



Handmade Vacuum System in the Management of Serious Complications of Sternal Reconstruction: A Case Report

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Abstract

Sternum chondrosarcomas are infrequent lesions, the indication is surgical resection, but when very wide resections are performed it compromises adequate chest mobility and its reconstruction becomes more complicated, morbidity and mortality is related to the patient's previous state, the stage of the disease and the extent of thoracic resections [1]. The VAC system (Vacuum assisted closure) is already known to help create an environment suitable for the improvement of post-surgical mediastinitis by creating a vacuum state that stimulates the increase of local blood flow and the formation of granulation tissue [2].

Next, we refer to a case of sternal resection and reconstruction due to chondrosarcoma, complicated by infection and flap necrosis, as well as management with the artisanal VAC system.

Keywords: Vacuum System; Sternal Resection; Chondrosarcoma; Reconstruction of Chest Wall; Sternal Tumor

Abbreviation

VAC: Vacuum Assisted Closure.

Introduction

Wide resections of the chest wall are usually a surgical challenge, which is based on maintaining the protection and mobility function of the chest wall. Thoracic wall resections for neoplastic lesions have a curative or palliative function. Resections should provide adequate stability, avoid paradoxical movement, make a tight closure of the thoracic cavity and give protection to intrathoracic structures [3].

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The VAC system (Vacuum assisted closure) is already known to help create an environment suitable for the improvement of post-surgical mediastinitis creating a state of emptiness that stimulates

the increase of local blood flow and the formation of granulation tissue, allowing recovery stabilization of the patient of the septic state [2].

Next, we refer to a case of sternal resection with reconstruction with titanium plates and free flap rotation complicated with infection and flap necrosis in addition to management with handmade VAC system.

Clinical Presentation

A 48-year-old male patient with no known pathological history who is referred to our office for presenting an increase in volume at the sternum level of progressive growth of 6 months. The physical examination shows a lesion in the lower third of the sternum of 7x6cm hard, non-mobile, non-painful, chest tomography indicating a tumor of 6x5cm (figure 1) with destruction of the distal third of the sternum involving chondrosternal cartilages and intimate contact is indicated with the pericardium. Trucut biopsy is performed and reports, chondrosarcoma grade 2, extension studies are completed without evidence of distant disease, neoadjuvant therapy is performed with preoperative radiotherapy.

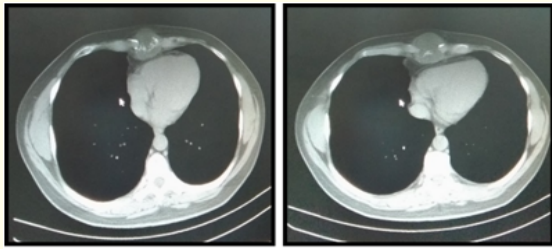


Figure 1: CT scan showing sternum tumor.

It takes surgery where the findings are obtained: 6x5cm tumor, adhered to pericardium which shows nodular infiltration, infiltration of anterior diaphragm insertions, pre-pericardial regional adenopathy. Block resection, with 3cm resection margins, involving 2/3 of the sternal body, chondrosternal cartilage, partial resection of the pericardium, resection of anterior diaphragm insertions is performed. The reconstruction (Figure 2) begins with repair of the diaphragm with Goretex® mesh, placement of reconstruction bars and myocutaneous free flap of the vast lateral of the left quadriceps is performed (flap performed by plastic surgery).



Figure 2: Resection and reconstruction.

Four days after the postoperative period, the patient presents a psychotic state where the flap hits multiple times, being treated by psychiatry, at 10 postoperative days there is evidence of purulent material discharge through the drainage and at 14 he presents progressive changes of coloration in the flap, reason why it is taken again to the operating room evidencing abundant purulent material, thrombosis of mammary arteries that irrigate the flap and necrosis of the same.

The necrotic flap is removed (Figure 3) and all the synthesis material together with the Goretex® meshes, washing, debridement and Keystone flap is performed, which eventually fails in view that the infection by coagulase negative *Streptococcus* and multidrug-resistant *Pseudomonas* is maintained. After this, a washing and irrigation protocol is carried out and subsequently placed in a handmade VAC system.

The definitive biopsy reports a sternal body tumor and fourth rib: grade 3 codrosarcoma, a tumor of 8.1x4.1x4cm free lateral margins at 4cm with a free deep margin at 0.5cm, pericardium without infiltration and adenopathy with metastatic disease. positive pericardial fluid for malignancy.

