Cardiac Rehabilitation in Surgical Condition

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Outline

• Cardiac Rehabilitation
  1. Coronary bypass graft (CABG)
  2. Valvular heart disease (VHD)
  3. Heart transplantation Recipients (HTRs)
## Coronary bypass graft (CABG)

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<th>Anatomy</th>
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### Revascularization

**Goal**

1. Improved survival
2. Relieved symptoms

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### PCI Vs. CAGB

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### 11/4/13
Coronary bypass graft (CABG)

Anatomy

1. Unprotected Left main
2. 3 vessel disease with or without proximal LAD artery disease
3. 2 vessel with proximal LAD disease
4. 2 vessel without proximal LAD, with extensive ischemia
5. 1 vessel proximal LAD artery with LIMA for long term benefit
6. Poor LV function

Indication

A 60-year-old, type 2 DM is admitted due to exercise-induced angina pectoris. He was history of COPD and still smokes 10 cigarettes/day. His cholesterol is 270 mg/dL, his BMI is 28, his blood pressure is 165/95 mmHg and Hba 1 C is 10.5 %. His currently treated with Metformin and Diltiazem. On admission, troponin remain normal, and a CAG shows a Lt. Main stem stenosis 90%. Echocardiography shows a modestly LV hypertrophy but preserved systolic function. CABG is suggested.
## Coronary bypass graft (CABG)

### Problem List

1. Underlying dz.: DM, COPD
2. Risk factor: Current smoking, Obesity, HT, DM

### Preoperative

- Breathing exercise
- Quit smoking
- Improved nutrition
- Aerobic exercise for improved aerobic capacity and reduce weight (Elective case)
- Control blood sugar (Elective case)

### Breathing exercise

- Inspiratory Muscle training
Preoperative physical therapy for elective cardiac surgery patients

- 8 Randomized controlled trials with 856 patients used a mixed intervention (Aerobic exercise or breathing exercise) that received preoperative physical therapy had a reduced risk of postoperative atelectasis: relative risk (RR) 0.52; CI 0.32 to 0.87; P = 0.01 and pneumonia RR 0.45; CI 0.24 to 0.83; P = 0.01

but not of pneumothorax (one study with 45 participants, RR 0.12; CI 0.01 to 1.11; P = 0.15) or mechanical ventilation for > 48 hours after surgery (two studies with 306 participants, RR 0.65; CI 0.39 to 1.09; P = 0.08). Postoperative death from all causes did not differ between groups (three studies with 552 participants, RR 0.68; CI 0.02 to 18.48; P = 0.81).

Cochrane review

Hemodynamic

Expected

Values

Mean arterial pressure (MAP) 60-90 mmHg
Systolic blood pressure (SBP) 90-140 mmHg
Diastolic arterial pressure (DAP) 5-15 mmHg
Pulmonary artery wedge pressure (PAWP) 10-15 mmHg
Coronary bypass graft (CABG)

Anatomy

Indication

Case Study

Assessment

Rehab. MX.

Pulmonary Issue

- Sternotomy shown to cause an important acute reduction in pulmonary function.
- 30% reduction in vital capacity and expiratory flows at 1st weeks

Factors contributing to sternal wound infection/dehiscence

<table>
<thead>
<tr>
<th>Pre-operative Factors</th>
<th>Intra-operative Factors</th>
<th>Post-operative Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>History: hypertension, diabetes, smoking, COPD</td>
<td>Use of internal and single internal mammary artery graft</td>
<td>Sternotomy - Tension fixation, early postoperative open surgical debridement</td>
</tr>
<tr>
<td>Obesity: overweight (BMI &gt; 30)</td>
<td>Cardiopulmonary bypass time</td>
<td>Results: better and effective prevention against development of sternal dehiscence and sternal infection in high-risk group</td>
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<tr>
<td>History: previous chest surgery</td>
<td>Heart-lung bypass time</td>
<td></td>
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<tr>
<td>Smoking status</td>
<td>Revised sternotomy technique</td>
<td></td>
</tr>
<tr>
<td>Alcoholism</td>
<td>Location and extent of sternotomy</td>
<td></td>
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<tr>
<td>Severe psychiatric illness</td>
<td>Additional risk factors</td>
<td></td>
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<tr>
<td>Antiplatelet therapy</td>
<td>Risk factors</td>
<td></td>
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</tbody>
</table>

