

Open Sternotomy and Delayed Sternal Closure

What the ICU Bedside Nurse Needs to Know

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Introduction

- Following cardiac surgery, open sternotomy (OS) and delayed sternal closure (DSC) may be utilized in several clinical scenarios:
 - Hemodynamic instability when sternum is closed (sternal closure may cause compression of an edematous myocardium or a dilated heart)
 - Respiratory compromise (capillary leaking from prolonged cardiopulmonary bypass contributes to lung edema)
 - Persistent bleeding (not treated by traditional methods may require mediastinal packing and also allows surgeon access for future exploration if needed)
 - Mediastinal placement of any circulatory assist device
- DSC is most frequently utilized in neonates and infants undergoing complex repairs, and is routine in most institutions after Stage 1 Norwood procedure repair of hypoplastic left heart syndrome (HLHS)
- DSC usually occurs in the first 24-72 hours postoperatively (frequently taking place at the bedside in the ICU)
- DSC is associated with an increased risk of infection. Other risks include late sternal instability, bleeding and sepsis.
- Typically, an open sternotomy is covered with a sterile mediastinal dressing consisting of Silastic sheeting (cut into the shape of the mediastinal cavity) attached to the external skin edges and covered with an occlusive dressing. The dressing is usually only removed by the surgeon.

Critical Thinking

- Diuresis is imperative for timely delayed sternal closure
- Hemodynamic and respiratory changes occur after delayed sternal closure. Anticipate changes to ventilator settings and inotropes
- Prevention of surgical site infection (SSI) and other infection is crucial
- Paralysis/sedation may be needed during the open sternotomy period
- At risk for complications related to immobility; prevent pressure sores
- Be prepared for surgical procedures at the bedside (ie mediastinal exploration, DSC). Surgical supplies should be readily available

Diagnostic Evaluation

- Daily CBC (or other labs to monitor infection ie CRP)
- Pan culture if infection is suspected
- Mediastinal wound culture sent at time of delayed sternal closure
- Physical Exam

- Assess patient's wound for signs of infection
- Assess dressing for occlusiveness, fullness or bulging and drainage (Bulging dressing may be a sign of impending tamponade)
- Assess for any clinical signs and symptoms that indicate sepsis

Treatment

- Frequent assessment of dressing
- Prevent infection
 - **See SSI guidelines and antibiotics stewardship section

Associated Complications

- Infection: Sternal wound infection, superficial or deep
 - **See antibiotic stewardship section
- Infection: Mediastinitis
 - Common organisms
 - Staphylococcus Aureus
 - Coagulase Staphylococci
 - Psuedomonas aeruginosa
- Bleeding: Tamponade
 - Dressing inspection (concave, convex, bulging, flat)
 - Chest tube
 - Record and assess output
 - Ensure patency
 - Checking lab values (Hemoglobin and Hematocrit, Coagulation)
 - Assess for:
 - Narrowing pulse pressure
 - Increased filling pressures
 - Tachycardia
- Impaired wound healing
 - Consider Wound-Vacuum Device
 - Maximize nutrition throughout post-operative period. "See nutrition section"

Special Considerations

- Ventilator settings
- Patient movement
 - Consider extra sedation
 - Consider muscle relaxation
- Devices within open chest dressing
 - Silastic sheet (in shape of mediastinal dressing) that is sutured to the skin
 - Stents
 - Struts
 - Rib-spreaders
- Chest tubes
 - May consider less suction
- Chest compressions
 - Gauze over dressing

- Need for sterile gloves at bedside
 - Side to side technique
- ECMO cannulas
 - Ensure that cannulas are secure
 - Beneath occlusive dressing
- Delayed sternal closure at bedside
 - Surgical preparation
 - Pre-procedure antibiotics
 - Intraoperative complications
 - Post-chest closure hemodynamic changes
- Parental preparation & education
 - Interdisciplinary work
 - Social work
 - Child life
 - Chaplains
 - Palliative care team
 - Provide accurate information

References

Pye, S., McDonnell, M. (2010). Nursing Considerations for Children Undergoing Delayed Sternal Closure After Surgery for Congenital Heart Disease. *Critical Care Nurse*, 30 (3), 50-61.

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