Simultaneous placement of filters in inferior vena cava and superior vena cava

Implante Simultâneo de Filtro de Veia Cava Inferior e Superior

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INTRODUCTION

Venous thromboembolism (VTE) is an important cause of morbidity and mortality all over the world[1]. The most fatal complication of VTE is pulmonary embolism (PE), which is responsible for 240 thousand deaths every year in the United States[2]. In the majority of patients, PE arises from deep veins of the lower limbs (LLs)[3,4], but they can also be a complication secondary to deep vein thrombosis (DVT) of the upper limbs (ULs) in 12 to 16% of cases[5,6], leading to death[7]. Anticoagulation is the standard treatment for VTE[8], usually effective and associated with low risk of major bleeding. However, in certain situations this risk is high, for example in patients with thrombocytopenia, gastrointestinal tract hemorrhages or conditions involving the central nervous system, such as strokes, among others. Furthermore, there are also cases in which anticoagulant treatment fails and the DVT progresses to proximal veins or to PE despite adequate levels of anticoagulation[9]. In such cases, placement of an inferior vena cava filter (iVCF) is recommended[10-14].

Insertion of an iVCF is indicated for around 8% of patients with lower limb DVTs and the procedure is considered safe and effective[11,14,15]. Notwithstanding, placement of these devices is reported to have a 5% rate of complications such as fractures, migrations, thrombosis or perforation of the vena cava[11,14,16] and a 5.6% rate of failure to prevent a clinically significant PE[14].

Upper limb DVTs account for 10% of DVT diagnoses[17,18] and their prevalence has been increasing because of wider use of venous catheters in the deep vein system of ULs[19].

Placement of superior vena cava filters (sVCF) is controversial, but has been suggested as an alternative treatment option for cases in which anticoagulation and fibrinolysis are contraindicated[20-22]. The placement technique is more difficult because the superior vena cava (SVC) is shorter than the IVC, meaning that correct placement demands greater precision. Although uncommon, there are descriptions of complications of sVCF placement, including migration of the device to the atrium, perforation of the SVC or incorrect fixation and selection of the right innominate vein[23]. Simultaneous insertion of both sVCF and iVCF, based on the indications commonly accepted for DVT of ULs and LLs in isolation, is even more controversial and there are few clinical studies of the technique[24].

PART I – CLINICAL SITUATION

A sixty-year-old male smoker (180 pack-years) with chronic obstructive pulmonary disease (COPD) and a reformed drinking habit, sought medical care for the first time at our hospital's Emergency Room (ER) complaining of dry cough, dyspnea and 8 kg weight loss lasting 30 days. He also described pain and edema of the left lower limb (LLL) with spontaneous onset 7 days previously. Physical examination revealed tachycardia (160 bpm), dyspnea and blood pressure at 90×60 mmHg, plus asymmetrical edema of the LLL. An electrocardiogram (ECG) revealed atrial flutter, which was controlled with diltiazem, leading to clinical improvement of tachydyspnea. Duplex ultrasound (USD) found occlusive DVT of the popliteal and fibular veins in the LLL, and indicated that the right lower limb (RLL) was free from DVT. Full anticoagulation was initiated with

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standard treatment for the DVT in the LLL, using enoxaparin (1mg/kg every 12 hours) and warfarin. The patient was discharged after the desired level of anticoagulation had been achieved (INR between 2 and 3) without suffering further intercurrent conditions.

Fifteen days after hospital discharge, he returned to the ER with sudden dyspnea in response to minimal effort, starting 6 days previously. On physical examination he exhibited tachycardia (160 bpm), dyspnea, facial flushing, jugular distension 3+/4+ to the left, collateral venous circulation in the left thorax, hepatomegaly, asymmetrical edema in the left upper limb (LUL), slow perfusion in the left hand and the asymmetrical edema of the LLL that he had presented previously. Anticoagulation levels were adequate. A provisional diagnosis was made of DVT of the LUL with PE and the patient was admitted once more for diagnostic investigation and treatment.

Venous USD showed occlusive DVT in the brachial, axillary and subclavian veins of the LUL, and of the subclavian and axillary veins in the right upper limb (RUL). Helical computed angiotomography of the thorax produced images suggestive of lymphoma involving paraaortic lymph nodes and confirmed PE with infarction of the upper right lobe, thrombosis of the brachiocephalic veins and a small section of the superior vena cava (a deep thrombosis). There was no evidence of extrinsic compression of proximal UL veins or of the SVC (Figure 1).

Faced with such a situation, there were a number of treatment possibilities: a) fibrinolytic treatment; b) maintenance of anticoagulation; c) Insertion of filters in both superior vena cava and inferior vena cava.

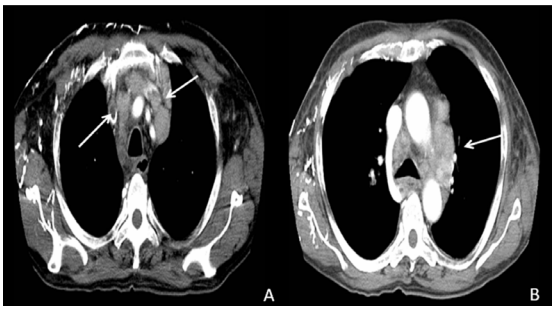

Figure 1. AngioCT of the thorax (venous phase): A – DVT in right and left Brachiocephalic Trunks (arrows). B – DVT of Azygos Vein and tumoral invasion of lymph glands around thoracic vessels (arrows).

