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INSPIRATORY MUSCLE TRAINING FOR REDUCING POSTOPERATIVE PULMONARY COMPLICATIONS: A SIMPLE METHOD BUT

SHORT OF DATA?

Reply to the Editor:

In a letter to the Editor, Licker and Diaper¹ expressed concern about the compliance and withdrawal of inspiratory muscle training (IMT) protocol and inconsistent inclusion criteria in the meta-analysis made by Ge and colleagues.² After the exclusion of 5 studies mentioned by Licker and Diaper,¹ only 536 patients (originally 784) can be analyzed in the study. That may get a different result.

A weak point of the meta-analysis is that although 13 trials were included in the study, there were only 372 patients receiving IMT and 369 patients in the control group. In addition, there were different IMT protocols in every trial. The efficacy of IMT for preventing postoperative pulmonary complications (PPCs) is also confounded by other factors that may prevent PPCs, such as smoking cessation and correcting anemia.³ These trials may indicate that IMT is one but not the only method of preventing PPCs. In the absence of confirmation by a large, randomized controlled trial, the efficacy of IMT in PPC prevention remains doubtful. We appreciate the viewpoint of Licker and Diaper,¹ and we hope that Ge and colleagues will clarify the study result. The accompanying editorial commentary⁴ also points out that IMT is time-consuming and needs staff time. So, is IMT a simple method? Until we have standardized IMT's protocol and conducted large clinical trials with more patients, the method remains difficult.

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REDUCING POSTOPERATIVE PULMONARY COMPLICATIONS: STILL A LONG WAY TO GO

Reply to the Editor:

We thank Licker and Diaper for their interest in our article.¹ Postoperative pulmonary complications (PPCs) are one of the most frequent causes of postoperative morbidity and mortality. The purpose of inspiratory muscle training (IMT) is to improve inspiratory muscle strength and endurance. No powered trials, however, can confirm that IMT can decrease the incidence of PPCs. Evidence from randomized, controlled trials was insufficient to reach definitive conclusions. Our team applied the statistical method of trial sequential analysis to complete the meta-analysis and found that preoperative IMT is associated with improved maximum inspiratory pressure and decreased PPCs in patients undergoing cardiothoracic or upper abdominal surgery.

In terms of confounding factors, Licker put forward very good questions about the factors that may contribute to the success of the intervention and the inclusion criteria. We agree that these concerns may limit widespread application and clinical effectiveness. As Chou and Chen² said in their editorial commentary, getting information from original clinical trials is a hallmark of meta-analysis, but sometimes it is not so easy. We sent email to all corresponding authors of included studies for the missing data. The study of Heynen and colleagues³ can be found in the *Diseases of the Esophagus Wiley Online Library* (<https://onlinelibrary.wiley.com/journal/14422050>), but the corresponding author's contact information did not show. One study was a nonrandomized trial, but it was a double-blind pilot study, and we evaluated the quality through the Cochrane risk of bias tool.⁴ The intervention in 2 studies was preoperative and postoperative IMT, which may also have had an impact on our current results.^{5,6} The study by van Adrichem and colleagues⁷ included 2 intervention groups (a high-intensity group and an endurance group), rather

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than usual care. The result of IMT associated with decreased PPCs suggests that the effect of IMT on improving pulmonary outcomes may be even stronger than our analysis suggests.¹ Because of the unclear proportions of laparoscopic or thoracoscopic versus open operations, whether minimally invasive surgery would eliminate the observed effect that patients who had IMT had significantly fewer PPCs after open surgery but not after thoracoscopy or laparoscopy is not certain. These limitations were illustrated in our section on strengths and limitations. Preoperative smoking cessation, correcting preoperative severe anemia, avoidance of general anesthesia in favor of regional anesthesia, protective ventilation, correction of anemia, and improvement of nutritional status all have an effect on PPC prevention.^{8,9} We need to find a higher level of evidence to identify which method is the best way to guide clinical practice.

In conclusion, to meet a higher evidence level and to determine the appropriate surgical candidates and the modalities of physical training when patients undergoing cardiothoracic or upper abdomen surgery, more double-blind and unbiased randomized, controlled trials are necessary.

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THE BENEFIT OF RECRUITMENT MANEUVER DURING NONINVASIVE VENTILATION IN PATIENTS AFTER CARDIAC SURGERY REMAINS UNCLEAR

To the Editor:

In their recent *Journal* article, Miura and colleagues¹ reported that in patients undergoing cardiac surgery with a ratio of Pao₂ to fraction of inspired oxygen less than 300 and a radiographic atelectasis score (RAS) of at least 2, the use of noninvasive ventilation with recruitment maneuver is associated with improved oxygenation, improved RAS, and fewer days of oxygen supplementation during the hospital stay.

Several limitations, however, should be clarified. One important issue is that the blinding of patients and the intensive care unit team cannot be guaranteed in the study of Miura and colleagues.¹ Although the comparison of final Pao₂ at room air between the 2 groups was significant, the absolute difference of Pao₂ was small (67.2 ± 5.9 vs 73.7 ± 7.1 mm Hg; *P* = .007). Because the value of Pao₂ changes continuously during the whole treatment, the selection of Pao₂ in each patient could easily be biased if the investigators were not blinded. Actually, we believe that blinding bias already existed, as we noticed the use of oxygen at intensive care unit discharge was more frequently in the control group (14/16 vs 4/18; *P* < .001), despite the small difference in Pao₂ (6.5 mm Hg). Second, Figure 2 of the article of Miura and colleagues¹ shows that 94.4% of patients in the recruitment group changed to an RAS of 0, versus 12.5% of patients in the control group (*P* < .001). The evaluation was performed by physicians blinded to the group allocation. According the definition of RAS, however, RAS of 0 to 1 (0 without atelectasis, 1 line of atelectasis or discrete infiltration) indicates only