



Sternotomy for management of myasthenia gravis: is the time to retire?

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Surgical resection is the main treatment for myasthenia gravis (MG) associated with thymic hyperplasia or thymoma. The first thymectomy was performed in 1939 using full median sternotomy, but the morbidity and mortality related to sternotomy let surgeons to explore in selected cases less invasive approaches including transcervical or partial sternotomy (1-4). With the growing experience in minimally invasive surgery and the improvement of surgical instruments, in 1994 Novellino *et al.* (5) performed the first video-assisted thoracoscopy extended thymectomy (VATET). After that, the adoption of VATET grew among thoracic surgeons who reported in selected cases the same clinical outcomes of sternotomy but better post-operative and cosmetic results (6-10). Over the years, the indication of VATET was then extended to include also myasthenic patients with small thymoma (Masaoka stage I or stage II) by performing additional surgical incisions at level of the sternum (11), of the anterior chest wall (12), and of subxiphoid region (13) to improve the endoscopic view and to facilitate the resection of the thymoma and mediastinal fatty. Furthermore, uniportal instead of multi ports VATET was also used to further reduce the surgical trauma and improve the cosmetic results (14-16).

In line with this tendency, Shiomi *et al.* (17) modified the single-port subxiphoid approach proposed by Suda *et al.* (18,19) by an additional 5-mm port performed on the right side of the chest to improve the access to the bilateral

phrenic nerves and the upper area of the innominate vein. They used the modified single-port trans-subxiphoid approach (MTXA) in 10 myasthenic patients with thymic hyperplasia and in three myasthenic patients with thymoma and retrospectively compared the post-operative and clinical results with those of myasthenic patients with thymic hyperplasia (n=6) or thymoma (n=14) operated in the same period using standard sternotomy. MTXA compared to sternotomy offered similar clinical outcome but a significant reduction of blood loss (P<0.001); length of hospital stay (P=0.004); CRP in post-operative day 1 (P=0.0073). Despite these results are in line with other studies (6-13) and reviews (20,21), however they should be considered with cautious for the following limitations: (I) the retrospective nature of the study and the lack of a propensity match analysis due to the small number of patients make the two study groups not comparable. The sternotomy group presented a higher incidence of thymoma; thus, the surgical maneuvers to resect thymoma rather than the different surgical incision could explain the different post-operative out-come; (II) in theory, the reduction of length of incisions related to MTXA could be associated with less post-operative pain and better cosmetic results compared to sternotomy. However, no variables (i.e., post-operative pain, consumption of analgesic etc.) to support this hypothesis were evaluated; (III) Jaretzki *et al.* (22) reported that the amount of tissue resected is the most objective parameter for estimation of surgical effect in

the management of MG. However, the weight of specimens was not reported, making difficult to define whether the amount of the thymus and surrounding tissue resected in MTXA group was equivalent to that in sternotomy group; (IV) in a meta-analysis including 15 studies and involving 1,003 MG patients, Ng *et al.* (23) compared VATS (n=533), transcervical (n=449), and infrasternal mediastinoscopic (n=21) procedures and found that VATS and transcervical surgery had comparable remission rates at the 10-year follow-up (35.4% *vs.* 38.1%, respectively). However, the short follow-up did not allow to draw definitive conclusions on the clinical outcome of this technique, since thymoma is an indolent tumor that can recur 5–10 years after resection.

Finally, the authors should be commended for their work that additionally confirmed the general impression that in selected myasthenic patients a minimally invasive approach could be equivalent to sternotomy in terms of clinical outcome but with the advantages of better post-operative outcomes and cosmetic results. However, the selection of patient remains mandatory for the appropriate choice of the surgical approach, taking in mind that the obtaining good cosmetic results should not reduce the ability to achieve radical resection of thymic tissue, the primary objective of surgery. Thus, future prospective randomized trials are wanted to clarify whether it is the time to retire for sternotomy.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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