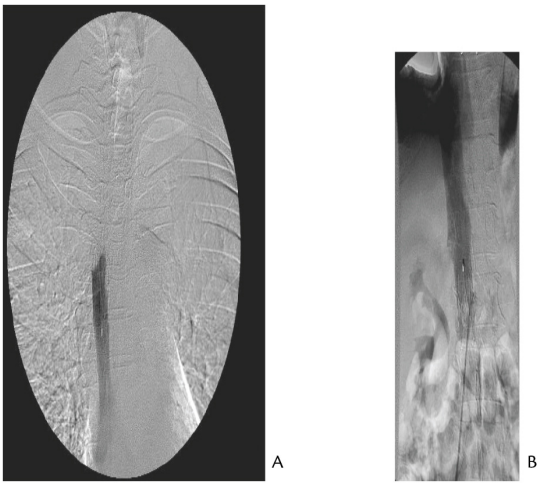

Figure 2. Phlebography: A – Control for sVCF placement (inverted position). B – Control for iVCF placement.

PART II – WHAT WAS DONE

The option chosen was insertion of filters in both superior vena cava and inferior vena cava.

The procedure was performed by catheterization of the right common femoral vein (RCFV) and, first, release of a Venatech® VCF into the superior vena cava in the inverted (jugular) position, followed by release of an identical device into the infrarenal inferior vena cava in the routine (femoral) position. These procedures were conducted with the aid of phlebography before and after insertion. On the basis of phlebography, the operation was technically successful and there were no complications (Figure 2).

A thorough work up was conducted including laboratory tests, abdominal CT, transesophageal echocardiogram, upper digestive endoscopy (EDA) a fine needle aspiration biopsy taken of a cervical lymph node.

While in hospital, the patient was maintained on anticoagulation with low molecular weight heparin at therapeutic dosages. The RUL suffered an erysipelas infection and antibiotic therapy was initiated. Over the course of 5 days, right hand perfusion worsened and sustained cyanosis of the third, fourth and fifth fingers, even though there was adequate arterial flow to the palm, according to Doppler. Clinical status, mainly respiratory status, worsened progressively, preventing any further intervention procedures.

The patient suffered persistent hypoxemia, tachycardia and dyspnea throughout his time in hospital and died 15 days after the filters had been placed. An autopsy was conducted and death was attributed to a malignant tumor of the mediastinum (carcinoma with little differentiation), of probable

thymic origin, which was later confirmed by immunohistochemical testing of the fine needle biopsy material. Contributing factors included metastatic invasion of the peribronchial lymph glands, bilateral metastases to the adrenal glands, lymphangitis carcinomatosa of the esophagus and PE with thrombi with an organized appearance.

DISCUSSION

The current case was defined as an anticoagulation treatment failure (the patient suffered PE while adequately anticoagulated), with proximal progression to thrombosis affecting the ULs and deep thrombi in the SVC, which is why this alternative was not indicated in isolation. Fibrinolysis was not considered an appropriate treatment choice because of the deep thrombus in the SVC and the very extensive DVT in the ULs and LLL, in addition to the potential neoplastic nature of the thrombus.

Placement of an iVCF is considered a safe and effective protection against PE[12,14]. In contrast, there are features of sVCF insertion that make the release technique difficult, primarily due to the shortness of the SVC[20]. In this case, correct placement of the device within the SVC was of particular importance because of the deep thrombus in the proximal section. Other complications have also been described in connection with insertion of sVCF: migration to the cardiac atrium, perforation of the superior vena cava, cardiac tamponade, perforation of the aorta, pneumothorax and occlusion of the superior vena cava, with phlegmasia of the ULs[23,25,26]. Since simultaneous placement of iVCF and sVCF is linked with a higher proportion of cases of severe malignant neoplasms, it is correlated with high mortality rates[22]. In the aforementioned situation, the origin of embolus could not be determined because there were DVT in the ULs and the LLL. The decision to insert both an iVCF and an sVCF was based on descriptions of successful prevention of PE that are available in the literature[9,20] and on consideration of the severity of the case. It cannot be stated that insertion of the sVCF and the iVCF averted recurrence of PE, but the fact that the autopsy found organized thrombi leads us to believe that they were older rather than recent. A recent publication showed that 67.5% of patients given an sVCF died within 1 year after placement and that 64% of these deaths occurred while still in hospital or within 1 month of filter placement[22]. In the case described here, it was the fast-developing tumor that determined the fatal outcome while in hospital.

CONCLUSIONS

Simultaneous placement of an sVCF and an iVCF is an unusual procedure for few circumstances, but it is reasonable in cases with simultaneous DVTs, when anticoagulation is contraindicated, when anticoagulation fails to prevent PE or when fibrinolysis cannot be performed.

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