MANAGEMENT OF DEEP STERNAL WOUND INFECTION

Essay

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بسم الله الرحمن الرحيم

"ويسئلونك عن الروح قل الروح من أمر ربي وما أوتيتم من العلم إلا قليلا"

صدق الله العظيم
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ABSTRACT

In spite of protocols of hospital infection control, improved antibiotic therapy and a sepsis of perioperative care, the incidence of postoperative deep sternal wound infection has not decreased over the years. Incidence of postoperative mediastinal infections ranges between 0.15 to 8% and in averages 1-2% in the most recent reported series. Despite the low incidence of postoperative deep sternal wound infections and defects, they are significant cause of death and life threatening complications. As the postoperative sternotomy wound infection and defects are major complication and may be a main cause of death in such cases, it is better to avoid this complication as much as possible by following high sterile techniques, instruments and operative theaters. Early diagnosis and proper treatment is the key point in this serious problem. Early diagnosis depends on high index of suspicion and daily examination of the patient. Once diagnosis is established, early treatment is mandatory to prevent more complications and more tissue destruction. Early aggressive debridement is anyway mandatory. Some authors claim a higher success rate with open treatment, others support the theory that primary muscle or omental flap may achieve earlier and better results. Recently, reconstruction using variable tissue flaps to obliterate dead space and provide immediate coverage of the thoracic contents, showed very high success rate. The omentum, pectoralis major, rectus abdominis and latissimus dorsi muscles have been the most commonly used tissue flaps. The vaccum assisted closure provides a viable and efficacious adjunctive method by which to treat postoperative wound infection after cardiac surgery.

Keywords:
Omentum – Pectoralis major – Rectus Abdominis – Tissue Flaps

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LIST OF ABBREVIATIONS

BIMAs	Bilateral internal mammary arteries
CABG	Coronary artery bypass grafting
CDC	Centers for disease control and prevention
COPD	Chronic obstructive pulmonary disease
CPB	Cardio-pulmonary bypass
CT	Computerized tomography
CVP	Central venous pressure
FEV1	Forced expiratory volume in 1^{st} second
FVC	Forced vital capacity
IABP	Intra-aortic balloon pump
ICU	Intensive care unit
IMA	Internal mammary artery
ITA	Internal thoracic artery
SSIs	Surgical site infections
VAC	Vaccum assisted closure

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INTRODUCTION

In spite of protocols of hospital infection control, improved antibiotic therapy and asepsis of perioperative care, the incidence of post operative deep sternal wound infection has not decreased over the years **(Blanchard et al., 1995)**.

Incidence of postoperative mediastinal infections ranges between 0.15 and 8% and it averages 1-2% in the most recently reported series **(Ottino et al., 1987)**.

Prognosis of deep sternal wound infection is severe; despite appropriate antibiotic treatment and wound debridement, infection may propagate in the mediastinum and eventually involve the cardiac sutures leading to septic shock and/or catastrophic hemorrhage **(Milano et al., 1995)**.

Mortality for post-cardiotomy deep sternal wound infection is still high, ranging between 5 and 47% in spite of early diagnosis and appropriate treatment **(Newman et al., 1988)**.

Many studies have been performed to find out risk factors for postoperative mediastinitis in order to lessen the incidence of deep sternal wound infection. Many factors have been found to increase the incidence of postoperative sternal infections, unfortunately only few of these are modifiable **(Baskett et al., 1999)**.

Reoperation is mandatory, nevertheless infection may continue, leading to local and/or systemic complications. Treatment is

distressing for both the patient and the surgeon, since rate of failure is high and dressing may be painful and time consuming. Hospitalization time is considerably prolonged and a large amount of resources are wasted **(Borger et al., 1998)**.

The appropriate treatment of deep sternal wound infection is still matter of controversies: since Shumaker proposed closed chest catheter irrigation, this has been the treatment of choice of deep sternal wound infection, but in the recent years plastic procedures either with omental or pectoralis muscle flaps have reported high rate of success and short hospital stay . Two therapeutic options are available whenever the infection shows refractory to a closed irrigation system. Redebridement is anyway mandatory. Some authors claim a higher success rate with open treatment others support the theory that primary muscle or omental flap may achieve earlier and better results. Conventional dressing with PVI solution soaked gauze are often difficult to apply and require special nursing staff. Even with frequent redressing and careful active debridement of all necrotic tissues, the wound often remains purulent for a long time without granulating **(El-Gamel et al., 1998)**.

Sternum resection combined with plastic surgery using mobilized flaps and vacuum sealing led to further improvement in patient outcome **(Milano et al., 1999)**. The greater omentum as well-vascularized tissue was transplanted into the sternal defect, its immunological properties further accelerated wound healing. This procedure, however, requires laparotomy, which can lead to additional complications especially in septic and critically ill patients. On the other hand it does not improve sternal stability and frequently necessitates skin transfer. Another option is the transfer of the rectus

abdominis muscle, but this technique requires extensive dissection and may result in postoperative abdominal hernia formation. The previous use of mammary arteries may compromise blood supply, and substernal chest tube placement at the primary operation commonly affects the rectus abdominis muscles and may impair the results of the muscle transfer. The use of latissimus dorsi muscle flaps for coverage of the wound defect and chest stabilization is limited by the required large incisions and the resulting functional impairment. Therefore, the pectoralis major flap has gained increasing acceptance in plastic surgery, if stabilization of the chest and coverage of a severely infected sternal wound defect is required **(Jones et al., 1997)**.

AIM OF THE WORK

The aim is to review the literature concerning post operative deep sternal wound infection, its risk factors, early diagnosis, complications, and most important is to review the results of the different surgical approaches for its management, and the recent devices used for this purpose.

REVIEW OF LITERATURE

RISK FACTORS

Pre-operative risk factors:

Preoperative risk factors for sternal wound dehiscence and infections include obesity, chronic obstructive pulmonary disease, diabetes mellitus, smoking, advanced age and female sex of the patient.

Obesity, particularly in diabetic women, is considered a major risk factor **(Zacharias and Habib et al., 1996)**. It was found that large female breast size was associated with high incidence of sternal dehiscence. This finding initiated serious consideration of reduction mammoplasty as viable option in treating deep sternal infection **(Copeland et al., 1994)**.

Baskett and associates in 1999 found that COPD was the only factor to be statistically significant with deep sternal wound infections **(Baskett et al., 1999)**. Although the mechanism is unclear, it is found that patients with COPD have greater colonization and thus are more likely to be infected **(Newman et al., 1988)**.

Other studies found that COPD which reduces forced expiratory volume in 1S/forced vital capacity ratio (FEV_1/FVC) and smoking raised the incidence of sternal wound complications to levels associated with obesity and insulin dependent diabetes mellitus **(Zacharias and Habib, 1996)**.

Smoking increases the risk of sternal wound complications due to increased risk of postoperative pulmonary complications,