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Grand Rounds—Hammersmith Hospital

New approach to superior vena caval obstruction

Mechanical clearance of thrombus may help

Superior vena caval obstruction is a well recognised complication of bronchogenic carcinoma, with distressing clinical sequelae secondary to oedema of the soft tissues, larynx, and central nervous system. Conventionally it has been treated with radiotherapy and adjuvant chemotherapy or surgery with varying degrees of success.

Case history

A 56 year old white woman presented with a 10 week history of progressive oedema of the face and upper limbs followed by a one week history of worsening dyspnoea and dry cough. She denied any other symptoms. In her history she was noted to have mild asthma controlled by inhaled bronchodilators but she was otherwise well. She had smoked 20 cigarettes a day for about 40 years and had a red florid complexion with severe oedema of the face, chest wall, and upper limbs. The jugular veins were non-pulsatile and greatly

distended. She was tachypnoeic at rest with a respiratory rate of 30/min, a monophonic wheeze in the right upper zone, and bilateral pleural effusions. Neurological examination confirmed a right Horner's syndrome. Cardiovascular and abdominal examinations showed no abnormality.

Chest radiography showed a coin lesion in the right upper lobe with associated hilar and mediastinal lymphadenopathy and small bilateral pleural effusions; this was confirmed by computed tomography of the thorax. Pleural aspiration and biopsy, bronchoscopy, and anterior mediastinotomy did not give a diagnosis but confirmed the presence of a hard thrombosed superior vena cava with dilated venous collaterals. Cytological investigation of sputum confirmed the diagnosis of squamous cell carcinoma of the bronchus.

The tumour was inoperable, so to relieve the obstruction and palliate her symptoms, she had radiotherapy at a dose of 20 Gy in five fractions over five days

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FIG 1—Right and left subclavian venograms taken by digital subtraction and line diagrams. The axillary and subclavian veins (SV) contain large amounts of thrombus (arrows). The brachiocephalic veins (BCV) and superior vena cava (SVC) are completely occluded. Numerous collateral veins are opacified around both shoulders and chest wall and there is retrograde filling of the azygos vein (curved arrow).

Schematic representation of the venograms, with solid lines showing vessels visible on the venogram and dotted lines indicating the position of vessels which are not opacified (BVC, brachiocephalic vein; SVC, superior vena cava; SV subclavian)

FIG 2—Bilateral venographs of arms. Top: the Amplatz thrombectomy device has been used to clear left brachiocephalic vein. A small amount of thrombus persists. The device (arrow) is in the right brachiocephalic vein, which has not been cleared of thrombus. Bottom: the right brachiocephalic vein is now clear of thrombus

with concurrent oral dexamethasone. Unfortunately, her oedema seemed to get worse. Venography showed numerous opacified collateral veins around both shoulders and the chest wall with antegrade filling of the azygous vein and a complete obstruction of the superior vena cava with thrombus extending into the subclavian veins bilaterally (fig 1). Initially angiographic catheters (5 gauge French) were inserted through both brachial veins and their tips were embedded into the subclavian vein thrombus. She was given streptokinase at a rate of 5000 units per hour through both catheters. Repeat venography at intervals over the next 40 hours showed some evidence of clot lysis, but because of complications of rectal and nasal bleeding streptokinase was replaced by alteplase. Further venography four hours later showed little further lysis but a 2 cm stenosis of the superior vena cava had become visible.

As the large amount of free thrombus remaining within the brachiocephalic veins on both sides increased the risk of massive pulmonary embolism it was necessary to clear this before dilatation and stenting of the stenosis. An Amplatz thrombectomy device (Microvena, Vadnais Heights, MA, USA) was introduced into the superior vena cava. This device consists of an 8 gauge French catheter with an impeller in a metal housing at its tip, which rotates at up to 100 000 rpm. The rotation creates a vortex, sucking in blood and thrombus and macerating the clot to particles of 8 μ m or less. The remaining thrombus within both brachiocephalic veins was cleared rapidly (fig 2) and the stenosis was then dilated and a double

Gianturco-Wallace Z stent (William Cook Europe, Bjaererskov, Denmark) inserted. Venography after insertion of the stent showed rapid venous drainage into the right atrium and no filling of venous collaterals. Intravenous heparin was continued for 48 hours.

The clinical result was excellent with almost complete resolution of oedema and symptoms. No complications arose from the procedure and the patient remained well two months later.

Comment

Obstruction of the superior vena cava was first described in 1757 by William Hunter in a case of syphilitic aortic aneurysm. Today bronchogenic carcinoma is the commonest cause, with obstruction occurring in up to 5% of tumours. The clinical features, as highlighted by this case, can be severe and disabling and may become much worse when narrowing due to compression by tumour or lymphadenopathy is complicated by acute thrombosis.

Treatment is aimed at relief of symptoms and prevention of the life threatening complications of laryngeal and cerebral oedema. Radiotherapy, although no longer indicated as an emergency procedure before diagnosis, is the mainstay of treatment with a 91% response rate at one week.¹ The relapse rate, however, may be as high as 20-50% and treatment often fails in patients with superior vena caval thrombosis. Bed rest, steroids, diuretics, and anticoagulants, are of unproved benefit and chemotherapy should be reserved for chemosensitive tumours such as lymphomas and small cell carcinoma of the bronchus. Reconstruction with spiral vein or synthetic grafts has had good results and low mortality,² but the appropriateness of this treatment in view of the poor overall prognosis must be considered.

Thrombolytic drugs can be successful, particularly when the thrombosis is recent,³ and can be used in conjunction with balloon angioplasty and heparin. The use of intravenous stents was first described in 1985, and these are effective either alone or in combination with angioplasty and thrombolytics.⁴ Mechanical thrombectomy with the Amplatz thrombectomy device has been completed successfully in dogs,⁵ but this is the first reported use in a human with central venous thrombosis. The success in this case may allow it to be considered for treating thrombus resistant to more conventional therapies.

