in the prevention of infections.

5) During postoperative dressings. The skin's natural barrier is compromised and, especially in the first two postoperative days, is a vulnerable point.

Many data sources should be used for the control and notification of nosocomial infections, including those related to surgical procedures. Usually, the combination of data improves the sensitivity of the studies. However, the literature highlights some sources as starting points for data collection, including:

- Microbiology report;
- Visits to wards with attention to signs and symptoms such as fevers, antimicrobial therapy, isolation, underlying diseases
- Inpatient sector
- Distribution and consumption of antimicrobials;
- Assistance services
- Outpatient clinic for post-minute return;
- Interaction and participation of the multidisciplinary team in care.

1.1 ISOLATION OF MICROORGANISMS

According to Salomão and Pignatari (2004), infectious diseases are generally difficult to diagnose and require the knowledge and collaboration of several professionals to be adequate. For most infections, the help of laboratory medicine is mandatory, and communication between the microbiologist and the professionals involved in patient care is essential. It is known that many fungi and microbial agents that make up the environment or microbiota can normally cause disease in individuals when immunocompromised.

All diagnostic information from the clinical microbiology laboratory is influenced by the quality of the sample received. Consequently, poorly performed collection and transport cause difficulties in isolating the microorganism responsible for the infectious process. In this sense, the clinical suspicion of the infectious process determines the type of sample to be sent to the laboratory to confirm and establish or complement the clinical diagnosis.

The laboratory diagnosis of infectious diseases begins with the appropriate clinical indication of microbiological examination; Therefore, it is essential to know the epidemiology and pathophysiology of the infectious process. Sample collection and transportation are also critical steps in performing microbiological examination. Good management of these steps supports good laboratory practices. In the same vein, according to Salomão and Pignatari (2004), the site of infection should be carefully selected, and for the appropriate sample we should mainly consider:

1.1.1 Pre-analytical phase:

- Knowledge of the disease;
- Proper request for the exam;
- Collection;
- Sample shipping.

1.1.1.1 Analytical Phase:

- Procedure;
- Quality control.

1.1.1.2 Post-analytical phase:

- Result report;
- Time;
- Quality;
- Interpretation of the result;
- Diagnosis and treatment.

Whenever possible, antibiotics should be avoided for at least at least 2 weeks prior to microbiological culture, as this can turn specific bacterial species into viable but non-cultivable ones (Metsemakers et al., 2018).

Somehow cultures can therefore become falsely negative. (Solomon and Pignatari, 2004) There is still an ongoing debate about the duration of culture incubation: 7 to 14 days of incubation may be reasonable, balancing the risk of losing a hard-to-grow pathogen with the risk of growing an irrelevant contaminant. If the implanted material is removed during surgery, they should be sent to the microbiological laboratory for sonication and sonication fluid culture, if possible. Sonication is believed to detach the biofilm-encased bacteria from the implant and disrupt the biofilms themselves, thus making the bacteria for culture. This method has been proven to increase the yield of positive cultures, especially after antibiotic pretreatment (Metsemakers et al. 2018).

REFERENCES

Brasil. Agência Nacional de Vigilância Sanitária. Critérios Diagnósticos de Infecções Relacionadas à Assistência à Saúde/Agência Nacional de Vigilância Sanitária. Brasília: Anvisa, 2017.

Berríos-Torres SI, Umscheid CA, Bratzler DW, Leas B, Stone EC, Kelz RR, et al. Centers for Disease Control and Prevention Guideline for the Prevention of Surgical Site Infection, 2017. JAMA Surg. 2017;152(8):784–91.

CASTRO RGMGE. Infecção pós-operatória: estudo de cirurgias ortopédicas realizadas no Hospital Universitário Pedro Ernesto-UERJ em um ano. Rev Bras Ortop. 1997;32(1)

Silva, Edilane Neves da; Silva, Renata Kelly dos Santos e; Carvalho, Simone Barroso de; Façanha, Dilene Maria de Araújo; Carvalho, Rhanna Emanuela Fontelene Lima de; Pereira, Francisco Gilberto Fernandes. Fatores de risco para infecção de sítio cirúrgico em cirurgias traumato-ortopédicas. Revista Cuidarte. 2021;12(2):e1292. http://dx.doi.org/10.15649/cuidarte.1292

Heitzmann LG, Battisti R, Rodrigues AF, Lestingi JV, Cavazzana C, Queiroz RD. Osteomielite crônica pós-operatória nos ossos longos – O que sabemos e como conduzir esse problema. Rev Bras Ortop. 2019;54(6):627-35.

Heitzmann, Lourenço Galizia et al. Postoperative Chronic Osteomyelitis in the Long Bones - Current Knowledge and Management of the Problem* * Originally Published by Elsevier. . Revista Brasileira de Ortopedia [online]. 2019, v. 54, n. 6 [Acessado 5 Maio 2022] , pp. 627-635. Disponível em: <https://doi.org/10.1016/j.rbo.2017.12.013>. Epub 13 Dez 2019. ISSN 1982-4378. https://doi.org/10.1016/j.rbo.2017.12.013.

Morelli RSES. Considerações sobre as infecções em feridas cirúrgicas. Rev Bras Ortop. 1996;31(2):.

Rundgren J, Enocson A, Järnbert-Pettersson H, Mellstrand Navarro C. Surgical site infections after distal radius fracture surgery: a nation-wide cohort study of 31,807 adult patients. BMC Musculoskelet Disord. 2020 Dec 18;21(1):845. doi: 10.1186/s12891-020-03822-0. PMID: 33339519; PMCID: PMC7749509.

Salomão, R; Pignatari, ACC. Guias de Medicina Ambulatorial e Hospitalar – Infectologia. MANOLE. UNIFESP, 2006.

TORRES, Lilian Machado et al. Readmissão por infecção do sítio cirúrgico ortopédico: uma revisãotiva. Rev. esc. enferm. USP , São Paulo, v. 49, n. 6, pág. 1004-1011, dezembro de 2015 . Disponível em <http://old.scielo.br/scielo.php?script=sci_arttext&pid=S0080623420150006010 04&lng=en&nrm=iso>. acesso em 09 de maio de 2022. https://doi.org/10.1590/S0080-623420150000600018 .

Vieira Gde D, Mendonça HR, Alves Tda C, Araújo DF, Silveira Filho ML, Freitas AP, Bressan F, Radaeli Rde F, Sousa CM. Survey of infection in orthopedic postoperative and their causative agents: a prospective study. Rev Assoc Med Bras (1992). 2015 Aug;61(4):341-6. doi: 10.1590/1806-9282.61.04.341. PMID: 26466216.

W.J. Metsemakers, R. Kuehl, T.F. Moriarty, R.G. Richards, M.H.J. Verhofstad, O. Borens, S. Kates, M. Morgenstern,Infection after fracture fixation: Current surgical and microbiological concepts,Injury,Volume 49, Issue 3,2018,Pages 511-522,ISSN 0020-1383,https://doi.org/10.1016/j.injury.2016.09.019.