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SHORT REPORT

Transoesophageal Echocardiography Guided Extraction of Renal Cell Carcinoma Extending into Suprahepatic Inferior Vena Cava: Approach via Laparotomy

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Introduction

Renal cell carcinoma extending to inferior vena cava (IVC), but not extending to right atrium is amenable to extraction without the aid of cardiopulmonary bypass (CPB), along with nephrectomy. A combined thoracotomy with laparotomy is generally warranted to obtain control of IVC proximal and distal to the tumour so as to prevent catastrophic pulmonary embolism. We report successful removal of IVC tumour with laparotomy alone, avoiding thoracotomy in cachectic patient using Foley's catheter to prevent tumor embolization under multiplane transoesophageal echocardiography (TEE) guidance.

Case Report

A 51-year-old cachectic woman (weight 50 Kg) was admitted with right renal cell carcinoma, tumour extending to IVC, as detected by CT scan and ultrasonography. Transthoracic echocardiographic examination suggested extension of tumour to IVC–right atrium junction (Fig. 1). TEE was deferred preoperatively as we had planned to use it after induction of anaesthesia. The anaesthesia was induced by standard technique. A triple lumen cannula (Certofix, B. Braun, USA) was inserted in right internal jugular vein under guidance of intracardiac ECG to avoid placement in right atrium. A long venous cannula inserted in left femoral vein revealed that IVC pressure was more than pressure in superior vena cava. A multiplane TEE probe (CFM 800, Vingmed, Netherlands) inserted in oesophagus showed the extension of tumour into IVC, with 1 cm clearance from right atrium. There was no blood flow from IVC to right atrium. Hence, it was planned to extract the IVC tumour without CPB. Right femoral artery and vein were dissected and looped at groin for institution of CPB if necessary.

Abdomen was opened by midline incision and right nephrectomy was performed. Left renal vein was looped. IVC was clamped below right renal vein after partial heparinization. There was no rise in IVC pressure after clamping. The IVC was opened between stay sutures. A Fogarty catheter was first introduced through incision and advanced to right atrium. Removal of tumour was attempted. Subsequently we introduced a 12 F Foley's catheter and inflated its bulb at IVC–right atrium junction under TEE guidance. The Foley's catheter was withdrawn in the inflated condition and back-bleed was allowed to flush out tumour thrombus (Fig. 2). Intraoperative blood loss was about 2.5 l. TEE demonstrated that the IVC was totally clear of tumour. Flow across hepatic vein was demonstrated on Doppler. Incision on IVC was repaired and IVC clamp was removed after de-airing. TEE and end tidal carbon dioxide monitoring did not detect incidence of embolism during extraction of tumor and later after reestablishment of forward flow from IVC. Ultrasonography performed postoperatively showed patent IVC up to right atrium.

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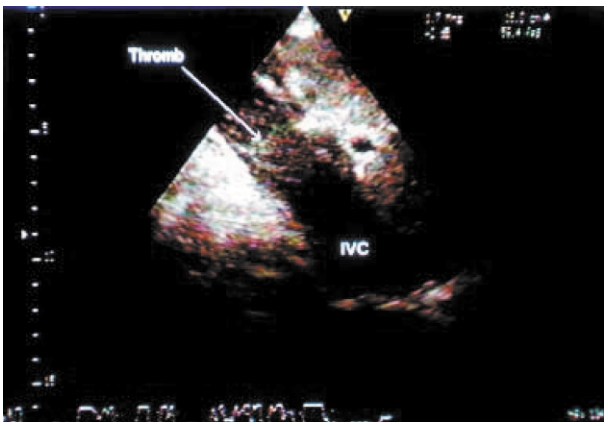

Fig. 1. Preoperative transthoracic echocardiography showing extension of tumour in the IVC.

Discussion

Renal cell carcinoma extending to right atrium demands operation, using CPB for its safe and complete extraction. CPB is not usually required unless the tumour extends into heart and requires atriotomy for removal.[1] Tumour extending to varying levels of IVC could be operated without CPB. However, CPB should be kept standby. It allows immediate support of circulation if hemodynamic deterioration occurs during surgery. We preferred to perform surgery without CPB so that we could avoid subjecting the cachexic patient to CPB with its sequelae. Obstruction to IVC because of tumour induces collateralization of IVC blood flow, which allows IVC clamping during surgery. IVC pressure was the same before and after IVC clamping in our patient.

Tumour embolism to pulmonary artery is the most serious intraoperative complication. Tumour is isolated by IVC clamping above and below the tumor, which necessitates both laparotomy and thoracotomy.[2] There are reports about use of other methods for the prevention of tumour embolism to pulmonary artery. Mobin–Uddin umbrella and Greenfield filter, which have been used previously have complications like failure of insertion, misplacement, migration and caval thrombosis. Mortality rate of 3% for Mobin–Uddin umbrella and 6% for the Greenfield filter also have been reported.[3] Mizoguchi T, et al successfully removed tumour thrombus using balloon catheter. However, the balloon was placed below hepatic venous opening in their patient, as hepatic vein was patent and occlusion of IVC at IVC–right atrial junction resulted in hypotension.[4] There was no flow from IVC to right atrium in our patient. Foley's catheter could be inserted and removed easily and fully inflated bulb of Foley's catheter could block the IVC completely. We did not expect tumour embolism or hypotension to occur during insertion and extraction using Foley's catheter. Because the tumour thrombus extending cephalad is rarely adherent, except near renal veins, it floats or is flushed out retrograde with backbleeding and gentle traction on the tumour. Back-bleed from right atrium through surgical incision could flush out the tumour fragments retrogradely in our patient. We could prevent thoracotomy in a cachexic patient.

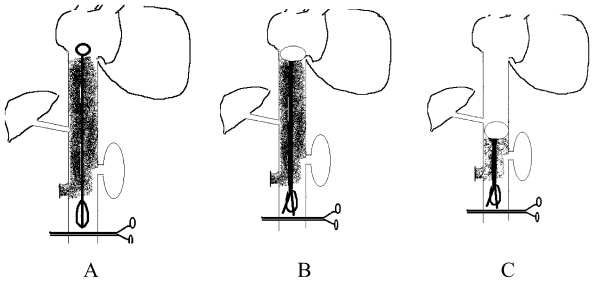

Fig. 2. Schematic diagram of steps of surgical procedure. (A) Fogarty catheter introduced in to right atrium. (B) Foley catheter with inflated balloon at IVC–right atrium junction. (C) Withdrawal of Foley catheter.

Multiplane TEE plays a major role during surgery.[5] We could assess tumour extension and defer CPB relying upon observation on TEE. Demonstration of absence of flow across IVC and correct placement of bulb of Foley's catheter into IVC–right atrium junction enabled us to complete the procedure with laparotomy alone. TEE permits early diagnosis of tumour embolism as the emboli traverse through right atrium. TEE could also demonstrate clearance of IVC of tumor and absence of embolism of tumour fragments after re-establishment of forward flow across IVC.

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