Case Report

Large lateral thoracic defect by chondrosarcoma resection chest wall reconstruction using myocutaneous latissimus dorsal flap without parietal rigid repair

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ABSTRACT

A case of a 66 year-old women, with a large chondrosarcoma arising from right lateral chest wall is presented. Parietal pleura, 3rd, 4th, 5th and 6th ribs (lateral arch), underlying muscle, subcutaneous tissues and the right breast were also involved by the tumor. Surgical resection was planned including skin, right breast, 3rd, 4th, 5th and 6th lateral rib arches and parietal pleura; a wide defect was created with exposure of lung. Reconstruction was planned by means of an extensive myocutaneous dorsal flap pedicled on right thoracodorsal vessels; alloplastic mesh for parietal chest wall reconstruction was not used. Two years postoperative results showed no local recurrence and excellent aesthetic and functional results were evident; respiratory function remained unaltered. The progressive rigidity reached by the reconstructed lateral chest wall, allowed us to conclude that the use of myocutaneous flap is enough to avoid paradoxical respiratory movements and any type of alloplastic mesh is unnecessary.

KEY WORDS

Chondrosarcoma, chest wall, myocutaneous flap

INTRODUCTION

Primary chest wall tumors are uncommon and constitute 0.2-2% of all tumors.[1] Metastatic tumors and tumors of local extension are more common. Myeloma and chondrosarcoma are the most common primary malignant tumors arising from cartilaginous and bony structures and account for nearly 60% of all malignant rib tumors.[2] The treatment of large chest wall tumors was limited for many years until 1898 when Parham described the first thoracic resection of a chest neoplasm.[3] Initially the risks of surgery were related to pneumothorax and respiratory failures. Advances in anaesthesia and controlled airway ventilation with positive pressure allowed chest wall resections to be done safely. Chest wall surgery progressed when measures were taken to reconstruct the defect left after the tumor was removed.

Early attempts at reconstruction included the use of fascia lata, rib grafts.[4] As early as 1960, Graham and Usher introduced the use of prosthetic materials when they described using Marlex mesh to repair defects of the chest wall[5] Today, the success of thoracic tumor resection is due to advances in critical care and functional reconstructive surgery.

A combination of prosthetic materials and rotational flaps,

with improvement in mechanical ventilation provide good cosmetic and functional results and short hospital stays. Latissimus dorsi myocutaneous flap is the most used methods for extensive soft tissue defects in chest wall reconstruction.

We are presenting a case in which a large Latissimus dorsi myocutaneous flap was used for lateral chest wall reconstruction after extensive chondrosarcoma resection was performed without the use of alloplastic mesh for thoracic stability. The mechanics of ventilation was not altered and respiratory function was normal from the immediate postoperative period.

CASE REPORT

A 66-year-old women with an extensive right lateral chest wall tumor was referred to our Service. The lesion was firm, attached to the rib arches and involving the right breast; the borders were distinct and the skin covering it was healthy. [Figure 1] The CT scan demonstrated a destructive lesion involving parietal pleura, 3rd,4th and 5th lateral rib arches, surrounding muscles and mammary tissues. An excision biopsy was done and the subsequent histology test showed the lesion to be characterized by; "Irregularly shaped lobules of cartilage with variable size, often separated by narrow fibrous bands. Chondocytes arranged in clusters or groups, slightly enlarged nuclei and occasionally bizarre nuclei with mitotic figures". The diagnosis was malignant chondrosarcoma.

The lesion was removed together with parietal pleura, affected rib arches, soft tissues (including skin) and right breast. A 20x20 cm defect was created [Figure 2] The chest wall was reconstructed with a large ipsilateral latissimus dorsi myocutaneous flap; alloplastic mesh was not used for rigid parietal repair. [Figure 3]

The skin portion of the flap was elliptical and horizontal and the donor area was closed directly.

The patient was ventilated artificially for 24 hours, then she was weaned without difficulty, her respiration was normal but with a light movement of the flap, no dyspnoea was detected. After 6 months the flap movements had disappeared almost completely in normal breathing. Excellent aesthetic result was obtained [Figire 4, 5].

