Risk Factors and Management of Complications of Sternotomy Incisions in Patients with Open Heart Surgery.

An Essay
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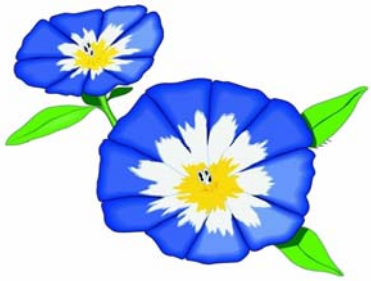

Thanks are one emotion that flows directly from the heart and it is a very wonderful feeling that never goes away.

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ABSTRACT

Median sternotomy is the gold standard incision in open heart surgery. One of its most serious complication is sternal wound infection and dehiscence. The incidence of this complication was known to be about 0.15 -20%, although recent work shows that it is reduced to 2% but when this complication occurs , there is significant morbidity and mortality rate which exceeds 20%. There are different methods of classifying types of sternal wound infection and dehiscence but they are all about whether it is superficial infection affecting the skin and subcutaneous tissue or deep wound infection affecting the sternum and mediastinum. Many studies have been carried out to identify risk factors which can be categorized as medical causes such as obesity, COPD, DM and operative causes such as surgical technique, antiseptic preparations, antibiotic and the use of internal mammary arteries. Unfortunately only few of these are modifiable. Early diagnosis and proper treatment is the key point in this serious problem. It depends mainly on high index of suspicion and daily examination. Although there are some investigations which might help in the diagnosis, but they are far less evident than clinical diagnosis. Surgical treatment is mandatory in most cases with early aggressive debridement in all cases, where some claims that open treatment and late closure is successful, while most surgeons adopt 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 drsi muscle have been the most commonly used tissue flaps. Lastly, the vacuum assisted closure provides a variable and efficacious adjunctive method by method by which to treat postoperative wound infection after cardiac surgery. It is especially useful for managing sternal osteomyelitis in high risk patients and is an attractive option as a first line therapy followed by closure with wires or plates or combined with muscles and omental flaps. The post operative care is an important issue not to be neglected, as these patients are usually high risk patients and has been debelited from these complications. It has an important role I preventing morbidities afterwards.

Keywords:

Risk Factors
Sternotomy
Open Heart Surgery

List of contents

LIST OF ABBREVIATIONS

BMI	Body mass index
CABG	Coronary artery bypass grafting
CFU	Colony forming unit
CONS	Coagulase negative staphylococci
COPD	Chronic obstructive pulmonary disease
CPR	Cardiopulmonary resuscitation
CT	Computed tomography
DM	Diabetes mellitus
ECG	Electrocardiogram
ESAAS	Electrolyzed strong aqueous solution
FEV	Functional expiratory volume
Fr	French
FVC	Forced vital capacity
GJ	Glyn Jones
HBO	Hyperbaric oxygen
ICU	Intensive care unit
IMA	Internal mammary artery
IV	Intravenous
LVEF	Left ventricular ejection fraction
MRI	Magnetic resonance imaging
PAE	Post antibiotic effect
RCT	Randomized controlled trial
SSI	Surgical site infection
SWI	Sternal wound infection

LIST OF TABLES

List of Figures

INTRODUCTION AND AIM OF WORK

Introduction

Median sternotomy incision is the preferred method of exposure for the cardiovascular operations. One of the most serious complications of the cardiac surgery is sternal wound infection ***(Salley et al., 1985).***

In 1957, Julian re-introduced Milton's approach, already described in 1897: the median sternotomy. With the subsequent development of cardiac surgery, median sternotomy became the most common thoracic incision. This incision does not tolerate any mistakes. The sternum may be divided by using either an electric or air-powered saw, with either a right blade or a rotative disc. This vertical and strictly median osteotomy may be performed either from above downwards, or from below upwards ***(Dürrleman N and Massard ., 2006).***

