

Endovascular stenting in neoplastic superior vena cava syndrome prior to chemotherapy or radiotherapy

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ABSTRACT

Background: The standard conventional palliative treatment of choice for patients with neoplastic superior vena cava syndrome (SVCS) is chemotherapy, radiotherapy or surgery. In our study, palliative stenting was used as a first-line therapeutic measure in all cases using self-expanding stents prior to any antitumour therapy.

Methods: 17 patients, 10 men and 7 women, all of whom presenting with the clinical diagnosis of SVCS confirmed by phlebography combined with CT, were referred for stenting of the superior caval vein. All procedures were performed after local anaesthesia without sedatives or general anaesthesia in the angiosuite at the radiology department. Symptom response was evaluated directly after the procedure at several intervals by clinical and nursing staff.

Results: 19 self-expanding Symphony® stents were successfully implanted in 15 of 17 cancer patients with SVCS in a period of five years. All 15 individuals remained free from SVCS after the successful stenting procedure. No stent-related complications occurred.

Conclusion: This study demonstrates that palliative SVC stenting prior to any antitumour therapy is feasible, easily performed without serious complications and provides a quicker symptom response than obtained with radiation therapy or chemotherapy alone. Primary stenting also provides the opportunity to establish a correct diagnosis before starting antitumour therapy.

facial oedema and severe headache.¹ These symptoms are the result of venous hypertension in veins draining the upper extremities, thorax and head to the right atrium, due to significant narrowing or occlusion of the superior caval vein. The superior vena cava syndrome (SVCS) is caused predominately by malignancy (74 to 95%) and usually occurs at advanced stages of neoplastic disease.² Most common malignancies encountered are bronchogenic carcinoma and lymphoma.

Traditionally, the treatment of choice for patients with SVCS due to malignancy is radiotherapy, chemotherapy or surgery.³ Initial success rates after radiotherapy and/or chemotherapy do not exceed 90%.^{4,5} If standard conventional treatment reduces neither tumour volume nor caval compression, endoluminal stenting may be employed as an additional treatment to restore vessel lumen and prevent tumour or thrombotic occlusion.

In our study, palliative stenting was used as a first-line therapeutic measure in all cases using self-expanding stents prior to any radiotherapy and/or chemotherapy. We investigated feasibility, duration, complications and time to response of the therapy of stenting prior to radiation therapy or chemotherapy.

PATIENTS AND METHODS

Patients

During a period of five years, 17 patients (ten men) with SVCS of neoplastic origin were referred for stenting of the superior caval vein. All patients presented with the clinical

INTRODUCTION

Obstruction of the superior caval vein may cause many symptoms such as cough, orthopnoea, dyspnoea, plethora,

diagnosis of SVCS confirmed by phlebography combined with CT (figures 1 and 2). The mean age was 65 years (range 43 to 78).

Seventeen patients had superior caval vein obstruction of more than 90% according the Stanford classification (table 1).⁶ They suffered from evident clinical venous obstruction symptoms and venous collateral pathways, proven by CT or phlebography, and were considered to be eligible to undergo the procedure. Informed consent was obtained.

Our patients had SVCS caused by various tumour types. None of the 17 individual patients had received chemotherapy or radiotherapy prior to the stenting procedure. The causes of caval obstruction were small cell lung carcinoma in six, non-small cell lung carcinoma in five patients, mediastinal adenopathy due to breast cancer in two, large B-cell non-Hodgkin lymphoma in one patient, leiomyosarcoma in one individual and of unknown origin in two patients. Exclusion criterion was the presence of a proven complete vessel occlusion.

Methods

All procedures were performed after local anaesthesia without sedatives or general anaesthesia in the angi suite at the radiology department. Oxygen saturation, blood pressure, electrocardiograms, and pulse were continuously monitored. To ensure proper measurement and evaluation of the degree and extent of the VCS stenosis, we used digital subtraction equipment and spiral CT (Philips Medical Systems, Eindhoven, the Netherlands); CT parameters: 7 mm slices, 7 mm reconstruction, pitch 1.4, 100ml I/I Omnipaque® contrast medium.

The right femoral or brachial vein was used both for the phlebography as well as for stent insertion. We used a 7 French introduction system for the vein selected for stent insertion.

