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Original Article

Stent Placement for the Treatment of Malignant Superior Vena Cava Syndrome—A Single-Center Series of 56 Patients☆

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ABSTRACT

Objective: To report a series of stenting procedures for the treatment of malignant superior vena cava (SVC) syndrome.
Material and methods: A review conducted from October 2005 to July 2013 retrieved 56 consecutive patients treated for symptomatic malignant SVC syndrome with stenting.
Results: SVC stenting was attempted in 56 patients (46 males, 10 females), aged 34–84 years (mean 59.3). The success rate was 49/57 (86%). Success was associated with the type of obstruction and was classified as follows: group 1 (a—SVC stenosis, or b—unilateral innominate vein occlusion with contralateral innominate vein stenosis and normal SVC), group 2 (SVC occlusion excluding bilateral innominate vein occlusion) and group 3 (bilateral innominate vein occlusion irrespective of SVC status). Success rates were 100% (39/39), 75% (9/12) and 16.6% (1/6), respectively. These differences were significant for group 1 versus group 2+3 (P<.001) and for group 2 versus group 3 (P=.032). Acute complications occurred in 9 patients. Patients in whom acute complications occurred were older than the others (67.8 vs 57.6 years, P=.019). Procedure-related death rate was 3.5% (n=2). Stent occlusion occurred in 3.5% (n=2). Patient survival was poor (median 2.6 months; range <1–29.6 months), independent of the success of stenting.
Conclusions: Stenting for malignant SVC syndrome provides immediate and sustained symptomatic relief that lasts until death in this set of patients with a short life expectancy and restores the central venous access for administration of chemotherapy. Technical failure was associated with SVC occlusions and primarily with bilateral innominate vein occlusion.

Implantación de endoprótesis para el tratamiento del síndrome de vena cava superior maligno: serie de 56 pacientes de un solo centro

Palabras clave:
Síndrome de vena cava superior
Endoprótesis
Neoplasia de pulmón

RESUMEN

Objetivo: Presentar una serie de intervenciones de implantación de endoprótesis para tratar el síndrome de vena cava superior (VCS) maligno.
Material y métodos: En una revisión del periodo comprendido entre octubre de 2005 y julio de 2013 se identificaron 56 pacientes consecutivos tratados por un síndrome de VCS maligno sintomático mediante implantación de endoprótesis.
Resultados: La implantación de endoprótesis en la VCS se intentó en 56 pacientes (46 varones, 10 mujeres) de 34-84 años de edad (media 59,3). La tasa de éxitos fue de 49/57 (86%). El éxito se asoció al tipo de obstrucción agrupada de la siguiente forma: grupo 1 (a: estenosis de VCS, o b: oclusión de vena innominada unilateral con estenosis de vena innominada contralateral y VCS normal), grupo 2 (oclusión de VCS y exclusión de oclusión de vena innominada bilateral) y grupo 3 (oclusión de vena innominada bilateral con independencia del estado de la VCS). Las tasas de éxito fueron del 100% (39/39), del 75% (9/12) y del 16,6% (1/6), respectivamente. Estas diferencias eran significativas: grupo 1 frente a grupo 2 + 3 ($p < 0,001$) y grupo 2 frente a grupo 3 ($p = 0,032$). Se produjeron complicaciones agudas en 9 pacientes. Los pacientes en los que se dieron las complicaciones agudas fueron de mayor edad que los demás (67,8 frente a 57,6 años, $p = 0,019$). Hubo muertes relacionadas con la intervención en el 3,5% (n = 2). Se produjo una

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oclusión de la endoprótesis en el 3,5% (n = 2). La supervivencia de los pacientes fue baja (mediana 2,6; rango <1-29,6 meses) e independiente del éxito de la implantación de endoprótesis.
Conclusiones: La implantación de endoprótesis para el síndrome de VCS maligno proporciona un alivio sintomático inmediato y sostenido que persiste hasta la muerte en este grupo de pacientes con una esperanza de vida corta y restablece el acceso venoso central para la administración de quimioterapia. El fallo técnico se asoció a oclusiones de la VCS y sobre todo a una oclusión de la vena innominada bilateral.

