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Optimizing Surgical Procedures to Reduce the Risk of Sternal Wound Infections

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Introduction

Sternal Wound Infections (SWIs) are a significant concern in patients undergoing cardiac surgery, particularly after complex procedures such as Coronary Artery Bypass Grafting (CABG), valve surgery and heart transplantation. These infections are associated with extended hospital stays, increased healthcare costs and serious complications, including sepsis and mortality. The sternum, being the site of surgical incision and division, is particularly vulnerable to infection, with risk factors such as diabetes, obesity, immune suppression and poor surgical technique contributing to the development of SWIs.

As the number of patients undergoing cardiac surgeries continues to rise, optimizing surgical procedures to reduce the risk of sternal wound infections has become a key focus for healthcare providers. This article aims to explore how surgical techniques can be optimized to prevent SWIs, delving into aspects such as preoperative preparation, intraoperative methods, antibiotic prophylaxis and postoperative care [1].

Description

Sternal wound infections can range from superficial to deep infections, with the latter being particularly dangerous as they can involve the sternum and surrounding tissues, leading to life-threatening complications such as mediastinitis. The incidence of sternal wound infections varies, but it is estimated that around 1% to 5% of cardiac surgery patients experience this complication, with certain risk factors significantly increasing the likelihood of infection. These factors include the patient's overall health, comorbid conditions such as diabetes, advanced age, obesity and immunosuppression, as well as technical factors such as the duration of surgery and the precision of wound closure [2].

The prevention of sternal wound infections begins long before the patient enters the operating room. Preoperative optimization plays a crucial role in reducing the risk of infection. Managing modifiable risk factors such as hyperglycemia, malnutrition and obesity before surgery is vital. In patients with diabetes, ensuring well-controlled blood glucose levels is critical, as uncontrolled diabetes impairs immune function and delays wound healing. Nutritional support is another key factor in improving immune function and promoting faster healing. Additionally, preoperative antiseptic measures, including chlorhexidine washes and nasal decolonization with mupirocin, have proven effective in reducing the risk of infection by addressing bacterial colonization.

During the surgery itself, maintaining strict sterile techniques is paramount. This includes proper hand hygiene, sterilization of surgical instruments and the use of sterile drapes and gloves. Minimizing tissue trauma and ensuring precise closure of the sternum are essential to prevent infection. The use of non-reactive, durable sutures or wires to close the sternum is preferred to ensure that the wound heals effectively. Another important aspect of surgery is antibiotic prophylaxis, which is essential in preventing infection. Administering appropriate antibiotics before surgery, typically broad-spectrum agents such as cefazolin or vancomycin, helps prevent bacterial colonization and infection at the surgical site [3].

Postoperative care is equally important in reducing the risk of sternal wound infections. Managing the wound by keeping it clean and dry, using antimicrobial dressings and monitoring for signs of infection are essential steps. Negative Pressure Wound Therapy (NPWT), which applies controlled suction to the wound, can help accelerate healing by promoting circulation and reducing fluid buildup, further decreasing the risk of infection. Additionally, monitoring for systemic signs of infection, such as fever and changes in vital signs, allows for early intervention in case an infection develops.

Patient-related factors such as smoking, obesity and poorly managed comorbidities also play a significant role in the risk of developing sternal wound infections. Smoking impairs circulation, delays wound healing and increases the risk of infection. Therefore, patients should be encouraged to quit smoking before surgery. Additionally, managing other chronic conditions such as diabetes and hypertension through lifestyle modifications and medications can reduce the risk of complications. Providing psychological support to patients can also contribute to better outcomes, as stress and anxiety can impair the immune response and hinder healing [4].

Recent advances in wound care technology and infection prevention have further contributed to the reduction of sternal wound infections. Antimicrobial dressings, which release antimicrobial agents gradually, offer an added layer of protection against bacterial contamination. Moreover, innovative surgical techniques, such as minimally invasive surgeries, have reduced the trauma to tissues, resulting in faster recovery times and a lower risk of infections. Research into regenerative medicine, including the use of growth factors and stem cells, shows promise for accelerating tissue regeneration and improving the body's natural defense mechanisms, potentially offering new avenues for preventing sternal wound infections in the future [5].

Conclusion

Sternal wound infections remain a challenging complication in cardiac surgery, but optimizing surgical procedures is a vital strategy to minimize their occurrence. A combination of preoperative optimization, strict intraoperative techniques, careful antibiotic prophylaxis and diligent postoperative care can significantly reduce the risk of these infections. Additionally, addressing patient-related factors such as smoking, obesity and poorly controlled comorbidities plays an essential role in minimizing infection risks. The use of advanced wound care technologies, antimicrobial strategies and surgical innovations further enhances the ability to prevent sternal wound infections and improve patient outcomes.

As research continues to advance, new techniques and therapies are expected to further refine the management of sternal wound infections. Future innovations in wound care, such as the use of biologic agents, regenerative medicine and more effective antimicrobial treatments, hold the potential to revolutionize patient care and drastically reduce infection rates. Ultimately,

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optimizing surgical practices and providing comprehensive, multidisciplinary care will continue to improve the quality of life for cardiac surgery patients, reducing complications and ensuring smoother, faster recoveries.

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