Complications of EC Thoracotomy
Errors in Performing Emergency Thoracotomy
Types of Errors

- Cognitive
- Technical
- Judgmental
- Normative
- Quasi-normative
# Types of Errors

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
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<tbody>
<tr>
<td>Cognitive</td>
<td>Did not think</td>
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<tr>
<td>Technical</td>
<td>Did it wrong</td>
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<tr>
<td>Judgmental</td>
<td>Lack of Logic</td>
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<td>Normative</td>
<td>Against culture</td>
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<tr>
<td>Quasi-normative</td>
<td>Staff Specific</td>
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</table>
Emergency Thoracotomy

• > 3000 decision nodes during an emergency thoracotomy (EC / OR)
• Most are subconscious
• TECHNICAL ERROR can occur at ANY decision node
• Occur at SEVEN (7) major steps in procedure
Emergency Thoracotomy
Anatomic Progression

1. Indications
2. Positions & Incisions
3. Chest Wall
4. Lung & Thoracic Vascular
5. Cardiac
6. Mediastinum
7. Closure
Emergency Thoracotomy

INDICATIONS

• Penetrating thoracic trauma
  – Arrest & < 10 minutes CPR-Intubated patient; < 5 minutes in unintubated

• Blunt trauma arrest
  – High probability of thoracic injury
  – < 5 minutes CPR in intubated patient

• Thoracic injury – Hemodynamic unstable
  – OR thoracotomy

• Children & Adults = SAME indications
Emergency Thoracotomy

CONTRAINDICATIONS

- When God puts his/her hands on, take your hands off
- Prolonged CPR (field & EC)
- GCS = 3 & cardiac arrest
- EKG = Sine wave pattern or flat line
Once you have made a decision to do an EC thoracotomy, DO NOT DELAY
SKIN PREP

• Rapid WASH
• Avoid POUR & SPLASH prep
• Do SOME Circular WASHING
• Create SOME sterile field
Pause Before Incision

Is Patient INTUBATED??
POSİTİON & İNCİSİỌNS

• Supine
• Arms outstretched
• Left anterolateral thoracotomy
  (vs. median sternotomy)
Are ALL members of surgical Team DOUBLE GLOVED??
Are the instruments you will need present, including knife, retractor, clamps, & /or saw??
Instruments

You will ALSO need a (sterile) INTERNAL cardiac defibrillator
Choice of Scalpel & Blade

• Good handle
• # 10, 20, 22, 23 Blade
• AVOID a #11 Blade
Instruments

- “Lipske” knife (?)
- Chest wall retractor
- Aortic Cross Clamp (SPRING CLAMP)
- Suture (4-0) polypropylene on a LARGE needle
Proceed with Operation

Just DO it
CHEST WALL - Anterolateral

- CURVED incision
- UNDER breast or nipple
- Aim for axilla
- ONE clean sweep of knife, skin to chest wall, expose ribs with first cut
ERRORS

- Straight incision – ERROR
- Middle of breast – ERROR
- Incision too short-ERROR
- Follow normal curve of ribs
- No HESITATION marks
ERROR

Too SHORT of an incision

Trauma
CHEST WALL - Sternotomy

- Sternum to Xyphoid – ONE SINGLE CUT to the Chest Wall
- Stay in MIDLINE
- Dissect under Xyphoid
- Push finger under sternum
• Cut on SIDE of Sternum
• Cutting Right Ventricle
• Cutting Liver
• Cutting Innominate Vein
• Poking a hole in heart/liver
Entering Chest Cavity

- Pop thru pleura with finger or heavy scissors
- Push semi opened scissors along rib upper border cutting pleura
ERRORS

• Too SHORT of an INCISION
• Cutting LUNG with knife
• Cutting lateral suspensory ligament
• Cutting intercostal artery
Placement of Retractor

- Assure intercostal muscle divided on top of rib from sternum to axilla
- Put handle of retractor toward table
- Spread “slowly”-Do not BREAK ribs
ERRORS

- Opening too FAST
- BREAKING ribs
- Cutting skin with ratchet
- Handle over sternum
LUNG

- Avoid cutting lung with knife
- Retract lung interiorly
- Mobilize posterior mediastinum
- Divide mediastinal pleura
LUNG

- Assess for associated injury to lung
- Clamp bleeding area (Vascular clamp)
- Consider “Lung Twist” for hemorrhage control
Mediastinum

- Cut pleura around aorta
- Avoid cutting lung with knife
- Retract lung anteriorly
- Mobilize posterior mediastinum
- Divide mediastinal pleura
Aorta - Esophagus

- Aorta will be flaccid
- Do NOT clamp esophagus
- Clamp your fingers prior to placement of clamp on aorta
- Clamp aorta
- Do not injure segmental arteries
- Do not injury thoracic duct
Pericardium

- Visualize PHRENIC nerve
- Do NOT injure Phrenic Nerve
- Open longitudinally
- Remove clot
- Cut a “T” to the right
• Using TOO BIG of suture (Use 3(0) or 4(0) polypropylene)
• Use of Pledgets
• Elevating heart out of pericardium
Heart ERRORS

- Defibrillation prior to repair
- Epinephrine prior to repair
- Using pledgets
- Iatrogenic coronary artery injury
- Poking hole with thumb
MEDIASINAL ERRORS

- Using a CRUSHING clamp
- Injuring aorta, esophagus, nerves, thoracic duct
- Taking aortic clamp off too fast
- Cutting pulmonary vein
CLOSURE ERRORS

- NOT ligating cut internal mammary artery
- Using permanent suture as pericostal sutures
- Constricting dilated heart
Summary

- Many iatrogenic ERRORS exist
- Do NOT do emergency thoracotomy unless you understand anatomy, decision nodes, techniques, and potential errors
You MUST know how to recognize & reverse ERRORS