

Treatment of long-duration atrial fibrillation by modified maze procedure

Pankaj Kumar FRCS Thanos Athanasiou MD
Rex De L Stanbridge FRCS

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Atrial fibrillation is the commonest sustained cardiac arrhythmia, with a prevalence of about 10% in the over-70s¹. The implications in terms of mortality, stroke and quality of life are of major concern. Patients have been successfully treated by surgical interruption of conduction pathways—the maze procedure. Lately a saline-irrigated radiofrequency probe, Cardioblate, has become available in the UK for this purpose.

beating and sinus rhythm was restored (Figure 1). The total ablation time was 5 minutes 8 seconds. The patient was in sinus rhythm four months post-operatively.

CASE 2

A woman of 67 with rheumatic mitral stenosis had been in atrial fibrillation since the age of 45—i.e. for 22 years. She underwent mitral valve replacement together with a modified maze procedure with the irrigated radiofrequency probe. At the end of the procedure both atria were beating, with the heart in sinus rhythm. Total ablation time was 3 minutes and 22 seconds. She was in sinus rhythm when seen six months postoperatively.

COMMENT

The maze procedure, as usually practised, entails a series of incisions in the left and right atrium to achieve electrical isolation and block the re-entry pathway. Maze III is very effective, with sinus rhythm and atrial contractility restored

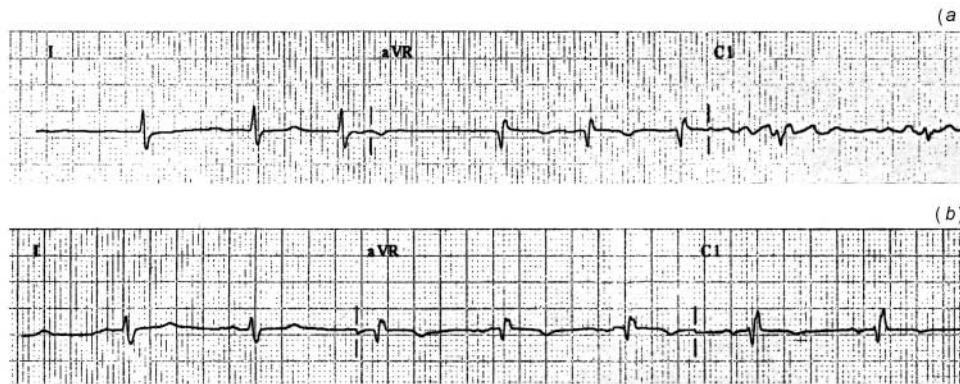


Figure 1 Preoperative (a) and postoperative (b) electrocardiograms in case 1

CASE 1

A man aged 71 with rheumatic mitral disease and coronary artery disease had been in atrial fibrillation since the age of 22—i.e. for 49 years. He underwent off-pump triple coronary artery bypass grafting; then, after institution of cardiopulmonary bypass, the mitral valve was repaired with an annuloplasty ring and a modified maze procedure was performed with the irrigated radiofrequency probe. On discontinuation of cardiopulmonary bypass the heart was initially in nodal rhythm but soon the atria started

long term in more than 90% of patients². It is, however, a difficult and long procedure with substantial morbidity.

The radiofrequency probe offers a shorter and simpler procedure, creating a full-thickness burn in the atrium. By use of saline irrigation the tip is constantly cooled so that resistive heating is directed several millimetres below the surface. The depth of the lesion can be varied depending on the power applied, the irrigation speed, the electrode diameter, and the delivery time. Nakagawa *et al.*³ report that this method produces larger and deeper lesions than 'dry' radiofrequency ablation. This has advantages in terms of speed, but does entail a risk of injury to deeper structures: Mohr *et al.*⁴ reported oesophageal injury in 1.3%.

The success rate of the modified maze (restoration of sinus rhythm with atrial contractility) was reported by Sie

Department of Cardiac Surgery, St Mary's Hospital, Praed Street, London W2 1NY, UK

Correspondence to: Mr P Kumar, 43 Blenheim Gardens, Kingston, Surrey KT2 7BN, UK

E-mail: pankajkumar66@hotmail.com

*et al.*⁵ as 90% at one year, 86% at two years and 75% at three years⁵. Benussi *et al.*⁶ reported 77% at a mean follow-up of 11.6 months. To the best of our knowledge the maze III operation has not been compared directly with the modified maze.

We are now recruiting more patients to assess the efficacy of this approach. Whilst at present surgical ablation is being used in patients requiring cardiac surgery for other reasons, the method may in future be applicable to a wider group.

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Ventriculoperitoneal shunt fractured by a closing car window

A H Mohammed MB ChB V P Sivasamy FRCS
S Griffiths FRCS T S Buxton FRCS

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Motorized car windows can present hazards to children. We report a new one.

