

QUALITY ASSURANCE GUIDELINES FOR SUPERIOR VENA CAVA STENTING IN MALIGNANT DISEASE.

*Dr Raman Uberoi MRCP FRCR
Department of Radiology, The John Radcliffe Hospital, Oxford, UK*

*Dr Robert Morgan MRCP, FRCR
Department of Radiology, St George's Hospital, London UK*

INTRODUCTION

Stenting of the superior vena cava for obstruction was first described by Charnsangavej et al in 1986 (1). Since then, it has become the standard treatment for this condition. The current main clinical indication for superior vena cava stenting is the alleviation of superior vena cava syndrome (SVCO) caused by malignant obstruction of the superior vena cava. Untreated this may result in severe oedema of the upper torso and patients may suffocate due to glottal oedema. Other symptoms such as dyspnoea, dysphagia, cognitive dysfunction and severe headaches may also occur in SVCO. Malignant causes account for in excess of 90% of cases of SVCO (2). Most commonly this is due to carcinoma of the bronchus (small cell and non-small cell) affecting a 3-4% of patients with bronchogenic cancer. SVCO appears to be more common with squamous cell carcinoma (SCLC) than non squamous cell carcinoma (NSCLC). The incidence of SVCO at diagnosis in a recent review was 10% for SCLC and 1.7% for NSCLC (3). Less commonly lymphoma, metastatic disease and other intrathoracic tumours such as mesothelioma and thymoma may be responsible.

The diagnosis of SVCO is usually made clinically at first. The most common features are neck swelling, unilateral or bilateral arm swelling and distended veins over the chest (4,5). Shortness of breath, hoarse voice and headache may also be caused by SVCO although these symptoms may arise from other manifestations of lung cancer. Superior vena cava obstruction results from the compression of the superior vena cava (SVC) by either a tumour arising in the right main or upper lobe bronchus or by large volume mediastinal lymphadenopathy. Symptoms tend to be more severe when the SVC is obstructed below the entry of the azygos vein. Contrast enhanced spiral or multi-slice computed tomography (CT) can identify with accuracy the site of obstruction and the presence of thrombosis. Impending SVCO may be also be apparent on CT or MRI imaging prior to the development of symptoms (6). Venography, which is usually carried out as a prelude to stenting is the gold standard for the detection of SVCO and also demonstrates the extent of any thrombus formation.

In the past, SVCO has been considered a medical emergency in all patients. For the majority of patients, this is now believed not to be the case as outcome is unrelated to duration of symptoms (7,8). The severity of symptoms of SVCO is increased by airway obstruction from laryngeal or bronchial oedema or coma from cerebral oedema. If patients with SVCO present with depressed CNS function or dyspnoea, stenting should be performed emergently. Other treatments such as steroids and radiotherapy although effective for SVCO, take time to work (9-12). Stenting of malignant SVCO provides rapid relief of symptoms and should be performed if severe symptoms of SVCO occur (12-52).

INDICATIONS

SVCO syndrome due to malignant obstruction of the superior vena cava.

CONTRAINDICATIONS

There are no absolute contraindications.

Relative:

Malignancies with a very good chance of cure or remission.

Benign disease – stenting should be avoided if at all possible because patients have long life expectancies and occlusion of the stent would be expected during long-term follow-up.

TECHNIQUE

The procedure is usually performed using conscious sedation and local anaesthesia. Standard monitoring should be used with assessment of the heart rate, blood pressure (BP), oxygen saturation and electrocardiography. Superior vena cavography should be performed first to confirm the disease extent and define the landing zones for stents ie patency of brachiocephalic veins and or proximal and distal SVC. Most operators prefer to use either the femoral vein or jugular vein as access sites. The basilic or subclavian veins can also be used as access if the operator prefers, or if the standard access sites are unavailable or occluded (13). Ultrasound is generally used when the jugular vein is used for access. Ultrasound should also be used for difficult punctures at other sites.

Many interventionalists administer heparin as a bolus of 5,000 units of heparin during the procedure, however this is not universal (14). If there is extensive thrombus, local thrombolysis can be carried out to reduce the length of the obstruction and hence the number and length of stents required, and the risk of emboli (15-20). Thrombus can also be removed by mechanical thrombectomy although this technique is used less than thrombolysis.