Sternotomy is a risky thoracic incision, there are several pitfalls in this approach because of its role of angle-stone of the chest. Healing of the bone incision occurs under the shearing stress of multiple respiratory movements, culminating with a cough. Periosteal hemostasis must be elective, excessive use of cautery leads to necrosis which may jeopardize healing of the sternum and favor infection. Accurate approximation of the bone edges is essential to minimize sternal dehiscence and postoperative pain. The aim is to reduce postoperative override and shift of the sternal verges, and sternal wound complications. ***(Dürrleman N and Massard G., 2006).***

Early use of the midline sternotomy was fraught with high complication rates. Sternal wound infection occurred in as many as 5% of patients, leading to sternal wound dehiscence, with reported incidence of mediastinitis in 0.4-6.9% of patients. These complications often led to significant morbidity, with reported mortality rates of more than of 50%. Sternal dehiscence initially was treated conservatively with open drainage and debridement with packing. Graft exposure, desiccation of wound margins, osteomyelitis, and, ultimately, sudden death, were grave consequences. This led to closed management with catheter-antibiotic irrigation; however, the mortality rate remained approximately 20% ***(Ascherman et al., 2004).***

The infection of surgical wounds of sternotomies should be considered as (A) superficial if only the skin and subcutaneous tissue are involved, (B) deep when the infection reaches the sternum but does not involve it, and (C) organ/space when sternal osteomyelitis or mediastinitis occurs. This classification enables a better comparison of related research. ***(Omran et al., 2007).***

Experimental work in the laboratory on the blood flow to the sternum has shown a marked, precipitous decrease in perfusion of the ipsilateral hemisternum immediately after harvesting of the internal mammary artery. This is one of many predisposing factors that can increase the incidence of median sternotomy dehiscence. The association of internal mammary artery harvesting with median sternotomy dehiscence remains a clinical problem of continuing concern ***(Gardlund et al., 2002).***

Formerly, the post-sternotomy defects were managed by debridement and secondary healing. Later, closed catheter irrigation, debridement, and resuturing were attempted ***(Bryant et al., 1969).***

The recurrent infection, osteochondritis and osteomyelitis are generally due to insufficient debridement; the debridement of the sternum should be carried out down to the vital bony tissue ***(Nahai et al., 1989).***

The treatment of an infected wound requires the transfer of a well-vascularized tissue, so muscle flaps offered a superior treatment for the post sternotomy defects. The transfer of a vascularized tissue was first attempted by omental transposition to the defect area; reconstruction with muscle flaps was first carried out in 1976 and then became the preferred method of treatment for presternal defects. The muscle flaps that can be used in reconstruction of the presternal defects are pectoralis major muscle flap, rectus abdominis muscle flap, vertical rectus abdominis muscle flap, latissimus dorsi muscle flap with or without skin island, bipedicled pectoralis-rectus muscle flap, and external oblique muscle flap. Pectoralis major muscle flap can be used either as bilateral or unilateral rotation advancement flap, island flap, turnover flap, split turnover flap, and segmental muscle flap ***(Ortak et al., 2008).***

Recently, a more conservative approach to the management of sternal wound dehiscence has been proposed and utilized. The use of a vacuum-assisted closure (VAC) device, allows for either sole therapy for sternal wound closure or adjunctive therapy in preparation for muscle flap closure. The principles of adequate wound debridement, treatment of infection, and

closure of dead space still predominate as inital management decisions in treating sternal wounds. The use of VAC helps decrease wound dressing changes, promotes granulation tissue, allows for smaller wounds to heal with secondary intention, and decreases edema in the tissues, which may allow the possibility for sternal salvage with rigid fixation ***(Agarwal et al., 2005).***

Aim of work:

The aim of work is to review the incidence of post sternotomy complications , risk factors , prophylaxis and management in patients with open heart surgery.

REVIEW OF LITERATURE