Rehabilitation in ischaemic heart disease

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Cybulska K., Mamcarz A. Rehabilitacja kardiologiczna w chorobie niedokrwiennej serca

Piotrowicz R., Wolszczakiewicz J. Rehabilitacja kardiologiczna pacjentów z chorobą wieńcową

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Initial examination before starting rehabilitation

It should evaluate:

- ✓ Stability of the clinical state regarding primary and secondary disease
- ✓ Risk of cardiovascular events
- ✓ Exercise tolerance
- ✓ Acceptable forms of training, its intensity and safety

Clinical evaluation before starting rehabilitation

- Anamnesis and physical examination
- Rest ECG
- Exercise test (except for the first stage)
- Echocardiography
- 24-h Holter monitoring
- Some situations require more detailed assessment (lab tests, chest X-ray, ergospirometry, Duplex Scan of the peripheral vessels, ambulatory blood pressure monitoring)

Model of the cardiovascular event risk stratification

Risk factor	Risk		
	Low	Moderate	High
Left ventricular systolic function	Without significant dysfunction LVEF ≥ 50%	Moderate dysfunction LVEF ≥ 36-49%	Siginificant impairment LVEF ≥ 35%
Complex vantricular arrhythmia	Absent at rest or during exercise		Present at rest and during exercise
Ischaemia on exercisestress test	Absent	ST-segment depression ≥1mm a ≤ 2mm	ST segment depression > 2mm
Physical capability	≥ 7 MET >100W	5-6-9 MET 75-100W	< 5 MET < 75 W
Haemodynamic reaction to exertion	Normal		No increaseor decrease of SBP or HR with the workload increase
Clinical data	Unomplicated myocardial infarction, CABG, PCI		Myocardial infarction or PCI or CABG complicated with cardiogenic shock, heart failure, recurrent ischaemia

Absolute contraindications to exercise training

- Unstable angina
- Decompensated heart failure
- Resting sBP>200mmHg; dBP>100mmHg
- Severe valvular heart disease
- Ventricular and supraventricular arrhythmia on exertion
- Coduction disorders associated with exertion
- Third degree atrio-ventricular block in patient without stimulator

Absolute contraindications to exercise training

- Pericarditis
- Endocarditis
- Arterial embolism
- Thrombophlebitis
- Postoperative complication
- Other diseases which may exacerbate on exertion

Training should be interrupted in case of

- Chest pain
- Dyspnoe
- Excessive fatigue
- Dizziness
- Excessive heart rate increase (over 20/min in the first stage and more than expected in the II and III phase)
- Heart rate decrease
- No increase or decrease of blood pressure

Training should be interrupted in case of

- Increase of blood pressure: I stage- systolic >40 mmHg and/or diastolic >20 mmHg comparing to baseline; stage II and III – systolic >200 mmHg, diastolic > 110 mmHg
- Dangerous arrhythmia and conductance disturbance
- ST-segment depression or elevation > 1mm (in leads without Q wave)

Ways to define workload and training intensity

- Based on exercise stress test and pulse reserve:

Pulse reserve *= max. exercise HR– rest HR*

Training pulse *= rest HR + 40-80% pulse reserve*

Ways to define workload and training intensity

- Workoload defined in Watts or METs based on exercise stress test

Training workload *= 40-70% of the maximal workload tolerated during exercise stress test*

Ways to define workload and training intensity

- Assessment by means of Borg scale

  Training intensity*= 11-14 points in Borg scale*
- Based on ventilatory anaerobic treshold (VAT) defined during ergospirometry

  Training workload *= 10% below the workload at VAT*

Ways to define workload and training intensity

- Based on peak oxygen consumption (peak VO_2) defined during ergospirometry

Training workload *= 40-80% of workload at peak oxygen consumption (peak VO_2)*

Stages of rehabilitation in patients after acute coronary syndromes

- Stage I – started in hospital and lasts up to the moment when progression to stage II is clinically reasonable , models depend on diagnosis
- Stage II – in hospital or in early outpatient phase, lasts from 4 to 12 weeks
- Stage III – late rehabilitation home- and outpatient-based, without time limit, may last till the end of life

Aims of stage I

- Optimalization of pharmacologic treatment
- Prevention of immobilization complications
- Improvement of physical capacity
- Reduction of anxiety, psychologic support
- Education
- Precise information on the disease, treatment modalities, risk factors and methods of its modification
- Assessment of the clinical condition and qualification to the appropriate model of the stage II