One year after surgery a CT scan showed the complete

Figure 1: Pre-operative view:Right chest wall lesion involving the right breast.

Figure 2: Operative view:Tumor resection creating wide parietal defect

Figure 3: Operative view:Extense myocutaneous dorsal flap covering the defect

absence of recurrence and a neopleura formation was noticed under the flap.

DISCUSSION

Primary bone tumors of the chest wall are uncommon. In one of the largest reviews done at the Mayo Clinic by Dahlin and Unni (1986) malignant neoplasm made up 89% of all bony chest wall tumors and are found in the ribs (85%) more often than in the sternum (15%)[2] The most common malignant neoplasms are myeloma, chondrosarcoma, limphoma and Ewing's sarcoma. Chondrosarcoma are the most common neoplasm of the anterior chest wall. Most often arising from the costochondral arches or the sternum, they account for 30% of all primary malignant bone tumors[6] This tumor is seen most often in men in their 40s and 50s.

Figure 4: Post-operative view: Good aesthetic and functional result two years later.

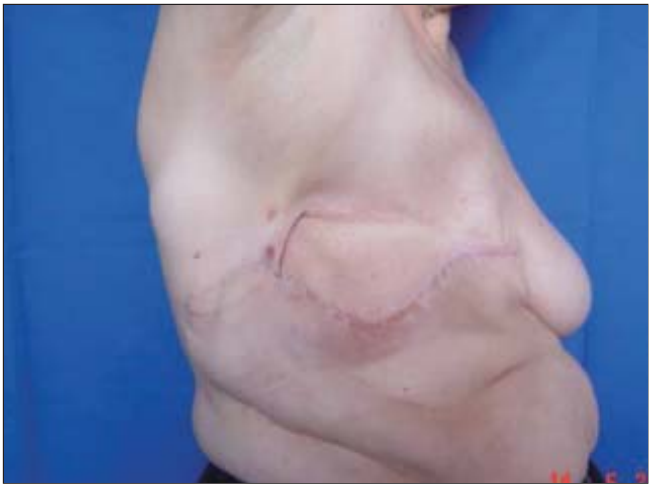

Figure 5: Post-operative view: Good aesthetic and functional result two years later.

The presentation is consistent with a slow-growing mass that may have been painful for several months. They may grow into the pleural cavity or through the muscles into the subcutaneous tissues. In our patient a 20x20 cm tumor developed in right lateral chest wall; it was slow-growing involving several rib arches, parietal pleura and ipsilateral mammary tissues. The presence of a chest wall tumor is an indication for surgical intervention; all malignant chest wall tumors should be resected for potential cure at the time of initial presentation.

The key to a successful chest wall tumor resection is obtaining wide margins at the time of initial resection.

Margins are not the only important principle in thoracic wall tumors, high-grade tumors should have the surrounding soft tissues resected with them. For tumors growing from ribs the surgical resection must include not only the affected bone but also portions of several ribs above and below. Chest wall resection and reconstruction are major operations that carry with them life-threatening complications. The position of the patient will be determined by the location of the tumor.

Standard lateral decubitus positioning should be adequate for anterior or laterally located tumors. Access to structures of surrounding soft tissues, neurovascular structures, and underlying structures of the thoracic cavity should be considered. In this position the vascular pedicles to major muscles bundles, particularly the latissimus dorsi muscle can be easily accessed.

Once the complete extension of the tumor is determined ribs above and below must also be resected if there is any question of clear margins. With the reconstructive techniques now available, resection should not be compromised and limited unless the patients will be incapable of tolerating the procedure.

Large defects should be reconstructed with appropriate tissues, but the respiratory mechanism should also be preserved and functional limitations minimized.The materials used by chest wall reconstruction are polypropylene (Marlex) or polytetrafluorethylene (PTFE) mesh such as Gore-Tex.[7]

The use of a mesh allows a rigid chest wall reconstruction avoiding a floating respiratory mechanism. The primary

objective is to obtain parietal stability and therefore minimizing functional limitations. Small defects of the chest wall (less than 4 cm in diameter) do not require reconstruction; defects larger than this should be reconstructed.