Symphony® (Boston Scientific, Natick, MA, USA) stents we employed in all patients. The self-expanded Symphony® stent diameter was 14 mm and in-stent length 4 or 6 cm. Further, we used a multipurpose catheter and a hydrophilic stiff Terumo guidewire (Terumo Europe N.V., Leuven, Belgium, Europe) to manage the stenotic caval vein. When necessary for better stent deployment (figures 3 and 4) we dilated using angioplasty balloons (Cordis Corporation, Miami, FL, USA) with a diameter range from 12 to 14 mm. No antibiotics were used. Heparin was not administered before or after the procedure.

Average contrast medium use was 150 ml 300 mg I/I Omnipaque. Postprocedural stent position, stent deployment and migration were evaluated by venography and chest radiographs and/or CT (figure 5).

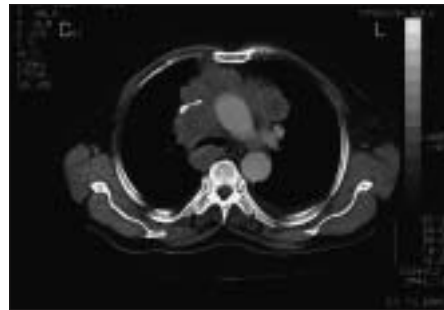


Figure 1
Spiral CT of patient presenting with symptoms of SVCS due to mediastinal adenopathy (breast cancer)

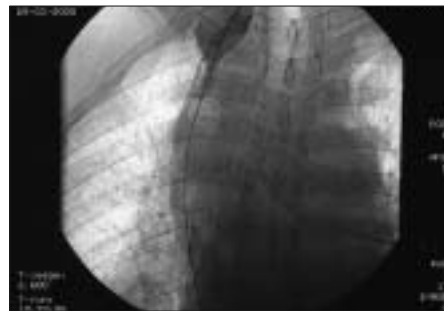


Figure 2
Phlebographic image of patient presenting with symptoms of SVCS due to mediastinal adenopathy (breast cancer)

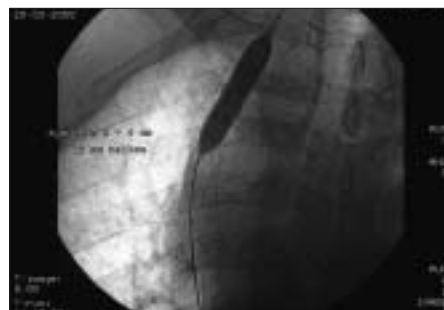


Figure 3
Phlebographic image of deployment by angioplasty balloon of Symphony stent in superior vena cava



Figure 4
Postprocedural result of deployment by angioplasty balloon of Symphony stent in superior vena cava



Figure 5

Follow-up spiral CT image of same patient after antitumour therapy

Clear regression of the mediastinal adenopathy and good sealing of the stent against the vessel wall without any migration is seen.

Postprocedural evaluation of symptom response before/after radiotherapy/chemotherapy

Vena cava repermeability was evaluated by monitoring symptom response. Symptom response was directly assessed after the procedure and further, at several intervals thereafter. The clinical and nursing staff of the radiology, internal medicine and pulmonary disease departments evaluated the symptom response.

RESULTS

Between August 1996 and July 2001, 19 self-expanding Symphony® stents were successfully implanted in 15 of 17 cancer patients with SVCS (*table 1*). In all 15 patients, correct positioning of the stents was achieved. No balloon angioplasty had been performed prior to stent placement.

Table 1

Characteristics and results of stenting with regard to relief of symptoms and survival

