in patients with functional single ventricular physiology by one of us (E.T.) [8]. Transient shunts were performed from the superior vena cava to the right atrium or left pulmonary artery, and the results demonstrated that this technique is feasible and safe. Thus, resection of thymoma, the infiltrated part of the superior vena cava and the right atrial mass were considered to be performed via cava-pulmonary shunt, through the inferior vena cava and the main pulmonary artery. Since the right atrium was filled with mass, inferior vena cava cannulation was performed under transoesophageal control over the anterior surface of the vein (Supplementary Video 1). After the main pulmonary arterial cannulation was performed with standard techniques, air was removed and the patient was kept in the Trendelenburg position for maintaining the flow from the inferior vena cava to the pulmonary artery. There was no problem with the flow due to all venous access coming from the inferior part of the body. Haemodynamic deterioration and hypoxemia were not experienced during the shunt period.

Avoidance of cardiopulmonary bypass for the thoracic malignancy resections may help in decreasing postoperative bleeding due to systemic heparinization, and thereby, causing a decrease in the amount of transfusion, requirement of inotropic agents, and pleural effusions and may help in early extubation. Moreover, concerns about the potential systemic side effects of cardiopulmonary bypass on thoracic malignancy patients can be avoided.

This case report was presented to demonstrate an alternative technique to cardiopulmonary bypass by pass for resection of tumours that have intra-atrial extension.

**SUPPLEMENTARY MATERIAL**

Supplementary material (Video 1) is available at EJCTS online.

**Conflict of interest:** none declared.

**REFERENCES**


**EDITORIAL COMMENT**

**Superior vena cava resection and reconstruction**

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Stage III thymic tumours often represent a major challenge; however, if complete resection is accomplished, long-term survival can be comparable with that of patients with stage I and II disease [1]. Induction and adjuvant regimens may help us to achieve these results [2]. The left brachiocephalic vein, superior vena cava (SVC), right atrium, pericardium, lung and diaphragm can be safely resected with or without reconstruction. Also, resection of one phrenic nerve or reconstruction of the ascending aorta and main pulmonary artery may be required to achieve complete resection; on the other hand, invasion through the pericardium into the myocardium usually precludes resection.
Vascular reconstructions certainly pose more serious technical problems. The SVC, the brachiocephalic vein(s) and also the right atrium can be resected and reconstructed, but only if it helps to achieve complete resection. If the SVC is infiltrated for <30% of the circumference, partial resection of the wall of the vessel is usually feasible, and repair can be accomplished either by direct suture or patch reconstruction; autologous (pericardial or venous) or heterologous material (bovine pericardium) is usually employed. If a larger circumferential involvement is present, complete resection of the vessel with prosthetic reconstruction is required. This is usually accomplished by synthetic grafts [rigid polytetrafluoroethylene (PTFE)] or a tube of bovine pericardium [3, 4], the latter allows excellent long-term patency without anticoagulation. These operations represent a major technical challenge for the potential detrimental effect of clamping a patent vessel [5] and the risk of complications. Partial or complete SVC clamping of a chronically obstructed vessel is usually well tolerated. On the other hand, if complete clamping of a patent SVC is required, a marked haemodynamic imbalance may occur, with consequent increase of the mean venous pressure in the cephalic district and a reduced arterial–venous gradient within the brain. This may result in cerebral oedema, haemorrhage and damage, and potentially intra-operative lethal reduction in cardiac output. The haemodynamic derangement may be limited by a dedicated pharmacologic support, adequate intra-operative strategy and intra—or extraluminal shunt placement.

Difficult situations with direct invasion of the right atrium or intracaval—intra-atrial involvement (with or without a neoplastic thrombus) usually require the institution of cardio-pulmonary bypass (CPBP) [6–8]. In fact, transient shunts bypassing the SVC and redirecting blood flow directly into the right atrium might not be technically feasible or may not be appropriate in these situations, since the atrium must be kept empty to allow removal of both the tumour and the endovascular neoplastic thrombus with safe reconstruction.

In this issue, Toker et al. describe an interesting technique [9] allowing transient cava-pulmonary shunt with complete by pass of the circulation draining in the inferior vena cava (IVC) directly into the pulmonary artery. Systemic heparinization was not required. The Trendelenburg position and the IVC pressure itself allow flow without haemodynamic instability. This shunt is easy to set and does not pose major technical problems. In the present case, it also took advantage of the complete obstruction of the SVC and left brachiocephalic vein clearly evident preoperatively; in fact, chronic obstruction of the upper caval system has probably already favoured the onset of collaterals contributing to drain blood from one venous system to the other.

However, CPBP should not be regarded any more as a detrimental option in these patients. Clamping time is usually short; the use of pre-heparinized circuits dramatically reduces the need for systemic heparinization and reduces the risk of intra- and post-operative complications, particularly bleeding. This is nowadays clear and it has been extensively described during lung transplantation, where CPBP is instituted much more liberally [10]. CPBP should be part of the armamentarium of thoracic surgeons and we should be ready to institute it, also with the cooperation of cardiac surgeons, if required. If less invasive options are technically feasible they should be taken into consideration without adding major risks.

REFERENCES