Models of early in-hospital rehabilitation in patients with ACS

- Model A1 (4-7 days)
  - ✓ ACS without myocardial infarction
  - ✓ Non-ST- elevation myocardial infarction (NSTEMI)
  - ✓ ST- elevation myocardial infarction (STEMI) without significant impairment of left ventricular systolic function
- Model A2 (7-10 days)
  - ✓ ST- elevation myocardial infarction (STEMI) with left ventricular systolic dysfunction
- Model B (>10 days)
  - ✓ Complicated myocardial infarction

Range of mobilization and kinesitherapy

Stage I			Stage II			Stage III		
A1 Days: 1-2	**A2** Days: 1-2	**B** Days: 1-7	**A1** Days: 2-4	**A2** Days: 3-5	**B** Days: 8-10	**A1** Days: 3-7	**A2** Days: 6-10	**B** Days: >10
Supine position, semi-sitting position, armchair Eating in semi-sitting position Bed-pan in semi-sitting position, or in the bedside wheelchair Washing and shaving in bed **Exercise in supine position(5-10min.):** -respiratory training - Isometric training of the selected group pf muscles (from day 2) - Dynami exercises f the small groups of muscles (from day 2) -relaxation			Active sitting in an armchair with legs down Self-service in feeding and toilet in bed (sitting) Toilet in the wheelchair Pionisation and walking around the ward **Exercise in supie and sitting position (10-15min.):** -stage I exercise - Dynamic exercise of the upper and lower extremities - Coordination exercise			Full self-service Toilet int a bathroom Longer walks Stairs up to second floor **Exercise in supine, sitting and upright and walk position(15-20min.):** -stage I and II exercise - Gradual increase of the walking distance up to 200 m		

Aims of stage II

- Evaluation of the clinical condition and adjusting pharmacotherapy
- Treatment of mental disordes (anxiety, depression)
- Improvement of mental and physical condition
- Prevention of the disease-related disability
- Fighting the coronary artery disease risk factors
- Education of patients and their families
- Promotion of the healthy lifestyle

Exercise models in stage II

MODEL A

Risk: Low

Exercise tolerance: High (≥ 7 MET; ≥ 100 Wat)

Types of training: endurance, continuous on a treadmill or cycloergometer (3-5days/week); resistance (2-3 days/week), general improvement exercise (5 days/week)

Total time: 60-90min/day

Intensity: 60-80% of the pulse reserve or 50-70% of the maximal workload

Exercise models in stage II

MODEL B

Risk: Moderate

Exercise tolerance: High and moderate(≥ 5 MET, ≥ 7 Wat)

Types of training: endurance on a treadmill or cycloergometer continuous for patients with high tolerance and interval for those with moderate , resistance exercise, general training frequency same as in model A

Total time: 45-60 min/day

Intensity: 50-60% of the pulse reserve or 50% of the maximal workload

Exercise models in stage II

MODEL C – for moderate risk

Exercise tolerance: Low (3-5 MET, 50-75 Wat)

Types of training: endurance interval training on a treadmill and cycloergometer (3-5 days/week)

Total time: 45min/day

Intensity: 40-50% of the pulse reserve or 40-50% of the maximal workload

Exercise models in stage II

- MODEL C – for high risk
- *Exercise tolerance: high (*≥ 6 MET, > 75 Watt)
- *Types of training:* general training (5 day/week)
- *Total time:* 45min/day
- *Intensivity:* 40-50% of the pulse reserve or 40-50% of the maximal workload

Exercise models in stage II

- MODEL D
- *Risk:* moderate and high
- *Exercise tolerance:* very low(< 3 MET, < 50 Watt); low and moderate(< 6 MET, < 75 Wat)
- *Types of training:* Individual training 3-5 days/week, 2-3 times a day
- *Total time*: 30-45min. a day
- *Intensivity:* less than 20% of the pulse reserve or heart rate acceleration less than 10-15% of the baseline HR

Stage III

In the stage III various proportion of following types of training are prescribed, depending on individual clinical condtion and exercise tolerance:

- ✓ Continuous or interval training on a treadmill or cycloergometer
- ✓ Dynamic exercises
- ✓ Resistance training
- ✓ Team games
- ✓ Individual exercises

