CASE REPORTS

CHEST WALL RECONSTRUCTION USING CUSTOMIZED NEO-RIBS: CASE REPORT

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Abstract

Chest wall tumours are challenging subjects. In the present article we describe a case of a 51 year old female who developed an angiosarcoma eight years after radiotherapy treatment due to left breast cancer at age 41. She had resection of the anterior segments of the 3rd to 5thribs followed by chest wall reconstruction, using MatrixRib fixation system®, Marlex® mesh and latissimus dorsi muscle flap. After two years the angiosarcoma relapsed. Considering the predicted extent of the chest wall resection, a reconstruction using titanium plates was not an option, so we opted to shape neo-ribs of Methyl Methacrylate using rubber drains as a mold.

It affords very good anatomical contour of the chest wall and more physiological function than other options, although only long-term follow-up and future studies will determine the performance of this method.

Keywords: *Neo-ribs, Chest Wall Reconstruction*

INTRODUCTION

Chest Wall reconstruction is considered a very demanding and challenging procedure.

The first description of a related surgical procedure was in 1898, when Parham performed the first chest wall tumor resection with closure of the defect[1].

In 1973 with the use of Marlex® mesh and Methyl Methacrylate (MMA) the reconstruction of chest wall[1] turned very popular[2]. During the 80´s, Pairolero and colleagues [3] largely developed and popularized chest wall resection and reconstruction. Since then, several devices and materials developed, although there are still minor pitfalls, especially concerning large chest wall defects. In order to cover these defects, techniques for muscle mobilization and rotation were essential.

CASE REPORT

The authors report a case of a 51 year-old female with history of cancer on the left breast 10 years before that underwent surgery and adjuvant chemoradiotherapy.

After eight years she developed a left chest angiosarcoma probably secondary to radiotherapy. A joint surgical procedure with plastic surgery department with excision of the anterior segments of the 3rd to the 5th rib took place, followed by a chest wall reconstruction, using MatrixRib fixation system® with a Marlex® mesh, and a latissimus dorsi muscle flap.

Two years later, the patient returned to the outpatient clinic with an angiosarcoma recurrence. A chest CT showed involvement of the serratus anterior muscle, chest wall titanium plates and the intercostal muscles. A new joint procedure was proposed.

The patient was positioned on right lateral decubitus. The first step was the excision of the lesion with safety margins, including part of the serratus anterior muscle and latissimus dorsi flap. The 3rd rib was apparently not involved. We proceeded to the partial excision of the 4th plate and extended the margin to the lateral part. The 5th rib plate, which was fractured, was also partially removed as well the anterolateral segment of the 6th rib. Due to the extension of the defect, chest wall reconstruction with Matrix Rib fixation system® was not considered.

A chest wall reconstruction based on the technique described by Jean Bellamy [4] was performed using a rubber drain as a cast which was then filled with MMA, shaped and attached by a 5 mm cortex screw to each bone tip. On the 4th and 5th we used the free tip of Matrix Rib® plate to anchor the neo-rib. After MMA dried, the outer rubber drain was removed. A gore-tex® mesh was fixed to the neo-ribs using prolene sutures. At last, a myocutaneous rectus abdominalis free flap anastomosed to the circumflex axillary vessels was used to cover the defect.

The post-operative period was uneventful. The patient was extubated on day 2 and discharged 14 days after surgery.

