Management of postoperative pain as part of a successful multidisciplinary lung volume reduction surgery programme

Alfonso Fiorelli[a,*], Mario Polverino[b] and Mario Santini[a]
[a] Thoracic Surgery Unit, Second University of Naples, Naples, Italy
[b] Pneumology and Rehabilitation Unit, Hospital of Scafati, Scafati, Italy

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We read with great interest the paper of Rathinam *et al.* [1] on the importance of a multidisciplinary team for the selection and outcome of patients undergoing lung volume reduction surgery (LVRS) for the management of advanced emphysema.

LVRS is a more invasive procedure compared with bronchoscopic lung volume reduction (BLVR) and thus the adequate control of postoperative pain becomes crucial to outcome.

Thoracic surgery is one of the riskiest procedures that often leads to chronic post-surgical pain (CPSP) with an incidence rate ranging from 14 to 83% [2]. CPSP is a debilitating symptom that may limit chest wall movement with negative effects on respiratory activity, especially in thoracic surgery patients. That may be further amplified in emphysematous patients who have a compromised respiratory activity due to lung hyperinflation and structural changes of the chest wall and the diaphragm. Despite most of patients reported by the authors in Ref. [1] being treated with a video-assisted thoracoscopic surgery (VATS) procedure ($n = 268$), in a recent survey of Dutch thoracic surgery patients, 47% of the VATS patients reported chronic pain [3].

Peng *et al.* [2] showed that postoperative chest drain duration >4 days and different strategy for pain control were significant predictive factors for CPSP after thoracic surgery regardless of whether thoracotomy or VATS was performed. Despite advances in surgical techniques, air leak remains a frequent complication related to LVRS due to the friable nature of the underlying lung parenchyma. Prolonged chest tube placement causes injuries to the intercostal nerve and pleura. The subsequent hypersensitivity, reorganization and sensitization of the central nervous system may lead to CPSP.

Thus, in patients undergoing LVRS, an increasing emphasis and effort should be focused on treating thoracoscopic pain effectively and minimizing the later development of chronic pain with a wide spectrum of analgesic techniques. Significant pain relief in the early postoperative period allows for active physiotherapy facilitating lung function recovery and prevents the transition from acute to chronic pain, reducing the neuropathic pain components with further positive effects on long-term outcome.

Compared with BLVR, LVRS has the main advantage of resecting only the more emphysematous parenchyma zone, while BLVR excludes the entire lobe [4]. Recently, we proposed the volumetric quantification of emphysema using 3-dimensional computed tomographic scan in order to identify the target emphysematous lobe to treat with the endobronchial valve [5]. For unknown reasons, the pattern of emphysematous destruction varies considerably from one region of the lung to another. Thus, the volumetric quantification of emphysema in addition to a quantitative radionuclide perfusion scan may theoretically improve the identification of which part of the parenchyma should be surgically resected, excluding from ventilation the regions of most damaged parenchyma, and allowing the re-expansion of the remaining less damaged parenchyma.

We congratulate the authors once again for their invaluable investigations on the management of emphysema and we hope that they find our comments useful for the role of a multidisciplinary team in the LVRS programme that is underway.

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* Corresponding author. Thoracic Surgery Unit, Second University of Naples, Piazza Miraglia, 2, 80138 Naples, Italy. Tel: +39-0815665228; fax: +39-0815665230; e-mail: alfonso.fiorelli@unina2.it (A. Fiorelli).

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Reply to Fiorelli *et al.*

Sridhar Rathinam*, Inger Oey and David A. Waller
Department of Thoracic Surgery, Glenfield Hospital, University Hospitals of Leicester, Leicester, UK

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We would like to thank Fiorelli and colleagues for their interest in our study [1, 2]. We are grateful to them for pointing out some very important aspects in the management of patients for lung volume reduction surgery (LVRS).

Lung volume reduction is primarily a procedure to improve health status. Acute postoperative pain may not only increase the risk of postoperative complications but also, in the long term, chronic postoperative pain detracts from the intended benefits of the procedures.

We have shown that postoperative pain reduces the improvement in health status after LVRS even after unilateral video assisted thoracic surgery (VATS) [3]. We use two generic health status questionnaires to assess postoperative improvements after lung volume reduction: SF-36 and EuroQOL. When using SF-36, up to 45% of patients continued with a worse score in the pain domain, even 2 years after LVRS, when using EuroQOL this percentage did decrease from 30% at 3 months to 14% at 2 years.

We mention a study of Peng *et al.* [4] in which patients who had chest drain duration of longer than 4 days were more likely to have chronic postoperative pain. Interestingly, we found no significant correlation between the change of pain scores and the duration of chest drainage.

We accept the impact and importance of postoperative pain relief and early mobilization in this frail group of patients. Our practice incorporates epidural analgesia, early mobilization on portable suction units with active physiotherapy. Pain management is optimized by a dedicated pain team.

We think all the thoracic surgeons will agree that both CT scan and a quantitative lung perfusion scan have a role to play in the selection of patients for lung volume reduction. In our institute, we prefer using a quantitative lung perfusion scan to assess functional rather than anatomical heterogeneity with good outcomes [5].

The authors also raise a very valid point which is in keeping with our Unit's philosophy which is VATS LVRS is better as it excises heterogeneous non-functioning lung as opposed to bronchoscopic LVRS which isolates the whole lobe with endobronchial valves.

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