



## Case report

## Sternum resection and reconstruction for metastatic renal cell cancer

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## ABSTRACT

A 62-year-old male with bilateral renal cell carcinomas underwent bilateral nephrectomies. Following which he continued hemodialysis. He was admitted to our hospital with a small sternal mass present for 10 months. The operation consisted of sternectomy with right 4th costal cartilage resection and sternal reconstruction with Prolene mesh and methylmethacrylate. Postoperative course was uneventful and his respirations were normal without paradoxical movement of the thorax or hypoxemia. He is currently well and being followed up as an out patient.

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## 1. Introduction

Solitary metastasis of renal cell carcinoma in sternum is rare.<sup>1</sup> Surgery is indicated as a first-line therapy in individual patients and should be advocated in the case of solitary bone metastasis. This therapeutic approach occasionally remains the only hope of offering a long-term cure with an improved quality of life and prolonged survival, in the case of isolated metastases amenable to resection. Prostheses for sternal reconstructions are required to restore ventilatory mechanics and to protect the intrathoracic organs. We created a prosthetic anterior chest wall from molded methylmethacrylate sandwiched between two layers of Prolene mesh, to reconstruct the chest wall successfully after sternectomy for a solitary renal cell cancer metastasis.

## 2. Presentation of case

A 62-year-old male was admitted to our hospital with a small mass present for 10 months on junction of sternum and right 4th costochondral cartilage. He underwent left nephrectomy for left renal cell carcinoma 5 years ago and right nephrectomy for right renal cell carcinoma 18 months ago. Following which he continued hemodialysis, 3 times a week. Physical examination revealed chronically ill looking appearance but vital signs were stable. There were no abnormalities on physical examination. There was no abnormal blood test except high Blood Urea Nitrogen/Creatinine (27.9/6.6). PET revealed hot uptake on right sternum (Fig. 1). We

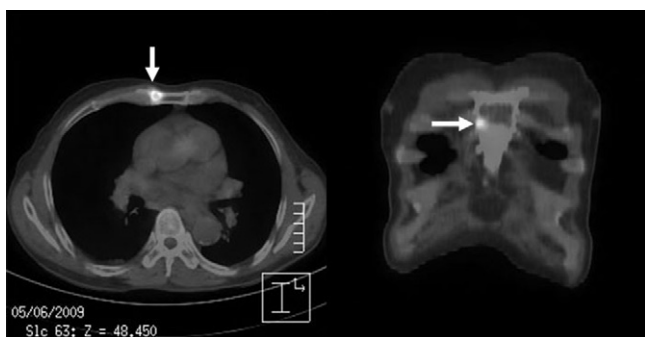
decided sternal mass as a metastatic cancer and performed a surgical operation. Sternectomy except manubrium with resection of right 4th costal cartilage through median sternotomy skin incision was done. A prosthesis was created to fill the defect by sandwiching molded methylmethacrylate (Heraeus Kulzer, Germany) between two layers of Prolene mesh (Ethicon, Somerville, NJ, USA). The prosthesis was fixed to the cut ends of the costal cartilages and the residual manubrium using wire (Fig. 2). Postoperative course was uneventful and his respirations were normal without paradoxical movement of the thorax or hypoxemia. The histopathological results indicated metastatic renal cell carcinoma. He is currently well and being followed up as an out patient.

## 3. Discussion

Solitary metastasis of renal cell carcinoma in sternum is rare.<sup>1</sup> Solitary sternal metastasis without any evidence of systemic spread is reported to be a good indication for sternectomy because it is likely to remain solitary for a long time. Therefore sternectomy can improve quality of life and prolong survival.<sup>2</sup> The only absolute contraindication to sternectomy is a patient's inability to tolerate the operation from a physiologic cardiopulmonary standpoint.<sup>3</sup> When the sternum is partially or totally removed, the anterior chest wall must be reconstructed to protect the heart, lungs, and great vessels. In addition, it is important to restore functional thoracic movement and prevent flail chest and paradoxical respiration. The ideal prosthetic material used in chest wall reconstruction should be rigid enough to prevent collapse and abolish paradoxical respirations and yet be malleable to fashion it to the appropriate shape. It should be inert, allow ingrowth of fibrous tissue, decrease the likelihood of infection and be radiolucent to facilitate radiologic

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**Fig. 1.** PET-CT showing sternal hot uptake (white arrow).



**Fig. 2.** Operative picture showing Prolene mesh attached to chest wall.

imaging.<sup>4</sup> Different techniques of chest wall reconstruction have been described. These include the use of muscular flaps, autologous tissue, bone heterografts, metal plates, stainless steel mesh, Marlex mesh, resin plates, methylmethacrylate and hydroxyapatites combined with tricalcium phosphate.<sup>5</sup> The defect should be covered either by autogenous or artificial substitutes. In our case, reconstruction was performed with two layers of polypropy-

lene mesh and methylmethacrylate. Polypropylene mesh (Marlex<sup>®</sup>, Prolene<sup>®</sup>) is easy to handle. It assimilates well with the surrounding soft tissues. It is resistant to infection and radiotransparent.<sup>6</sup> Although these meshes are easy to handle and have long-term tolerability without remarkable foreign body reactions, the strength is not always sufficient to protect underlying endothoracic organs from an external impact. Rigid prosthesis (methylmethacrylate) or moldable titanium plates are sandwiched between two layers of prosthetic mesh.<sup>6</sup> The mesh-methylmethacrylate composite has been frequently used on large anterior chest wall defects and provides chest wall stability, which minimizes ventilatory impairment. The size and shape of the prosthesis can be determined easily in the operation. In our actual case, the postoperative course was uneventful. There were no infections, no strong reaction, and no respiratory trouble, like flail chest.

In conclusion, we created a prosthetic anterior chest wall from molded methylmethacrylate sandwiched between two layers of Prolene mesh, to reconstruct the chest wall successfully after subtotal sternectomy for a solitary renal cell carcinoma metastasis.

#### Conflict of interest statement

There are no conflicts of interest.

#### Funding

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#### Ethical approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

#### References

1. Nakajima T, Suzuki M, Ando S, et al. Spontaneous regression of bone metastasis from renal cell carcinoma: a case report. *BMC Cancer* 2006;**6**:11.
2. Noguchi S, Miyauchi K, Nishizawa Y, Imaoka S, Koyama H, Iwanaga T. Results of surgical treatment for sternal metastasis of breast cancer. *Cancer* 1988;**62**:1397–401.
3. Klueber R, Bines S, Bradley C, Faber LP, Witt TR. Major chest wall resection for recurrent breast carcinoma. *Am Surg* 1991;**57**:523–30.
4. Le Roux BT, Shama DM. Resection of tumors of the chest wall. *Curr Probl Surg* 1983;346–85.
5. Nakamura H, Kawasaki N, Taguchi M, Kitaya T. Reconstruction of the anterior chest wall after subtotal sternectomy for metastatic breast cancer: report of a case. *Surg Today* 2007;**37**(12):1083–6.
6. Briccoli A, Manfrini M, Rocca M, Lari S, Giacomini S, Mercuri M. Sternal reconstruction with synthetic mesh and metallic plates for high grade tumours of the chest wall. *Eur J Surg* 2002;**168**:494–9.