Surgical Technique

Chest wall resection and reconstruction by composite prosthesis for locally recurrent breast carcinoma

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Introduction

Primary or secondary chest wall neoplasms and contiguous infiltration of the chest wall from breast or lung cancer represent the most frequent indications for neoplastic chest wall resection (1,2). Chest wall reconstruction together with adequate soft tissue coverage are the main principles for managing major post resectional chest wall defects (3).

Minor chest wall defects after limited resections or posteriorly located apical and small defects, do not necessarily require rigid prosthesis and can be effectively treated by using absorbable mesh or soft tissue alone, while more extended and antero-lateral defects need synthetic reconstruction by rigid prosthesis (4).

Many synthetic prostheses can be used to stabilize chest wall after resection: the ideal material should provide—on one hand, rigidity to effectively protect underlining structures; on the other hand, malleability, as well as inertness and radiotransparency, are essential for optimal replacement of resected bones and soft tissues (5).

Crystalline polypropylene and high-density polyethylene (Marlex or Prolene) are synthetic materials presenting ideal properties for reconstructing limited defects; larger resections, requiring structural stability to prevent chest wall collapse, are usually performed by using rigid materials (6).

Although many different synthetic materials have been used to maximize the chest wall stability after major resections, there is not only one material or technique to be used and surgeon's personal expertise plays a significant role for the choice.

Here we report our technique of chest wall resection and reconstruction by polypropylene mesh/methylmethacrylate prosthesis in a case of locally recurrent breast carcinoma after previous mastectomy.

Surgical technique

Patient presenting with right chest wall infiltration from locally recurrent breast carcinoma is placed in contralateral decubitus; the lesion, previous scars and the planned extension of the resection are drawn. Circular incision is performed with wide margins and soft tissue are circumferentially incised by ultrasonic shears until the ribs plane is fully exposed. Pleural cavity is then entered and endothoracic lesion extension is evaluated by manual palpation. Every single vascular pedicle of the involved rib is isolated, ligated and coagulated proximally and distally to the lesion with wide margin; every single rib is then transected by dedicated rib cutters. Hemostasis is then optimized by wax and coagulators; a template of the resected chest wall is performed and a methylmethacrylate sandwich prosthesis is devised and—after polymerization—fixed to chest wall by interrupted non-absorbable stitches. Latissimus dorsi muscle flap is then rotated to fully cover the prosthesis (*Figure 1*).

Discussion

The chest wall is the most frequently neighboring structure involved in locally advanced lung tumors and its resection is required for a radical treatment (8).

Figure 1 Chest wall resection and reconstruction by rigid prosthesis and latissimus dorsi muscle flap coverage (7). Available online: http://www.asvide.com/watch/33068

The function of the rib cage and its bony structure is to protect chest organs and to allow the dynamic function of ventilation (9). Since the first report of chest wall resection and reconstruction in 1841 by Poland (10), many pathophysiologic aspects of chest wall resection have been widely investigated, in particular at in the 20th century through several different procedures for tuberculosis, as well as, later on during pioneering experience of chest wall reconstruction for congenital defects or after resected locally-advanced breast tumors or other thoracic neoplasms (11,12).

Nowadays, thanks to the developments in tissue engineering and biomaterials as well as in all the clinical branches related to extended surgery (13-18), chest wall resection is considered a feasible and safe procedure, although requiring adequate technical skills and multimodality approach. Several prostheses with flexible or rigid structure as well as permanent or absorbable materials have been developed throughout the years, but the best technique has not been found yet (9). A recent study of Spicer et coll. suggests that the kind of a prosthetic material, does not conditionate postoperative respiratory complication rate after thoracic resection; on the contrary, the total number of resected ribs and synchronous pulmonary resection are independent predictors of respiratory complications after chest wall resection (9). Our favorite chest wall reconstruction technique is methyl methacrylate sandwiched between two layers of non-absorbable mesh: it provides ideal chest wall stability reducing risk of respiratory complications, preventing flail chest (paradoxical movement with breathing) (2,19). Although this type of prostheses has been related to a higher number of wound complications, only 4.8% of operated patients in our personal series of 166 consecutive patients—had prosthesis infections requiring removal (2); anyway, it is of paramount importance an adequate prosthesis coverage by well vascularized muscle flap.

In conclusion, methyl methacrylate rigid prosthesis covered by well vascularized muscle flap, usually a latissimus dorsi flap, provides excellent chest wall stability, does not interfere with physiologic mechanical ventilation and presents an acceptable post-operative infection rate.

Acknowledgments

None.

Footnote

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

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The patient was informed that her clinical data could be used for various clinical studies, and written informed consent was obtained on this basis.

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