Yokote and Osada (1996)[8] conclude that the chest wall reconstruction is indicated when

1. The area of the defect is greater than 100 cm^2.
2. Three or more ribs are resected in the anterior thoracic aspect
3. As many as four ribs are resected in lateral chest wall.

If function is not to be compromised preoperatively, a decision must be made at the time of surgery as to whether reconstruction is possible. A free flap using various muscles or omentum for coverage must be used when a adjuvant radiation therapy is to be performed; distant and protected vascular pedicles must be used avoiding those that could be injured by effect of radiation. Rotational myocutaneous flaps using latissimus dorsi can initially be considered as technique of choice since it not only permits extensive soft tissue repair but also covers wide defects.

In this case, the reconstruction was done using only a large myocutaneous latissimus dorsi flap, no alloplastic mesh was used for chest wall stability. The parietal pleura was replaced using the anterior fascia of the latissimus dorsi muscle. Initial mild paradoxical respiratory movement disappeared two months after surgery achieving rigid thoracic stability, the respiratory function remained unaltered.

Development of a fairly rigid scar and soft tissue fibrosis could explain the progressive flap stability avoiding paradoxical movements. In our experience the reconstruction with prosthetic material has a high percentage of complications, mostly infections. Consequently we attempted the reconstruction without prosthetic material. We decided to implant a mesh for stability secondarily if this was inadequate. This case showed to us that a large chest wall defect including ribs (lateral arches of ribs) can be reconstructed using only a myocutaneous flap and alloplastic mesh is necessary for parietal rigid stability; no respiratory distress developed. We realize one case cannot be used to make a generalized claim but this result is encouraging and more studies are planned on future patients to determine if this is indeed feasible.

REFERENCES

1. Liptay MJ, Fry WA. Malignant bone tumors of the chest wall. Semin Thorac Cardiovasc Surg 1999;11:278-84.
2. Dahlin DC, Unni KK. Bone Tumors:general aspects and data on 8.542 cases. Sprinfield: Thomas, 1986.
3. Parham FW. Thoracic resection for tumor growing from the bony wall of the chest. Trans Surg Gynecol Assoc 1898;11:223-363.
4. Bisgard JD, Swenson SA Jr. Tumors of sternum. Arch Surg 1948;56:570-7.
5. Graham J, et al. Marlex mesh as a prothesis in the repair of thoracic wall defects. Ann Surg 1950;151:469-79.
6. Faber J. Chondroma and chondrosarcoma. Semin Torca Cardiovasc Surg 1999;11:270-7.
7. Grosfeld JL, Rescorla FJ, West KW, et al. Chest wall resection and reconstruction for malignant condition in childhood. J Pediatr Surg 1988;23:667-73.
8. Yokote K, Osada H. Indication and method of chest wall reconstruction. Kyobu Geka 1996;49:38-41.

DISCUSSION

Chest wall resection and reconstruction may be required for tumour, infection, radiation injury and trauma.[1] Notwithstanding the need for effective management of pleural cavity, the actual defect requires restoration of chest wall stability and soft tissue coverage. Maintenance of chest wall mechanics relies on both an airtight seal within the pleural cavity as well as skeletal support.[2] Introduction of muscle and myocutaneous flaps, development of reliable synthetic substances for skeletal support, and availability of newer artificial ventilatory support appliances have allowed the surgeons to be more aggressive in chest wall resections with tremendous refinement in reconstruction methods. So much so, massive chest wall resections with immediate reconstruction, are safe and have become a routine.

Historically, the major concerns with massive chest wall resections were directed towards the respiratory mechanics than the actual pathology[3] and it still continues to dominate the reconstructive surgeon's concern. The most appropriate reconstructive option depends on the location of the defect (anterior, lateral or posterior), its etiology, and a thorough understanding of the chest wall mechanics[2]. Several large series[1,2,4] reporting experience