Resection and reconstruction of the sternum: case report

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Beltrami, V. and Gidaro, G. (1976). *Thorax*, **31, 350–353. Resection and reconstruction of the sternum: case report.** The case history of a 67-year-old man who underwent a subtotal sternectomy for a tumour of the manubrium and left clavicle is reported. Histological examination revealed a highly undifferentiated metastatic carcinoma: the original tumour was not discovered but the patient was in good condition 10 months after operation. Adequate replacement and stabilization of the chest wall was obtained with autotransplantation of the tibia and muscle flaps.

Sternal tumours are relatively uncommon and their malignancy is usually high. They are often metastatic from neoplasms of the lung, breast, kidney or thyroid.

Partial or total resection of the sternum for malignant tumours has been performed up to now in no more than 60 cases. Various methods of reconstruction have been used, for example, mobilization of peripheral tissues, autogenous grafts, and prosthetic devices.

CASE REPORT

Our patient was a 67-year-old man. In the previous two months he had noticed a small mass in the sternal end of the clavicle; this was hard in consistency and painless and had rapidly increased to reach the size of an egg (Fig. 1). Physical examination revealed that the neoplasm was attached to the clavicle and manubrium sterni. The sedimentation rate was high (KI=81).

Radiographs showed an osteolytic lesion of the sternal end of the left clavicle and of the manubrium (Fig. 2). Bronchography, barium study, mesenteric angiograms, urography, and isotopic study of the liver and thyroid were non-contributory.

Resection of the manubrium, the inner third of the left clavicle, and the sternal end of both the first two ribs was performed.

Two split tibial grafts, each 8 cm long, were sutured with steel wire to the resected ends of the first and second ribs in order to close the

FIG. 1. Shows a mass in the sternal end of the clavicle at the time of admission to hospital.

defect in the anterior chest wall (Fig. 3). The pectoralis muscles and subcutaneous tissues were drawn together in the midline to cover the autogenous grafts. A drainage tube was placed in the subcutaneous space and the skin was closed.

The patient had an uneventful postoperative course without paradoxical respiration (Fig. 4).

Histological examination revealed a highly undifferentiated metastatic carcinoma of uncertain origin. Further search for the primary tumour was unsuccessful. The patient is well 10 months after the operation.

FIG. 2. Osteolysis of the left clavicle and manubrium.

FIG. 3. Two split tibial grafts were sutured to the resected first and second ribs in order to close the chest wall defect.

DISCUSSION

From 10 to 15% of neoplasms of the thoracic skeleton are located in the sternum. Benign and primary malignant tumours are unusual; meta-

stases from the thyroid, breast, kidney, and lungs form the majority in most reported series.

A palpable mass is the commonest sign; bone pain is present in 10% of cases. Diagnosis is not easy; metastases in bones may be either osteoplastic or oestolytic, and since primary malignant tumours can behave in the same way, radiographs cannot offer a certain diagnosis. On the other hand, pathological fractures—which may be the first indication of bone metastasis—are unusual in the sternum.

Resection of the sternum, total or partial, poses problems. Chest wall stability, protection of the thoracic organs, and prevention of paradoxical respiration are required. Different methods have been employed to solve these problems: satisfactory results have been obtained both with autogenous grafts and with prosthetic devices (Table). In our patient, split tibial grafts and flaps of muscle were used with a good result.

TABLE
METHODS OF STERNAL RECONSTRUCTION

Reference	Number Recorded	Method of Repair
Griswold (1947)	1 partial	Tantalum prosthesis
Kinsella <i>et al.</i> (1947)	2 partial	Tibia autotransplant (2)
Bisgard and Swenson (1948)	1 partial	Rib autotransplant
Campbell (1949)	1 partial	Muscle flaps
Cotton (1949)	1 partial	Tantalum prosthesis
MacManus <i>et al.</i> (1953)	2 partial	Fascia lata (1); muscle flaps (1)
Beardsley and Cavanagh (1950; 1955)	5 partial	Tantalum prosthesis (5)
Myre and Kirklin (1956)	1 partial	Muscle flaps
Brodin and Linden (1959)	1 total	Iliac bone autotransplant
Giraud and Bonneau (1961)	1 partial	Nylon prosthesis
Reboud <i>et al.</i> (1961)	1 partial	Iliac bone autotransplant
Biancalana and Varola (1962)	3 partial	Tantalum prosthesis (3)
Baue (1963)	1 total	Marlex prosthesis
Nigrisoli (1963)	2 total	Tibia and iliac autotransplant (2)
Kleint (1964)	1 partial	Tantalum prosthesis
Grabchenko and Gaiduk (1965)	1 partial	Acrylic prosthesis
Arnold <i>et al.</i> (1966)	1 total	Marlex prosthesis
Eygelaar (1966)	8 partial	Marlex prosthesis (8)
Siderys <i>et al.</i> (1966)	1 partial	Cartilage and muscle flaps
Groff and Adkins (1967)	1 partial	Stainless steel prosthesis
Edland <i>et al.</i> (1969)	1 partial	Marlex prosthesis
Larson <i>et al.</i> (1969)	1 partial	Fascia lata + rib autotransplant
Teitelbaum and Bessone (1969)	1 partial	Muscle flaps
Froysaker and Hall (1970)	1 total	Fascia lata + rib autotransplant
Alonso-Lej and de Linera (1971)	1 total	Acrylic prosthesis
Calinog <i>et al.</i> (1971)	2 partial	Marlex prosthesis (1); muscle flaps (1)
Peabody (1971)	1 partial	Muscle flaps
Echapasse <i>et al.</i> (1972)	2 total	Rib graft + acrylic (1); acrylic (1)
Mineo <i>et al.</i> (1973)	1 partial	Iliac bone + Silastic
Vincze (1973)	7 partial	Teflon prosthesis
Zannini (1973)	1 partial	Muscle flaps
Beltrami (1974)	1 partial	Tibia autotransplant

FIG. 4. Chest film five months after operation.

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