Neurosurgical infections

- Population-Based Analysis of Vaccination Status and Post-Vaccination Adverse Events in Adults Aged 55 and Older
- Prevalence and antibiotic resistance of pathogens isolated from neurosurgical patients with postoperative central nervous system infections in a tertiary hospital in North China
- Additive Manufacturing, Thermoplastics, CAD Technology, and Reverse Engineering in Orthopedics and Neurosurgery-Applications to Preventions and Treatment of Infections
- PANoptosis: Cross-Talk Among Apoptosis, Necroptosis, and Pyroptosis in Neurological Disorders
- Early progressive ambulation in neurosurgical patients with tracheostomy: clinical application and evaluation
- Surgical site infections with multi-drug resistant organisms in patients undergoing neurosurgery: a retrospective comparative cohort study from Turkey
- Prospective insights into pediatric neurosurgery: transforming care through adverse event analysis
- Rural Health: What can and cannot be done in an isolated rural neurosurgical unit

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Neurosurgical infections refer to infections that occur in or around the central nervous system (CNS) as a result of neurosurgical procedures or as complications of neurologic conditions. These infections can involve the brain, spinal cord, meninges (the protective membranes covering the CNS), or surrounding structures.

Neurosurgical infections can arise from various sources, including:

Surgical site infections (SSI): These infections occur at the site of a surgical incision or in the deeper tissues that were exposed during neurosurgery. SSIs can be caused by bacteria that are normally present on the patient's skin or by organisms introduced during the surgical procedure.

Meningitis: Meningitis is an infection of the meninges, which are the membranes that cover the brain and spinal cord. It can occur as a complication of neurosurgery, particularly if there was a breach in the protective barriers during the procedure. Meningitis can be caused by bacteria, viruses, fungi, or other microorganisms.

Ventriculitis: Ventriculitis is an infection that affects the ventricles of the brain, which are fluid-filled cavities. It can occur as a result of the introduction of microorganisms into the ventricles during neurosurgery, such as when a ventriculostomy tube is inserted. Ventriculitis is often caused by bacteria, and it can lead to serious complications.

Abscesses: Abscesses are localized collections of pus that can form within the brain or spinal cord or in the surrounding tissues. They can be caused by the spread of infection from a nearby source, such as an SSI or an infected sinus. Abscesses require prompt diagnosis and treatment, as they can cause significant damage to neural tissues.

The signs and symptoms of neurosurgical infections can vary depending on the specific type and location of the infection. They may include fever, headache, neck stiffness, altered mental status, neurological deficits, signs of wound infection, or drainage of pus from the surgical site.

Diagnosis of neurosurgical infections often involves clinical evaluation, laboratory tests (including blood cultures and cerebrospinal fluid analysis), imaging studies (such as computed tomography or

magnetic resonance imaging), and sometimes surgical exploration to obtain samples for culture and analysis.

Treatment of neurosurgical infections typically involves a combination of antimicrobial therapy, surgical intervention (such as drainage of abscesses or debridement of infected tissues), and supportive care. The choice of antibiotics depends on the suspected or identified causative microorganism and its antibiotic susceptibility profile.

Prevention of neurosurgical infections is essential and involves adherence to strict aseptic techniques during surgery, proper sterilization of instruments and equipment, appropriate antibiotic prophylaxis, and optimization of patient factors (such as glycemic control and nutritional status) to reduce the risk of infection.

Neurosurgical infections can be serious and potentially life-threatening. Prompt recognition, diagnosis, and treatment are crucial to minimize complications and improve patient outcomes.

Before advancements in infection control, only conditions that brought patients near death warranted the risk of surgical intervention. If patients survived the operation, infection was nearly inevitable and death by overwhelming sepsis was knocking at their door. In the late 19th century, with the development of germ theory by Louis Pasteur and its subsequent application to surgical sterility by Joseph Lister, surgeons were able to operate with a substantially reduced risk of infection. Consequently, surgeons became more confident and began to explore more extravagant procedures, including elective operations within the cranial vault. As scientific knowledge expanded in the 20th century, so did the advancement of infection control with the use of prophylactic antibiotic drugs, heat sterilization of instruments, and microbial barriers. Recent reports have placed the rate of complications due to infection between 0.75 and 2.32% for intracranial operations [1)].

Because of a low risk of infection (around 2-3%), antibiotic prophylaxis in neurosurgery is a controversial issue.

Some consider that there are strong arguments against the use of antimicrobials (promotion of antibiotic-resistant strains of bacteria, superinfection and adverse drug reactions) and meticulous aseptic techniques could be more usefully than prophylactic antibiotics. On the other hand, despite of being rare, the consequences of a neurosurgical infection can be dramatic and may result in a rapid death, caused by meningitis, cerebritis, abscess formation or sepsis. Clinical studies emphasized that the most important factors influencing the choice of antibiotic prophylaxis in neurosurgery is the patient's immune status, virulence of the pathogens and the type of surgery (“clean contaminated”–procedure that crosses the cranial sinuses, “clean non-implant”–procedure that does not cross the cranial sinuses, CSF shunt surgery, skull fracture). Prophylaxis has become the standard of care for contaminated and clean-contaminated surgery, also for surgery involving insertion of artificial devices. The antibiotic (first/second generation of cephalosporins or vancomycin in allergic patients) should recover only the cutaneous possibly contaminating flora (S. aureus, S. epidermidis) and should be administrated 30' before the surgical incision, intravenously in a single dose. Most studies pointed that identification of the risk factors for infections, correct asepsis and minimal prophylactic antibiotic regimen, help neurosurgeons to improve patient care and to decrease mortality without selecting resistant bacteria [2)].

Evidence for the effectiveness of linezolid in neurosurgical infections (NSIs) is growing.

Types

Central nervous system infection.

Cerebrospinal fluid infection.

Shunt infection.

Spine infections.

Surgical site infection.

Ventriculostomy related infection.

Wound infection.

Osteomyelitis.

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2)
Iacob G, Iacob S, Cojocaru I. [Prophylactic antibiotics in neurosurgery]. Rev Med Chir Soc Med Nat Iasi. 2007 Jul-Sep;111(3):643-8. Review. Romanian. PubMed PMID: 18293694.