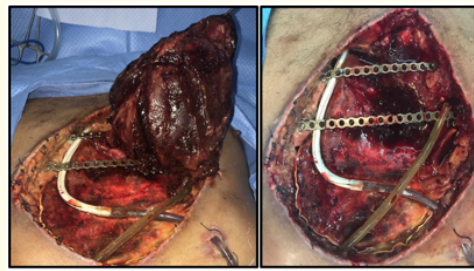


Figure 3: Necrotic flap.

The VAC system was made with special dressings (Cutimed Sorbact mesh and Silver alginate) under porous foam rubber adjusted to the wound size of 5cm thick, guaranteeing the vacuum seal with a Tegaderm® film, it is handled at 50mmhg with changes every 3 or 4 days conditioned by the expense and the state of the system, also the cures and the changes ended up being done in the patient's bed. progressive improvement was evidenced with granulation tissue formation that progressively covered the defect with its decrease (Figure 4). In view of maintaining positive culture for multidrug-resistant *Pseudomonas*, biopsy of the granulation tissue is taken confirming bacterial colonization. Because there are no systemic manifestations and localized infection is confirmed, it is decided to withdraw the VAC system and perform ambulatory management, obtaining a negative culture at 21 days. Subsequently, the patient was sent for specific cancer treatment at the end of the same skin graft will be performed on the remaining defect.

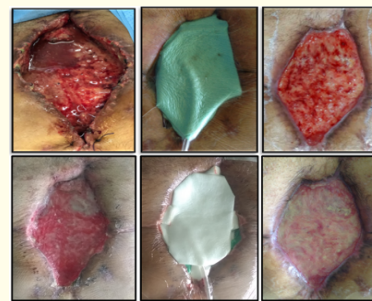


Figure 4: Handmade vacuum and granulation tissue progression.

Discussion and Conclusion

In order for the resection of the chest wall for tumors to be adequate, it must have at least 2cm of margin. But this results in a major defect that compromises the function of the chest wall, as well as breathing and circulation. So, the reconstruction must be well studied by the surgical team [4]. Thus, there are multiple techniques for the reconstruction of the chest wall that go, from the use of soft tissues (muscle flaps or myocutaneous, major omentum), through prosthetic materials (plates or titanium bars, 3D reconstructions are bone segments of the wall thoracic, polypropylene meshes, etc.) to bone homograft. Usually soft tissues are usually more resistant to infections.

The indication for reconstruction is highly debated, the reconstruction rate varies between 40 and 60% and there is a lot of discrepancy in its different phases [5]. Some authors do not perform reconstruction on defects smaller than 5cm and indicate that it should only be reconstructed if the defect involves 3 ribs or more, or if the defect is not covered by the scapula. What there is consensus is that there are multiple methods of reconstruction of the thoracic wall and that the choice of it depends on the individual experience [6].

Mortality and morbidity vary according to the series but vary between 2 to 7% and between 24 and 46% respectively [7]. The complications of these surgeries range from wound dehiscence, bleeding, ventilatory function disorders to mediastinitis. These are more frequent in patients with advanced age, multiple reoperations, ulcerated tumors, reconstructions with a combination of prosthetic and bioprosthetic material [8].

Mediastinitis after sternal resections and reconstruction with prosthetic material means that it must be removed to control the infection and plans a new reconstruction. The VAC system is an important tool in the management of this complication since it reduces edema, increases local blood flow thus decreasing the time of improvement leading to an early stabilization of the patient. It has also been shown that partial pressure of oxygen wound fluid and lactate levels increase during treatment, promoting healing [9].

Many studies have demonstrated the effectiveness of the use of VAC in the management of post-sternotomy mediastinitis [10,11]. Most only refer to the handling of only these types of wounds. In our case we had the management of mediastinitis without tissue that covered the defect, which complicated the management due to being directly over the remaining pericardium, but the use of VAC under a low pressure with respect to conventional use was effective in our case.

The multidisciplinary team in the management of serious complications after the resection of the chest wall takes on a determining factor in the subsequent evolution of the patient and active communication between the different team components must be maintained in order to facilitate the decision-making that you take the patient to a favorable outcome in the healing process [10,12].

Conflict of Interest

No Conflict of interest.

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