Sternal External Fixation

- A prospective RCT, 750 male post-standard median sternotomy (78% CABG).
- Used stern- E: Fix corset postoperatively for 6 weeks with same risk factor of sternal dehiscence.
- Results: better and effective prevention against development of sternal dehiscence and sternal infection in high-risk group.
Coronary bypass graft (CABG)

### Sternal External Fixation

- A prospective RCT, 2539 patients post median sternotomy
- Used Postphorax corset 24 hr. for at least 6 week
- Results: better and effective prevention deep sternal wounds

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Coronary bypass graft (CABG)

The patient is referred to ambulatory cardiac rehabilitation 1 week after discharge from triple vessel bypass operation. He complaint SOB when walking from parking lot to rehabilitation center. No history of orthopnea. Clinical examination shows normal heart sound, reduced breath sounds over the left lower lung and swelling at Rt. Ankle.

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Coronary bypass graft (CABG)

### Frequency of pulmonary complications after cardiac surgery

<table>
<thead>
<tr>
<th>complication</th>
<th>Frequency,%</th>
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<tbody>
<tr>
<td>Pleural effusion</td>
<td>27 - 95</td>
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<tr>
<td>Atelectasis</td>
<td>16.6 - 88</td>
</tr>
<tr>
<td>Phrenic nerve paralysis</td>
<td>30 - 75</td>
</tr>
<tr>
<td>Prolonged mechanical ventilation</td>
<td>6 - 58</td>
</tr>
<tr>
<td>Diaphragmatic dysfunction</td>
<td>2 - 54</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>4.2 - 20</td>
</tr>
<tr>
<td>Diaphragmatic paralysis</td>
<td>9</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>0.04 – 20</td>
</tr>
<tr>
<td>ARDS</td>
<td>0.4 – 2</td>
</tr>
<tr>
<td>Aspiration</td>
<td>1.9</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>1.4</td>
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</table>
Coronary bypass graft (CABG)

Leg edema

- RCT, 296 post CABG patient (396 limbs) received 2 difference types of compression (both provide 18 mmHg of compression) medical compression stocking (TED) and elastic bandage-type on donor limbs after CABG
- Average 12 day (Admission per)

Result: using the kind of knee length compression stocking (TED stocking) is more effective edema at foot and heel regions in donor limbs after CABG than elastic bandages.

Exercise program

Resistence Exercise - "Sternal Precaution"

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Management of Sternal Precautions Following Median Sternotomy by Physical Therapists in Australia: A Web-Based Survey


Forces required to perform ADL
Resistance exercise

Anatomy
Indication
Case Study
Assessment
Rehab. MX.

Exercise after CABG

Anatomy
Indication
Assessment
Rehab. MX.

Coronary bypass graft (CABG)

Anatomy
Indication
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Sexual Issue
- Decreased sexual activity among cardiac patients is frequently reported.
- Rates of ED among men with CVD are twice as high as those in the general population, with similar rates of sexual dysfunction in females with CVD.
- RCTs using a specific sexual counseling intervention would be useful in determining effectiveness in reducing the incidence or severity of specific physical and psychological variables.
- Independent predictors for preoperative sexual problems in CABG: male gender and DM.
- Resumed sexual activity in 6 to 8 weeks after a standard CABG surgery (Class IIa, Level of Evidence B) or non-coronary open heart surgery (Class IIa, Level of Evidence C). If the sternotomy is well healed.

Aerobic exercise
- Moderate intensity
- Duration 20-60 min
- Frequency 3-5 times/week
- Modality: walking, cycling, treadmill, ergometry

Swimming = sternal precaution

Resistance exercise
- 5-8 weeks post operation
- Lifting with UE should be restricted to 5-8 pounds.
- ROM and lifting 1-3 pounds with arms is permissible if no evidence of sternal instability

Coronary bypass (CABG)
### Valvular Heart Disease (VHD)

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#### Indication
1. Medically supervised training in postoperative valve surgery
2. Athletes with asymptomatic VHD
3. Mitral valve prolapse

#### Contraindication
1. Truly symptomatic aortic stenosis
2. Mitral valve prolapse with syncope
3. High BP (SBP>200 mmHg or diastolic >110 mmHg)
4. Uncontrolled or symptomatic arrhythmias
### Valvular Heart Disease (VHD)

#### Anatomy

- Echocardiogram: diagnosing and quantifying VHD
- EKG: cardiac chamber size
- EST: diagnostic and prognostic information

#### Indication

**Value of exercise testing in patients with VHD**

- To assess objective functional capacity
- To assess atypical symptoms
- Production of prior unnoticed symptoms
- To induce pathological hemodynamic response