The overall prognosis of obstruction of the superior vena cava is poor with a median survival of six to seven months when treated and less than six weeks if untreated. Only 1% of patients survive for longer than a year after diagnosis. Quality of life should therefore be given most importance during clinical management.

Discussion

SB: Is it common for obstruction of the superior vena cava to present as severely as this?

NP: No. This is the most severe case I have ever seen, with really disabling oedema of the upper body. I must reinforce, though, that this syndrome is not the medical emergency once thought and time should be spent making the underlying diagnosis before starting treatment.

SB: How long after the initial presentation was the thrombolytic therapy started?

NP: About two weeks.

SB: Is the time after the initial thrombosis important in determining the success thrombolytic drugs?

JJ: Studies of thrombolytics in peripheral vascular disease have shown good effect months, and even years, after the initial thrombosis. The reasons for this are not fully understood.

SB: What are the risks of the clot macerator? Surely even small particles of thrombus can be detrimental?

JJ: The clot is broken down to particles of 8 µm or less, but I am sure that if a ventilation-perfusion scan had been taken afterwards areas of mismatch would have been seen. There were, however, no subsequent clinical symptoms or signs of pulmonary embolic disease.

JH: Studies with radiolabelled albumin have shown that particles of 30 µm diameter can pass through the lung without causing systemic complications.

SB: Why did you change the thrombolytic drug to alteplase when the studies on thrombolysis after myocardial infarction have shown a higher rate of haemorrhage with this than with streptokinase?

JJ: Indeed at high doses that is true, but for low doses in direct contact with thrombus there have been anecdotely fewer bleeding complications with alteplase, as would be expected given its greater theoretical thrombus specificity.

SB: What do you think was the cause of the initial thrombosis, a general thrombotic tendency or extrinsic compression of the superior vena cava by lymph nodes and secondary venous stasis?

NP: I think extrinsic compression is more likely.

SB: In that case, radiotherapy would seem the obvious treatment to start with.

AM: Why were two short and connected stents used rather than one longer one?

JJ: There is a greater radial force supplied by two shorter ones, although there is the problem of stenosis at the waist where the two join. A spiral stent has been devised to counteract this but it does not seem to be particularly advantageous.

SB: In a patient who has a tendency to clot and a foreign body in the vessel what is being done to prevent reocclusion?

JJ: The most important factor is ensuring good flow across the stenosis afterwards and therefore balloon dilatation to 20 mm was performed after insertion of the stent. Intravenous heparin was given for 48 hours after the procedure but there is nothing to suggest that long term anticoagulation is necessary if good flows and an adequate diameter are achieved.

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Patient characteristics and clinical caseload of short stay independent hospitals in England and Wales, 1992-3

Brian T Williams, Jonathan P Nicholl

Abstract

Objective—To describe and quantify the patients and clinical activities of independent short stay hospitals.

Design—Retrospective survey of hospital records for sampled periods of one financial year and comparison with data from 1981 to 1986.

Setting—217 independent hospitals in England and Wales, 1992-3.

Main outcome measures—Distributions of sex, age groups, and areas of residence of patients, clinical procedures, financial provision.

Results—Data were obtained from 201 (93%) hospitals. An estimated 429 172 inpatients (7% more than 1986) and 249 531 day cases (an increase of 154%) from 1986 were treated in the year. The number of overseas patients was half that in 1986. Clinical case mix remained similar to 1986. Abortion remained the commonest procedure (13% v 19% in 1986). Lens operations, heart operations, endoscopies, and non-surgical cases showed the largest increases from 1986. Proportionately more overseas patients had abortions (30% v 12% for England and Wales residents) and they received 41% of coronary artery bypass grafting.

Three quarters of the patients were aged 15-64. The proportion of patients aged over 65 had changed little (19% v 17% in 1986). Estimated average bed occupancy was only 48%. Only one in 20 patients was treated under NHS contract; 90% of episodes were funded through private health insurance.

Conclusions—The demand for treatment in private hospitals continues to increase despite additional investment in the NHS, but the overseas market is falling. Overall, the range of clinical activity has changed little.

Independent hospitals in England and Wales have mainly performed elective surgery that does not require advanced technological support.^{1,2} Before the 1990 reforms of the NHS they managed three times more cases than NHS hospital pay beds.³ We investigated changes in their clinical activities and patients since 1986. In March 1993 there were 10 763 beds in 209 independent short stay hospitals⁴ compared with 9526 beds in 187 hospitals in December 1986,⁵ an increase of 11%. A total of 6724 beds (62%) were in 140 profit making hospitals and 4039 (38%) were in 78 hospitals with charitable status, compared with 53% and 47% respectively in 1986.

Method

We identified independent hospitals with operating theatres open at any time in 1992-3 from the lists of the Independent Health Care Association⁴ or the *Directory of Independent Hospitals and Health Services*.⁶ We collected information on all admissions and discharges from each hospital for a sample period, 1 April 1992 to 31 March 1993. For comparability we allocated the hospitals that provided data in 1986 the same data collection periods in 1992-3. For hospitals opened since 1986 the length of sample periods was set so that, based on the number of beds in the hospital, roughly 100 admissions would be sampled from each hospital. The time of year of sampling was set to obtain, within a region, a similar amount of data each month.

We estimated activity for the whole year by weighting the sample numbers according to the length of the sample period and time of year, correcting for the absence of data from 16 hospitals that were known to have been open for part of the year. Because of weighting and rounding of estimates the totals in the tables do not always equal the sum of the components.

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