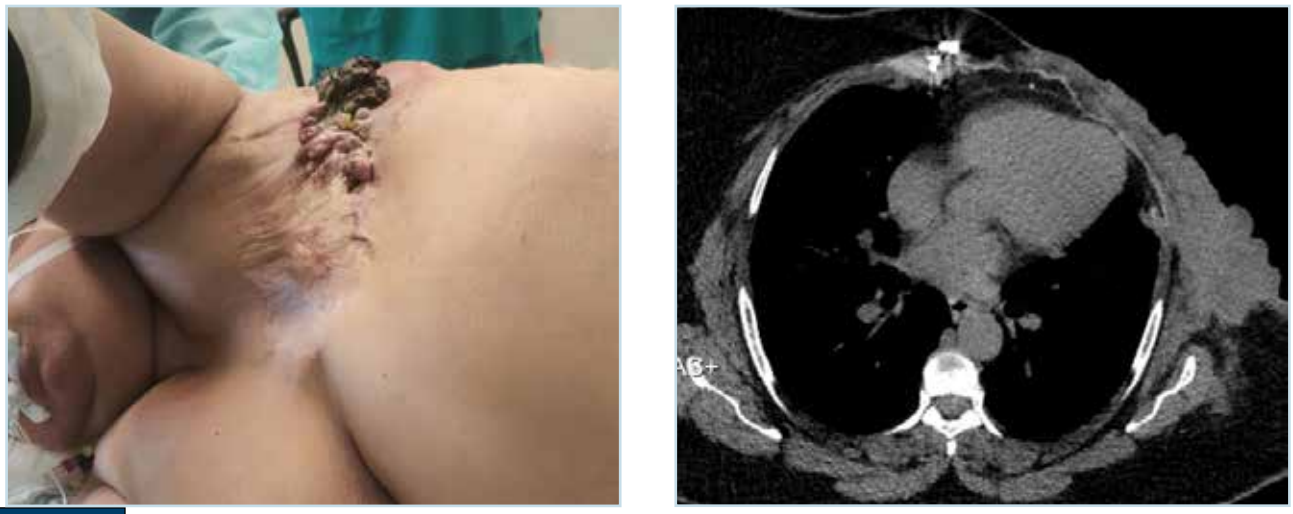

Figure 1 *Pre-operative.*

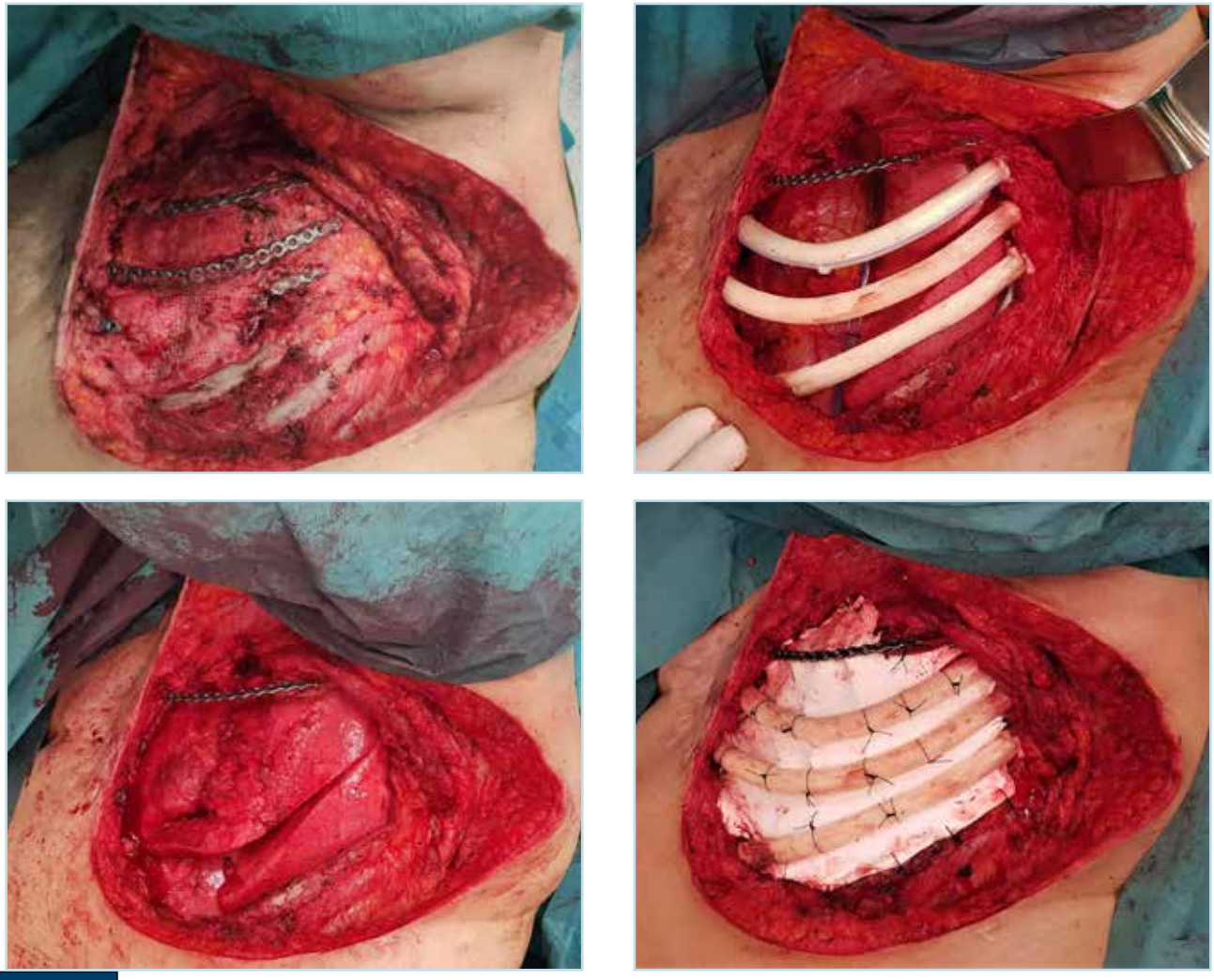

Figure 2 *Intra-operative sequence.*

Figure 3 *Post-operative.*

Pathology confirmed a margin free angiosarcoma.

DISCUSSION

It is commonly agreed that defects of 2 ribs can be managed with soft tissue reconstruction only. However, defects on the lateral chest wall larger than 5 cm or the involvement of 4 consecutive ribs demands skeletal reconstruction[4]. In our case, due to the size and location of the defect, skeletal reconstruction was mandatory.

Several materials are available, however it is still a great task to find the right option for the right patient.

The ideal prosthetic material should be radiolucent, provide adequate rigidity to prevent paradoxical movement, enough malleability so that it can be shaped and not limit chest wall physiological movements and, most importantly, it should also be inert allowing ingrowth of fibrous tissue, decreasing the risk of infection [3,6].

The so-called Marlex®sandwich technique, in which methyl methacrylate (MMA) is applied between 2 layers of Marlex® mesh, was introduced in the 1980s. This technique provides rigidity and allows shape customization, however, its rigidity may limit physiologic movements of the chest wall and high risk of infection and seroma formation has been reported[6,7].

Skeletal reconstruction using titanium plates, (as first used in this patient), is another option, providing a good contouring and strength. However, it is also associated with chest wall mobility limitation, and on a long term, especially in large defects, tends to break[3].

Customized dedicated prostheses are good but expensive solutions, not promptly available and have limitations in wide chest wall resections extending laterally to the sternum[6].

To overcome these limitations, another technique using MMA to shape neo-ribs with the use of silicone molds was described[4,6]. It reproduces the normal curves of a rib, providing more physiological shape and is readily available at reasonable prices.

Based on the above concepts of the ideal prosthetic material and taking into account the complexity of our case (redo surgery, dimension and location) we opted to use shaped ribs using MMA.

CONCLUSIONS

Chest wall reconstruction is a complex and demanding procedure in which multiple variables have to be assured.

Neo ribs, made of MMA, seem to be an excellent option, obtaining not only very good anatomical contour of the chest wall but also more physiological function. Furthermore, it is an easy technique to perform with readily available materials.

Long-term follow-up and future studies will determine the role of this method.

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