PATIENT	SITE STENOSIS	STANFORD CLASSIFICATION	RELIEF OF SYMPTOMS (TIME AFTER STENTING)	TUMOUR THERAPY	CLINICAL COURSE AND SURVIVAL AFTER STENTING
1	Left anonyma, VCS	IV	Yes (3 hours)	Radiotherapy	†, 31/2 months, respiratory insufficiency
2	VCS	III	Yes (12-24 hours)	Chemotherapy	†, 14 months, progression of disease
3	Right anonyma, VCS	II	Yes (1 hour)	Chemotherapy	Alive, 48 months +, complete/partial remission
4	VCS	II	Yes (12-24 hours)	None	†, 3 months
5	VCS	II	Yes (1 hour)	Not possible	†, 5 days, tumour progression dislocation of stent
6	Right anonyma, VCS	III	Yes (6-12 hours)	-	†, 4 days, respiratory insufficiency
7	Right and left anonyma, VCS	III	Yes (1 hour)	Chemotherapy	†, 10 days, progression of disease
8	Right and left anonyma, VCS	IV	Yes (6-12 hours)	Chemotherapy	†, 5 months, progression of disease
9	Right and left anonyma	IV	No, stenting not possible VCS completely occluded	Radiotherapy	†, progression superior VCS respiratory insufficiency
10	Right and left anonyma, VCS	-	No, stenting not possible thrombosis v. subclavia/ left v. anonyma	Radiotherapy	†, progression superior VCS and disease
11	Right and left anonyma, VCS	III	Partial (24-48 hours)	Chemotherapy	†, 3 months, sepsis after haemotherapy
12	Right and left anonyma, VCS	III	Yes (2 hours)	Chemotherapy	Alive, 39 months +, complete remission
13	VCS	II	Yes (4 hours)	Radiotherapy and chemotherapy	†, 8 months, progression of liver metastasis
14	Right and left anonyma, VCS	III	Yes (5 hours)	Chemotherapy	†, 16 months, progression of disease
15	VCS	III	Yes (1 hour)	Chemotherapy	†, 12 months, progression of disease
16	Right and left anonyma, VCS	III	Yes (2 hours)	Chemotherapy	†, 14 months, progression of disease
17	Right and left anonyma, VCS	III	Yes (12-24 hours)	-	†, 14 days, respiratory insufficiency

VCS = vena caval syndrome.

One patient with chronic SVCS had two unsuccessful recanalisation procedures (by femoral and brachial approach) due to complete obstruction. One patient achieved a successful repermeability by thrombolysis of extensive thrombosis in the superior caval and anonymamal vein. Endovascular follow-up treatment was no longer necessary. The longest distance stented in SVC was approximately 10 cm, requiring two self-expanding Symphony[®] stents, each with a length of 6 cm.

Six of the 17 patients presenting with SVCS were known to have a malignancy. Their malignancy had progressed before the SVCS developed.

In the remaining 11 patients, the cause of SVCS could only be established in three patients. In the other eight patients appropriate diagnostic procedures could not be performed before stenting SVCS. In seven of these eight patients, however, it was possible to perform diagnostic procedures within 24 hours after stenting to reveal the cause of SVCS.

In 14 of the 15 patients who underwent a successful stenting procedure total relief of symptoms was achieved within 24 hours after stenting (in most patients within six hours). One of the 15 individuals had partial relief of symptoms after 48 hours (*table 1*).

Complications

One patient showed partial migration of the stent without any consequences. This patient had a stent migration to the right atrium; the migration occurred before any additional antitumour therapy.

Cardiac arrhythmia (SVT) was seen in one patient during as well as after the procedure. This patient was treated temporarily with antiarrhythmic drugs in the intensive care unit. After the stenting procedure, three patients could not be treated with additional antitumour therapy as, despite stenting, their conditions did not allow the application of any available treatment.

Follow-up

The follow-up of these patients ranged from four days to four years. Of the 15 patients treated, two patients are still alive, 39 and 48 months, respectively, after stenting (*table 1*). All 15 individuals remained free from SVCS after the successful stenting procedure. Despite progression of disease in 13 of these 15 patients, no signs of SVCS were observed until death.

DISCUSSION

SVCS has long been, and sometimes still is, considered a potentially life-threatening medical emergency. The goals of treatment of SVCS are to relieve symptoms and to attempt to cure the primary malignant process.

As about 60% of patients develop SVCS before the primary diagnosis has been established several diagnostic procedures are considered in these patients. Although bronchoscopy, mediastinoscopy, thoracotomy, and percutaneous transthoracic CT-scan guided fine-needle biopsy seem to be less hazardous than was thought in the past, it remains difficult to perform these diagnostic procedures in many patients because of the gravity of symptoms, as has been confirmed in our patients. For that reason radiotherapy/chemotherapy is often applied before histological diagnosis of the primary lesion has been established.

Although radiotherapy/chemotherapy is able to achieve a relief of symptoms, the onset of this relief is late and amelioration is often incomplete. Moreover, radiotherapy/chemotherapy may disturb the microscopic judgement of biopsies. Despite the limited numbers, our study clearly demonstrates that palliative SVC stenting prior to additional therapy is feasible, easily performed without complications and provides a quicker response (hours-days) than obtained with radiation therapy or chemotherapy alone (weeks) as mentioned in other studies.⁷⁻¹⁰ Primary stenting also provides the opportunity to establish a correct diagnosis before starting antitumour therapy.

More research is needed to determine the long-term results of endovascular treatment and to find its role in benign and malignant disease.

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