Introduction

Superior vena cava (SVC) syndrome is caused by an obstruction in the veins returning from the head, neck and upper extremities to the right atrium of the heart. The obstruction may occur in the SVC or in both innominate veins. Around 95% of the cases are caused by malignant tumors and the remaining 5% are due to benign disorders. Malignant SVC syndrome occurs in 3%–5% of patients with advanced intrathoracic malignancies.[1] The obstruction of venous drainage is a consequence of the SVC being compressed by a tumor in the right primary bronchus or the right upper lobe, or by a large mediastinal lymphadenopathy of the right precarinal or paratracheal lymph nodes.[2] This may lead to secondary venous thrombosis. SVC invasion is rare. Clinical manifestations consist of edema of the face, the periorbital and cervical regions and both upper extremities, dilation of superficial veins and facial redness, dyspnea, cough, snoring, dysphagia, headache, blurred vision and cognitive changes. It may lead to death and coma resulting from cerebral edema or airway obstruction due to glottal or bronchial edema. Severity depends on the degree of obstruction and the speed of onset. Treatment is palliative. Medical treatment includes the use of diuretics, corticosteroids and anticoagulants. Chemotherapy and radiotherapy take about 3 weeks to become effective and have significant side effects. The success rate of these procedures is 77% in small cell lung cancer (SCLC) and 60% in non-small cell lung cancer (NSCLC), with recurrence rates of 16.5% and 11%, respectively.[3] Stenting procedures compare favorably with these approaches, since they provide risk-free relief in less than 72 h, with a success rate of 95%. The recurrence rate is 11% but this can be treated with re-intervention. Long-term patency is 92%.[3] Surgical treatment is not an option in patients with short life expectancy and poor general condition.

Materials and Methods

A review was carried out between October 2005 and July 2013 (retrospectively until October 2008 and prospectively from then on). Fifty-six (56) consecutive patients were identified who had received treatment for symptomatic malignant SVC syndrome with 57 SVC stent placements. SVC stenting was the first line of treatment offered to all patients with malignant SVC, regardless of the available tumor histology or the current or foreseeable use of chemotherapy or radiotherapy. Patients were excluded if they could not remain in decubitus or semi-decubitus position (n=2), if they had asymptomatic SVC detected on computed tomography (CT) (n=3), and if they had SVC of benign origin (n=2). Clinical diagnosis was confirmed by CT. An anteroposterior chest X-ray was performed the day after stenting to confirm positioning and expansion. A CT was performed if clinically indicated. Data were retrieved from clinical records and the National Death Registry. None of the patients were lost to follow-up.

Statistical Analysis

Variables associated with the success rate (SR) and complications were analyzed using the Fisher exact test for categorical variables and the *t*-test for continuous variables. A multivariate logistic regression analysis was used. The confidence intervals (CI) for the SR values were calculated using a binomial distribution model. Survival was estimated using the Kaplan–Meier method and an analysis of related variables was performed using the log-rank test. A *P*-value <.05 was considered statistically significant. The statistical analysis was performed using SPSS Statistics 20.0 software.

Procedure

SVC stenting was performed in the operating room with a portable digital imaging system (Philips, BV Endura). The SVC obstruction was generally approached via a femoral vein access using a PTFE-coated guidewire with a J-tip or a standard hydrophilic angled 0.035-inch guidewire, with the support of a vertebral catheter or multi-purpose 5F Berenstein catheter oriented with anatomical reference points. An initial digital subtraction venogram was performed after passing the obstruction, via the catheter situated in a superior location in the innominate or jugular vein. An intravenous bolus of heparin 5000 IU was then injected. For very narrow lesions, balloon dilation was employed before stent placement. Stent size was determined from the CT and venogram during the procedure. Obstruction in both innominate veins was treated with unilateral stent placement, as described elsewhere.[4] The side for recanalization was the side with a patent jugular vein. If both jugular veins were patent, the right side was preferred, since its trajectory is straight. Balloon dilation was performed after deployment until a diameter of 12–18 mm was achieved. After completion of the procedure, a venogram was performed to evaluate flow and diameter of the SVC and the pulmonary arteries (Fig. 1). The patients were discharged with a prescription for enoxaparin 40 mg and acetylsalicylic acid 100 mg/day for life. If there was associated thrombosis, enoxaparin was administered at full therapeutic doses for at least 3 months, followed by a dose of 40 mg. Patients with bleeding complications did not receive anticoagulation or anti-platelet treatment for a variable period of time.

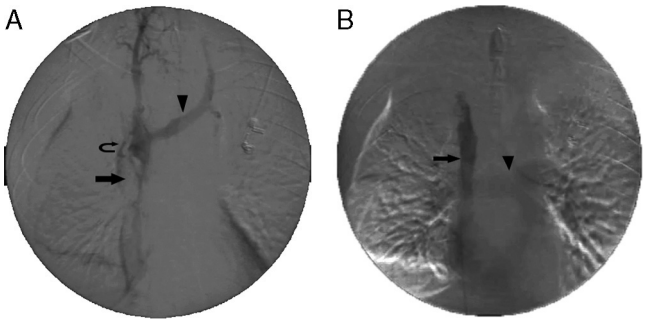

Fig. 1. Stent placement in the superior vena cava (SVC). (A) Initial venogram obtained via the femoral access with the catheter tip placed in the right innominate vein, showing SVC occlusion (arrow), retrograde filling of the left innominate vein (arrowhead) and collateral circulation (curved arrow). (B) Final venogram after placement of a 14 × 60 mm stent in the SVC (arrow). The left innominate vein and contralateral circulation can no longer be seen. The increased return of venous blood to the SVC and the right atrium leads to pulmonary artery filling (arrowhead).