AATS GUIDELINES
FOR THE PREVENTION AND MANAGEMENT
OF STERNAL WOUND INFECTIONS

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GOALS

• To develop guidelines during the Pre-Operative, Intra-Operative and Post-Operative periods which will prevent sternal wound infections.

• Establish principles for the most effective methods to treat sternal wound infections to achieve the lowest morbidity and mortality.
IMPACT OF STERNAL WOUND INFECTIONS

- Increased Morbidity/Mortality (16-30%)
- Decreased Long-Term Life Expectancy
- Prolonged Hospital Length of Stay
- Raises Hospital Costs by $62,000
- IS PUBLICALLY REPORTED

THE US CENTER FOR MEDICARE AND MEDICAID SERVICES (CMS) WILL NO LONGER REIMBURSE HOSPITAL COSTS INCURRED IN THE TREATMENT OF DEEP STERNAL WOUND INFECTIONS (DSWI) FOLLOWING CABG SURGERY
CLASSIFICATION OF RECOMMENDATION AND LEVEL OF EVIDENCE

Class I
Procedure/Treatment SHOULD be performed
- is recommended
- is indicated
- is useful/effective/beneficial

Class IIa
Procedure/Treatment is REASONABLE to perform
- is considered useful/effective/beneficial
- is probably recommended or indicated

Class IIb
Procedure/Treatment MAY be considered
- may/might be considered useful/effective/beneficial
- is unclear or not well established

Class III
Procedure/Treatment SHOULD NOT be performed
- may be harmful
- is not indicated
- is not recommended

LEVEL A: Recommendation based on multiple randomized trials or meta-analyses
LEVEL B: Recommendation based on evidence from a single randomized trial or non-randomized studies
LEVEL C: Recommendation based on expert opinion, case studies, standard-of-care
Class IA
All cardiac surgery patients should have nasal swabs and PCR testing, if available, prior to surgery.

Polymerase-chain-reaction (PCR) assay:

Advantages
- More accurate identification of nasal carriers of staphylococcus organisms
- Reduces the usage and cost of Mupirocin nasal ointment while lowering the incidence of staph infections

Disadvantages
- Expensive
- Not available in the vast majority of medical centers
GUIDELINES FOR PREOPERATIVE PREVENTION: NASAL DISINFECTANTS

Class IA

Routine Mupirocin administration is recommended for all patients undergoing cardiac surgery procedures in the absence of documented negative PCR testing for staphylococcal colonization.

- Mupirocin administered to the nares started within 24 hours of surgery and continued for 5 days
- Significantly decreases superficial and deep sternal wound infections
- Mupirocin has no effect in negative nasal staphylococcus carriers and in patients with a negative PCR assay
GUIDELINES FOR PREOPERATIVE PREVENTION: BATHING

Class IIbB
Presurgical bathing with Chlorhexidine may be helpful in reducing skin bacterial counts.

- Although preoperative bathing will reduce bacterial skin counts, it by itself does not reduce the incidence of sternal wound infections
- Although Chlorhexidine reduces skin bacterial-colony counts to a greater extent than other agents, it results in no difference in postoperative infection rates
GUIDELINES FOR PREOPERATIVE PREVENTION: ANTIBIOTICS

Class IA
A Cephalosporin, either Cefazolin or Cefuroxime, should be given within 60 minutes of the skin incision and be continued for no longer than 48 hours.
- Weight based dosing is recommended
- Redosing is indicated for procedures >4 hours

Class IIaB
Vancomycin is reserved for patients with a history of type I allergic reactions to B-lactam agents or in cases where MRSA is of special concern.
- Hospitalization >3 days
- Transfer from another in-patient facility
- Procedures involving a prosthetic valve or vascular graft
- Institutions with a high prevalence of MRSA
Class IIIB

Vancomycin is not recommended as the sole prophylactic antibiotic for cardiac surgical procedures.

- Vancomycin is essentially limited to gram positive bacteria, especially MRSA, MRSE.
GUIDELINES FOR PREOPERATIVE PREVENTION:

Class IB
Preoperative hypoalbuminemia is associated with an increased risk for sternal wound infections and should be corrected prior to surgery, if possible.

Class IC
All distant, extrathoracic infections, should be treated prior to cardiac surgical procedures.

Class IIaB
Optimizing glycemic control is preferable in patients with elevated HbA1c levels (>7.5) and serum glucose levels <200 mg/dl prior to any cardiac surgical procedure.