The obstruction can usually be crossed using a combination of selective catheters e.g. cobra, Berenstein, multipurpose (all Cordis, Johnson and Johnson, NJ), and a variety of standard or hydrophilic guidewires (e.g. Terumo glidewire [Terumo, Japan], Bentsen [William Cook, Bjaeverskov, Denmark]). If it is not possible to traverse the stricture from one direction (e.g. from a femoral vein access), the other direction (i.e. access from the jugular vein) should be tried. Once the lesion has been traversed, the standard or hydrophilic guidewire should be exchanged for a 180cm long or 260cm long stiff or ultrastiff guidewire.

Pre-dilatation of the stricture may be necessary, to allow passage of the stent delivery system, but should not be done if there is residual thrombus. There is no consensus on the size of balloon required for predilation (21, 22,23, 24). Most interventionalists either use a diameter of balloon equivalent to the vein being dilated or use a smaller balloon just to facilitate passage of the stent delivery system. Care should be exercised when performing balloon dilation because venous rupture is an uncommon, though occasionally catastrophic occurrence (24). Rupture of the SVC may result in cardiac tamponade. For this reason, facilities for pericardial drainage should be available in the room to allow emergent pericardiocentesis in case of cardiac tamponade after rupture of the central veins.

There appears to be no significant difference in the published outcomes of the three most commonly used stents, the Gianturco Z stent, the Palmaz stent (Johnson and Johnson, Warren, NJ,USA) and the Wallstent (Boston Scientific, Natick ,MA,USA)(25-28). Most interventionalists use self-expanding stents due to their greater length, and improved adaptability to the curves of the vessels. There are several new self-expanding stents available (e.g. Luminex, Bard Angiomed, Karlsruhe, Germany), Smart (Cordis), although there is little data on their use in the SVC.

A stent of sufficient length should be selected to cover the occlusion with at least 10 mm free at both ends to extend beyond the obstruction. More than one stent should be used if adequate coverage cannot be achieved with a single stent. The roadmap feature is useful to guide accurate deployment of the stent and should be used if available on the angiography equipment. The roadmap should be performed using injections from both sides of the obstruction, if sufficient visualisation of both sides cannot be achieved with a single injection from above the lesion. Where there is obstruction of both brachiocephalic veins and the SVC, it is sufficient to relieve the obstruction in one of the brachiocephalic veins with collateral veins enabling drainage from both sides. Although advocated by some interventionalists, there are reports suggesting that stenting of both brachiocephalic veins may result in higher complication rates and lower survival (12,14,29). Dilation of the stent after deployment is often required to assist full stent expansion. A completion venogram is carried out to confirm satisfactory position of the stent with free venous drainage and exclude venous rupture.

AFTERCARE

Patients should remain in bed for at least two hours after the procedure. Patients should be monitored regularly with pulse and BP monitoring every 15 minutes for the first hour, then half hourly for the second hour.

The need for long-term anticoagulants remains unclear. Although full anticoagulation has been carried out by many authors to prevent stent occlusion for periods of 1-9 months (19, 28-30), this remains controversial with some advocating simple antiplatelet regimes (14,31). There are no routine follow up imaging protocols in the literature other than plain films to assess stent expansion and as a baseline in case of future stent migration (14,28,32). Most patients are usually followed up clinically by their referring clinicians. Repeat venography should be carried out if symptoms recur. If recurrent obstruction is present, patients should undergo repeat stenting.

OUTCOMES (table 1)

The technical and clinical success rate of SVC stenting is high. Technical success is in the range of 95-100% and stents relieve SVCO in 80-95% of patients. Reported recurrence rates vary between 0-40% during follow-up (3 days to 8 months), however in a high proportion of these patency is restored with re-intervention (12-52). These results compare favorably with the results of chemotherapy or radiotherapy. A recent review concluded that stenting seems to be the most effective and rapid treatment for the relief of symptoms (3).

COMPLICATIONS (table 1)

Peri procedural and post procedural complications are low occurring in 0-19% of patients (12-52). These include SVC rupture, hemorrhage, haemoptysis, epistaxis, pericardial tamponade, cardiac failure, recurrent laryngeal palsy, stent migration, pulmonary emboli and groin haematoma. Overall these compare very favorably with treatment with chemotherapy and radiotherapy (3).

CONCLUSION: Superior vena cava stenting, has become widely accepted in the management of malignant superior vena cava obstruction. Outcomes and complications compare very favorably with standard therapies such as chemotherapy and radiotherapy.

Table 1 (12-52)

	Technical success	Clinical success	Recurrence	Complications	Mortality
Range	95-100%	80-95%	0-40%	0-19%	3-4%
Mean	99%	96%	13%	5.8%	3.3%

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