Role of venography in assessing patients with superior caval obstruction caused by bronchial carcinoma for bypass operations

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ABSTRACT The value of venography in assessing the level of obstruction in mediastinal block and hence the selection of patients for bypass grafting is demonstrated, and an illustrative case is presented.

Superior vena caval obstruction is a particularly distressing complication of bronchial carcinoma, occurring in 4.6% of cases,¹ for which the usual method of treatment is radiotherapy. However, innominate vein to right atrial appendage bypass grafts have been used to relieve the obstruction in certain patients with severe symptoms.²

Before considering surgical treatment, it is necessary to map out the superior mediastinal venous system,³ and the purpose of this paper is to show how preoperative superior vena cavography is of value in determining the level of obstruction and whether or not there is retrograde propagation of thrombus.

Methods

Superior vena cavography is performed using a rapid sequence film-changer. The patient lies in the supine position breathing quietly throughout the examination, to eliminate any tendency to a Valsalva manoeuvre.³ The equipment required is two 30 ml syringes, each containing 25 ml of Urografin 290, and two 16-gauge needles with connecting tubes.

Injections are made by hand simultaneously into the basilic veins in both antecubital fossae, and films of the innominate veins and superior vena cava are taken at a rate of one per second for eight seconds. When caval obstruction is severe, it is necessary to raise both arms to obtain a good bolus of contrast into the innominate veins and superior vena cava.

All the 39 patients in this series were thought

to have either superior vena caval obstruction caused by tumour, or mediastinal involvement by tumour, which might be involving the superior vena cava but as yet not causing obstruction.

Results

The table shows the findings at cavography in 39 patients. Figures 1 and 2 illustrate the two main levels at which obstruction may occur.

The seven patients with obstruction by tumour involving the superior vena cava at or below the azygos vein, in all of whom symptoms were severe, were selected for bypass grafting. All these patients had rapid relief of their symptoms.

Postoperative cavography demonstrated patent grafts in six of the seven patients. In one case the graft could not be demonstrated for technical reasons, although the patient's symptoms were relieved.

Illustrative case

A 49-year-old steel fitter (RT) was first seen on 8 September 1976. He complained of swelling of the neck for three to four weeks, and pain in the head on stooping. He had signs of caval

Table 1 *Results of superior vena cavography*

Site of obstruction	Number of cases
Above the azygos vein	16
The azygos vein or SVC below it	7
Tumour involving the SVC but not obstructing it	1
SVC displaced but not obstructed	15
Total	39

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Fig 1 Obstruction of the superior vena cava and both innominate veins. Venous flow via the accessory hemiazygos system to the azygos and inferior vena cava.

Fig 2 Obstruction below the azygos vein.

obstruction (fig 3). A chest radiograph showed widening of the right side of the mediastinum and enlargement of the right hilum. Bronchoscopy and biopsy revealed an undifferentiated carcinoma. A superior vena cavogram (fig 4) showed narrowing of the superior vena cava, with involvement of the azygos vein.

At operation the mean pressure in the innominate vein was 35 mmHg and in the right atrium 2 mmHg. A 10 mm Dacron graft was

Fig 3 Patient RT before operation.

Fig 4 Venogram showing obstruction of the superior vena cava including the azygos vein.

inserted between the left innominate vein and the right atrial appendage. Mean pressures at the end of operation were 10 mmHg in the innominate vein and 2 mmHg in the right atrium. The swelling of the face and neck

Fig 5 Patient RT three days after operation.

Fig 6 Postoperative venogram showing the graft from the left innominate vein to the right atrial appendage.

rapidly subsided (fig 5). Postoperative venography showed a patent graft (fig 6). The patient had a course of radiotherapy and was then

discharged. He remained well and caval obstruction did not recur. He was eventually readmitted 11 months later with cerebral metastases, and died on 9 September 1978. At necropsy the innominate to right atrial appendage graft was still patent.

Discussion

When superior vena caval obstruction occurs, an abundant collateral circulation may open up. The efficiency of this collateral circulation determines the degree of disability. If the obstruction is above the azygos vein collateral pathways are numerous and the patient tolerates the condition better (fig 1).⁵ However, when the obstruction occludes the azygos vein or is below it, there are relatively few collateral pathways, the venous pressure is much higher and the disability is correspondingly greater. It is these patients with severe symptoms who are suitable for grafting, as the graft can be performed only when the innominate veins are patent.

Roswit *et al*⁵ report a 76% remission rate in 38 patients treated by radiotherapy, although they do not indicate the differential figures for obstruction above or below the azygos vein. None of the patients in our series had any further episodes of caval obstruction, although in Roswit's series the average duration of remission was only 14 weeks.

Patients with superior vena caval obstruction caused by tumour involvement at or below the azygos vein may have their symptoms rapidly relieved by bypass grafting. This is a palliative procedure which may be combined with radiotherapy and which improves the quality of the patient's remaining life.

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