Class IIaC
Smoking cessation and aggressive pulmonary toilet should be performed in patients who are active smokers and those with COPD.
GUIDELINES FOR INTRAOPERATIVE PREVENTION

Class IA

A Cephalosporin should be administered within 60 minutes of the cardiac surgical procedure and redosed at appropriate intervals during surgery.

Vancomycin should be administered between 60 and 120 minutes prior to the incision.

Class IA

Continuous insulin infusions should be initiated to maintain serum glucose <180 mg/dl.
Class IB

Topical antibiotics should be applied to the cut edges of the sternum upon opening and prior to closing in all cardiac surgical procedures involving a sternotomy.
<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>VANCOMYCIN n 1,075</th>
<th>VANCOMYCIN n 2,150</th>
<th>p-VALUE</th>
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<tbody>
<tr>
<td>Superficial Sternal Infections</td>
<td>0 (0%)</td>
<td>34 (1.6%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Deep Sternal Infections</td>
<td>0 (0%)</td>
<td>16 (0.7%)</td>
<td>0.0005</td>
</tr>
<tr>
<td>All Sternal Infections</td>
<td>0 (0%)</td>
<td>50 (2.3%)</td>
<td>&lt;0.0001</td>
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<tr>
<td>All Sternal Infections-Diabetes</td>
<td>0 (0%)</td>
<td>24 (3.3%)</td>
<td>0.0004</td>
</tr>
</tbody>
</table>

ADVANTAGES OF TOPICAL VANCOMYCIN

- Easy to prepare and handle
- Inexpensive
- No systemic or local adverse effects
- No skin drainage
- Provides bacteriostatic and bacteriocidal protection against gram (+) bacteria and clostridia
GUIDELINES FOR INTRAOPERATIVE PREVENTION

Class IIIb

Bone wax should not be applied to the cut edges of the sternum at any time.

Bone Wax:
- Inhibits formation of new bone, prevents bone union, and may increase the incidence of sternal dehiscence
- Induces inflammation, acts as a foreign body and has been associated with an increased incidence of sternal infection
- Does not limit blood loss or the use of blood products
GUIDELINES FOR INTRAOPERATIVE PREVENTION

Class IIaB

Closing the sternum using a figure of 8 technique is preferable to prevent sternal dehiscence and wound infections.

Class IIbB

Closing a sternum with multiple fractures using the Robicsek Weave technique may prevent sternal dehiscence and wound infections.

Class IIbB

Rigid sternal fixation with bands or plates may reduce sternal dehiscence and wound infections.
- may be advantageous in high risk patients (obese, fragile bones)
- more expensive

Class IIbB

External chest support vests may limit the incidence of sternal dehiscence and infections.
- cumbersome and compliance may be poor
GUIDELINES FOR POSTOPERATIVE PREVENTION

Class IA

Appropriate antibiotics should be continued postoperatively for no longer than 48 hours.

Class IA

Continuous insulin infusions should be initiated in the ICU for at least 24 hours to maintain serum glucose <180 mg/dl.
GUIDELINES FOR MANAGEMENT OF STERNAL INFECTIONS

Class IIIB

Use of dilute povidone iodine irrigation for the treatment of deep sternal wound infections and mediastinitis should be avoided.
GUIDELINES FOR
MANAGEMENT OF STERNAL INFECTIONS

Class IIaB

Negative Pressure Wound Therapy should be initiated whenever possible in patients in which delayed sternal closure is anticipated following deep sternal wound infections.

- stabilizes chest wall and allows for earlier extubation
- removes excess fluid and reduces edema
- shortens time to sterilization of the wound
- reduces hospital stay
- cost effective
- improved early and long-term survival

Class IIaB

When using Negative Pressure Wound Therapy, it is necessary to place a dressing barrier between the sponge and the heart and great vessels to prevent tissue erosion resulting in fatal hemorrhage.
ESSENTIAL PRINCIPLES TO PREVENT STERNAL WOUND INFECTIONS

- Hibiclens showers/baths prior to surgery

- Nasal Mupirocin for 5 days beginning 24 hours prior to surgery

- Cephalosporin antibiotic to be administered within 60 minutes of surgery, continued in the OR for procedures >4 hours and for not more than 48 hours postop

- Continuous insulin infusions to keep serum glucose <180 mg/dl during surgery and for at least 24 hours postop

- Topical antibiotics (Vancomycin) applied to the cut edges of the sternum immediately following the sternotomy and prior to closure

- Avoid bone wax

- Robicsek Weave for sternal closure if multiple fracture sites are present

- Sternal closure with the figure of 8 technique
NEXT STEPS

- Manuscript is in preparation
- Submission to AATS Executive Council
- Submission to the Journal of Thoracic and Cardiovascular Surgery