MINIMAL-ACCESS RIGHT ATRIAL EXPOSURE FOR TUMOR EXTENSIONS INTO THE INFERIOR VENA CAVA

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The use of cardiopulmonary bypass (CPB) with deep hypothermia and circulatory arrest for clearance of tumors of the inferior vena cava (IVC) and thrombosis associated with renal or adrenal carcinomas extending into the right atrium is widely accepted. On the basis of a description by Cosgrove and Sabik¹ and Navia and Cosgrove,² who used a right parasternal incision for mitral valve repairs and aortic valve replacements, as well as our own experience,³ we attempted to use a right parasternal incision for resection of IVC tumor extensions into the right atrium.⁴ We believed this would reduce the extent of the operation and allow patients to recover more quickly after these extensive operations.⁴ This report describes our experience with 21 patients in whom we used a right parasternal incision for access to the right atrium and right subclavian artery cannulation for arterial inflow.

Methods. Between November 21, 1996, and August 7, 2000, 21 patients underwent the minimal-access approach. Seven were female and 14 male. The average age of the patients was 59.2 years (SD 15.1 years). Nineteen had renal

tumors and 2 adrenal tumors. The operative technique is described below.

After the chevron abdominal incision, the anterior aspect of the carcinoma is mobilized. However, a strict no-touch technique is used around the renal vein and the IVC to reduce the risk of any renal vein or IVC manipulation resulting in embolization of the tumor. Thereafter, an incision is made below the right clavicle and the right subclavian artery is exposed. Another incision is made along the right sternal border from the lower edge of the third rib to the lower edge of the fifth rib. The fourth and fifth rib cartilages are resected for a distance of approximately 3 cm and the right internal thoracic artery is oversewn and divided. A flap of periosteum, muscle, and pleura is retained for closing the defect and is swung laterally. The pericardium is then opened, and stay sutures are placed to expose the right atrium and IVC. An 8-mm collagen-coated graft is sewn to the right subclavian artery after heparinization and is connected to the arterial side of the CPB machine. A 2-staged venous cannula is placed in the right atrium through a purse-string suture, attempting, if possible, to swing the narrow part into the superior vena cava. The patient is then placed on CPB and cooled until the electroencephalogram shows electrical brain silence.

Once the circulation has been arrested, the right atrium is opened between stay sutures and the IVC is incised, the tumor extracted, and a sponge passed through the IVC to ensure that no potential tumor embolic material is left behind. If there is any concern about remaining tumorous material, an endo-

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Fig 1. Inflow through the right subclavian artery and right parasternal incision for minimal-access exposure to the right atrium.

scope is used to examine the IVC internally. The right atrium and IVC are then closed in two layers. If circulatory arrest time may be prolonged, antegrade flow through the subclavian artery is used to reperfuse the brain, including also selective use of an occlusive balloon in the descending aorta. The rest of the tumor is then resected while the patient is still supported by CPB. Hemostasis is obtained as much as possible on CPB by meticulous technique in the abdomen and routine administration of aprotinin at half strength.

Results. Of the 21 patients, one died postoperatively in the intensive care unit of multiple organ failure. One patient had postoperative transient nystagmus and was found to have had an old stroke. The mean CPB time was 162 minutes (SD 43 minutes) and the circulatory arrest time was 35.5 minutes (SD 15.9 minutes). The mean hospital stay was 18.4 days (SD 8.9).

Discussion. The combination of a full sternotomy and a transverse abdominal incision has, in the past, resulted in patients requiring prolonged ventilation with the attendant complications. The approach described in this brief report has contributed to improved results by reducing morbidity. Although concern has been expressed about parasternal incisions causing chest wall defects and lung herniation, we have not encountered this problem. This may be because the parasternal incision is narrow and we repair the defect with a flap. The only complication related to the parasternal incision that we have noted was a superficial infection in one patient. None of the patients has had a complication related to the subclavian artery. We have now used the subclavian artery for deep hypothermia and circulatory arrest in 42 patients with-

out any problems. In most patients, we have found it advantageous to attach an 8-mm side graft to the artery rather than to use direct cannulation. However, with heparinization there may be some oozing at the anastomosis that may need to be collected by a flexible coil sucker. Several authors have also described the use of the subclavian axillary artery for various operations with excellent results.⁵

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