Training should be supervised periodically

Aims of the stage III

- Optimalization of the pharmacotherapy
- Maintaining patients optimal physical and mental condition
- Fighting coronary artery disease risk factors
- Promotion of the healthy lifestyle

Models of the stage III rehabilitation

- Model A – low risk patients
- Model B – moderate risk patients with high exercise tolerance
- Model C – moderate risk patients with moderate or low exercise tolerance or high risk patients with high exercise tolerance

Patient after percutaneous coronary angioplasty (PTCA)

- Assessment of the clinical condition according to the general rules
- During the first day after PTCA patient is often immobilized due to compression on the femoral
- Stage I is shortened if there are no complications, the revascularisation is complete and patient has no left ventricular dysfunction
- In the case of planned revascularization, rehabilitation process is started before the procedure and stage one is cut down.
- Complications require individual regimen

Patient after coronary artery by-pass graft (CABG)

Aims of preoperative preparation

- ✓ reducing thromboembolic complications
- ✓ reducing respiratory system-related complications
- ✓ maintaining proper functioning of the peripheral muscles in order to achieve patient mobilization as soon as possible
- ✓ minimalization of the peri-procedural stress

Patient after coronary artery by-pass graft (CABG)

Methods of preoperative preparation

- ✓ Patient education regarding the matter of the procedure and the course of postoperative period
- ✓ Respiratory training
- ✓ Practicing effective cough
- ✓ Light exercises adjusted to patient condition
- ✓ Psychotherapeutic training

Patient after coronary artery by-pass graft (CABG)

Stage I

- ✓Rehabilitation according to model A2 in the case of no complications and according to model B if complications occur
- ✓Place of rehabilitation:
  - Intensive care unit (2-3 days)
  - Cardiosurgery unit (from day 3 to day 7)
  - Cardiosurgery, cardiology and internal diseases units (from day 7)

Patient after coronary artery by-pass graft (CABG)

Stage II

- Should last 6 weeks, in the case of complications 8-12 weeks.
- In complicated course, should start on day
  - ✓ Wound care
  - ✓ Mild respiratory training (withput breastbone stretching)
  - ✓ Positional exercises to improve venous return with special regard to the leg from which a venous graft was taken.
  - ✓ Mild physiotherapy reducing postoperative pain (warmth, mild massage)
  - ✓ General exercises

Patient after coronary artery by-pass graft (CABG)

- In the third week - exercise stress test up to 70% of the maximal heart rate or up to 13 point in the Borg scale.
- Patients are qualified to the appropriate rehabilitation models according to the exercise tolerance and the risk of cardiovascular events
- At the end of stage II – submaximal exercise tress test (85% max. HR 15 points in the Borg scale)
- In patients after sternotomy, breastbone stretching exercises should start no sooner than 3 months after surgery.
- Stage III – according to the general rules of cardiac rehabilitation

Practical advices for patients after CABG

Patients should avoid static efforts with apnea.

It is not allowed

- ✓ To carry heavy objects
- ✓ To push (np.: car, wheelbarrowi)
- ✓ To change a car wheel
- ✓ To clear of snow (street)
- ✓ To pen windows in a train (or other activities requiring strong pulling)
- ✓ To hang curtains
- ✓ To dig soil

Practical advices for patients after CABG

Patient is allowed:

- ✓To ride a bicycle
- ✓To play recreational games (badminton, volleyball)
- ✓To swim (water temp. 27-30ºC)

The most advised effort is walking

Physical activity in the primary prevention of ischeamic heart disease

- Systematic physical activity reduces mortality of cardiovascular diseases as well as all-cause mortality
- Beneficial effect of exercise on circulatory and musculosceletal system, metabolism and immunology is observed
- Endurance, dynamic exercise are believed to be the most beneficial
- It is advised to practice various sport disciplines and team games

Guidelines for physical activity in primary prevention of cardiovascular diseases.

Trainig frequency	**Minimum – 3 times a week**
Exercise intensity	**Moderate – up to 60% of the maximal heart rate**
Time of exercise unit	**Minimum – 30-60min (avarage 40 min.)**
Type of training	**Endurance exercise**
Resistance training	**As an amendment - 10-15% of the whole training**
Energetic cost	**Minimum – 200-300 kcal/training and over 1000 kcal/week** **Optimal over 2000 kcal/week**