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Surgical Pre-Rehabilitation: Inspiratory Muscle Training

Summery

Postoperative pulmonary complications are common and a major cause of perioperative morbidity and mortality.
Inspiratory muscle training using an inspiratory threshold loading device for 2–4 weeks before abdominal or cardiac surgery to prevent postoperative pulmonary complications.

Indication & Benefits

Patients undergoing abdominal or cardiac surgery, with the aim of preventing postoperative pulmonary complications.
Clinically significant complications include atelectasis, infection (bronchitis, pneumonia), prolonged mechanical ventilation and respiratory failure, exacerbation of underlying chronic lung disease, and bronchospasm.
Preoperative inspiratory muscle training reduces the incidence of postoperative pneumonia (number needed to treat approximately 4) and atelectasis (risk ratio 0.53; 95% CI 0.34–0.82). It also reduces the length of hospital stay by about one day (MD –1.33; 95% CI –2.53 to –0.13).
The benefits from general aerobic fitness training are at this stage unclear.

Contraindication and Adverse Effects

Contraindications

History of spontaneous pneumothorax or unstable asthma.

Precautions

Some studies excluded patients with prior stroke or cardiovascular instability as safety in these groups has not been established.

Adverse effects

No serious side effects have been reported with aquatic exercise.

Practical Description

Training

Respiratory muscles respond to training in the same way as skeletal muscles – by undergoing structural and functional adaptation to stimuli/stress. High-intensity training at 60% of maximal inspiratory pressure (MIP), seems to work better than a lower intensity at 30% of MIP, although there is also evidence of benefit at the lower intensity.

Trial patients performed three supervised training sessions per week, each consisting of six cycles of six inspiratory manoeuvers on an inspiratory threshold loading device. Resting time between cycles was progressively reduced from 60 to 45, 30, 15 and 5 seconds.

MIP was measured weekly to adjust intensity adequately. Initial intensity was 60% of MIP and was increased to 80% during the first week. In consecutive sessions, training intensity was 80% of MIP.

Tips and challenges

Inspiratory muscle training devices are available for athletes as well as for medical purposes. The difference is the maximum threshold pressure of the device. In the surgical research samples, it is rare for a participant to have maximal inspiratory pressure above 60 cm of water, so a light resistance device is generally best. *For example, the Powerbreathe Classic low-resistance device can be set from 10 to 90 cm of water. The medium resistance device goes to 170 cm of water with fewer fine gradations, so is less suitable.*

A number of factors increase the risk of developing postoperative pulmonary complications and may help select patients for inspiratory muscle training. Risk factors include:

- age >65 years
- surgery lasting >3 hours
- chronic obstructive pulmonary disease (COPD)
- poor general health status
- heart failure
- functional dependence

Other preoperative strategies to reduce postoperative pulmonary complications include smoking cessation and improving asthma control.

Availability

Inspiratory muscle training requires patients to purchase a hand-held training device that imposes a resistance to inhalation.

Several commercial products are available such as Philips Threshold IMT breathing trainer , Respifit S, Powerbreathe, Ultrabreathe, and Aerosure Medic. These range in cost from about $25 to over $900 depending on the complexity and functionality of the device.

Evidence

NHMRC level I evidence.

References

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