#### Assessment

- **High-Risk exercise Tolerance test Findings in Asymptomatic Severe Aortic Stenosis**
  - Angina or dyspnea
  - Failure to augment systolic blood pressure ≥ 20 mmHg
  - ＞ or = 2 mm ST segment depression
  - Significant ventricular arrhythmia
  - Mean gradient increase ＞ or = 18 mmHg by Doppler

#### Rehab. MX.

- Effect of exercise training
  - RCT, 64 consecutive pt. who underwent valve surgery
  - Improved in QOL and exercise tolerance
Exercise after Valve replacement

Aerobic exercise
- Moderate intensity
- Heart rate guided < 130 beats/min
- Duration 20-60 min
- Frequency 3-5 times/week
- Modality: walking, cycling, treadmill, ergometry

Resistance exercise
- 5 REP for strength training
- Duration 1-3 sets of 6-10 upper and lower body exercise
- Frequency 2-3 times/week
- Modality: elastic bands, weight

Heart transplant Recipients (HTRs)

Heart rate guided < 130 beats/min

Frequency 3-5 times/week

Modality: walking, cycling, treadmill, ergometry

Swimming = sternal precaution

Heart transplant Recipients (HTRs)
<table>
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<tbody>
<tr>
<td><strong>Anatomy</strong></td>
</tr>
<tr>
<td>- For Heart transplant</td>
</tr>
<tr>
<td><strong>Indication</strong></td>
</tr>
<tr>
<td>- History of repeated hospitalizations for heart failure</td>
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<tr>
<td>- Need for ventricular assist device or artificial heart to support circulation</td>
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<tr>
<td>- Increasing types, dosages, and complexity of medications</td>
</tr>
<tr>
<td>- Reproducible VO2 of less than 14 mL/kg per minute</td>
</tr>
<tr>
<td><strong>Assessment</strong></td>
</tr>
<tr>
<td>- Ineligible for HTRs</td>
</tr>
<tr>
<td>- Irreversible pulmonary hypertension</td>
</tr>
<tr>
<td>- Active infection</td>
</tr>
<tr>
<td>- Cancer</td>
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Heart transplant Recipients (HTRs)

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Heart transplant Recipients (HTRs)
Heart transplant Recipients (HTRs)

Anatomy
Indication
Assessment
Rehab. MX.

For LVAD
- High risk surgical procedures, such as CABG or VHD in patients with poor preoperative LV function
- Post-operative cardiogenic shock

Contraindications
- Aortic regurgitation or prosthesis aortic valve
- Aortic aneurysm or dissection
- Severe aortic or peripheral vascular disease
- Left ventricular or left atrial thrombi
- Bleeding diathesis
- Uncontrolled sepsis

Heart transplant Recipients (HTRs)

Anatomy
Indication
Assessment
Rehab. MX.

Compare exercise and Post-exercise
Functional Capacity and Pulmonary Function Tests

SF 36 and Psychologic issue

Heart transplant Recipients (HTRs)

Anatomy
Indication
Assessment
Rehab. MX.

1. Early – Mortality
   - Rejection
   - Infection

2. Late – Mortality
Heart transplant Recipients (HTRs)

**Anatomy**

**Indication**

**Assessment**

**Rehab. MX.**

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**Reduce risk of infection**

1. Good dental hygiene, no toothbrush older than 4 weeks
2. Frequent hand washing using liquid soap
3. Avoidance of close contact with people with infectious diseases (colds, diarrheas, influenza, meningitis, strep throat, flu)
4. Avoidance of contact with persons having measles and polo vaccination for 5 weeks
5. If indwelling, care in the household only under strict precautions
6. No gardening without gloves
7. No contact with sharp objects, plants, vegetables
8. No daily construction work and contact with dirt
9. No one outside the home
10. Maintenance of Hygiene: prone to putting emphasis in the home
11. Assistance of swimming in public baths during the first months
12. Assistance of not tubs, saunas, and saunapools

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**Exercise in HTRs**

### Aerobic exercise
- Intensity: RPE at anaerobic threshold
- Duration: 20 - 60 min at prescription intensity with warm up and cool down
- Frequency: supervised setting 3 times/week, 6 - 8 weeks no study for indicated EKG monitoring is required

### Resistance exercise
- First 6 weeks after surgery
- Sternal precaution
- 10 - 20 slow REP
- 1 to 3 sets of exercises for the major muscle groups
- Frequency: 2 - 3 sessions per week
- RPE: 12 - 14
- Immediately after cool down

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Thank you