CASE HISTORY

A 5-year-old boy was referred with headache, lethargy, nausea and vomiting. At age one month he had had a ventriculoperitoneal shunt inserted for postnatal haemorrhagic hydrocephalus. The present symptoms had developed

six days after an incident described by the parents. While unsupervised in the car the child had accidentally activated a window switch and caught his neck between the door frame and the closing window. On admission he was drowsy and confused, localizing to pain and opening his eyes to verbal command with a convergent squint. Radiographs showed that the shunt tube had fractured just distal to the clavicle (Figure 1). On a CT scan the ventricles were no bigger than previously. The shunt was revised and the old tube showed a transverse fracture. The child was discharged three days later without residual focal neurological deficit.

COMMENT

There is one previously reported case of shunt malfunction related to automobiles. That was caused by the seat belt rubbing against the tube in the neck on a long journey¹. Shunt fracture or disconnection is the second most frequent cause of shunt malfunction in children². Peritoneal catheter fractures occur most commonly in the neck, the area where the tube is most subject to mechanical stress³.

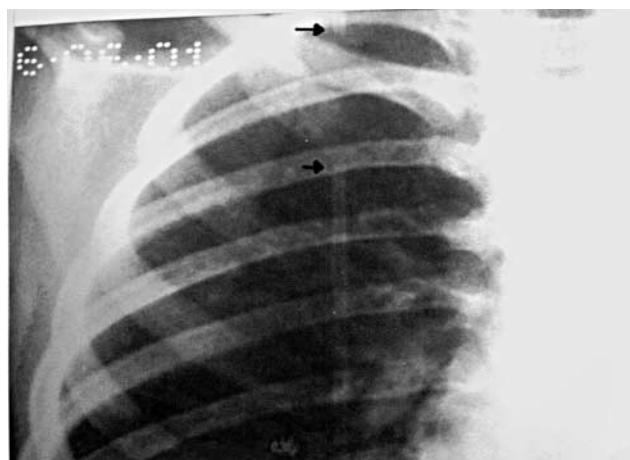


Figure 1 Chest X-ray showing tube fracture



Figure 2 Switch on car in which the injury was sustained

Department of Neurosurgery, Morriston Hospital, Swansea, UK

Correspondence to: A H Mohammed, 1 Llys Gwenci, Birchgrove, Swansea SA7 9NE, UK

E-mail: drausama@aol.com

The window operating systems in cars vary between manufacturers. From the safety point of view, switch type and position are of paramount importance. Prominent horizontally mounted buttons such as that shown in Figure 2, especially when on door handles, are likely to have the highest rate of accidental activation: children may step on the door handle or hang on to it. There are hazards even for children who do not have shunts, and we suggest the following precautions for parents considering purchasing a car with motorized windows: check that the system has a pressure-sensitive cut-out that inactivates the closing window on meeting resistance; make sure the system is disabled when the ignition is turned off; the safest switches are probably those that need to be lifted to close the window; be extra cautious with systems that operate with a one-shot closure feature, where the window continues to full closure after a single activation of the switch; take notice of the position of the switches and the likelihood of their being accidentally activated by young children.

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Liver abscess metastasizing to prostate and lung

K H Lim MB BS Y M Tan BSc FRCS [Edin]
 P K H Chow FRCS (Edin) FAMS

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Metastatic sepsis is a life-threatening complication of pyogenic liver abscess. Usually, only a single extrahepatic site is affected.

CASE HISTORY

A Chinese man aged 57 reported fever and malaise of one week's duration, associated with abdominal discomfort and a loss of appetite. 4 years previously he had been found to have non-insulin-dependent diabetes mellitus, complicated

Department of Surgery, Singapore General Hospital, Outram Road, Singapore 169608

Correspondence to: Yu-Meng Tan

E-mail: gsutym@sgh.com.sg

by retinopathy and neuropathy. Nothing remarkable was found on clinical examination. His white cell count was raised at $18.1 \times 10^9/L$ and liver function tests showed an albumin of 22 g/L, serum bilirubin 26 $\mu\text{mol/L}$, alanine aminotransferase 23 U/L, aspartate aminotransferase 37 U/L and alkaline phosphatase 69 U/L. A chest radiograph was normal.

Ultrasound of the hepatobiliary system revealed a 5 cm lesion in the right lobe of the liver, and CT of the abdomen showed this to be a loculated abscess in segment V. The abscess was drained percutaneously. Blood cultures and pus cultures from the abscess yielded *Klebsiella pneumoniae*. He was treated with intravenous ciprofloxacin and metronidazole and initially there was a good response with resolution of fever. However, the patient deteriorated on the seventh day after percutaneous drainage, with hypotension, spiking fever and urinary frequency. He also developed a persistent unproductive cough. A repeat chest radiograph revealed

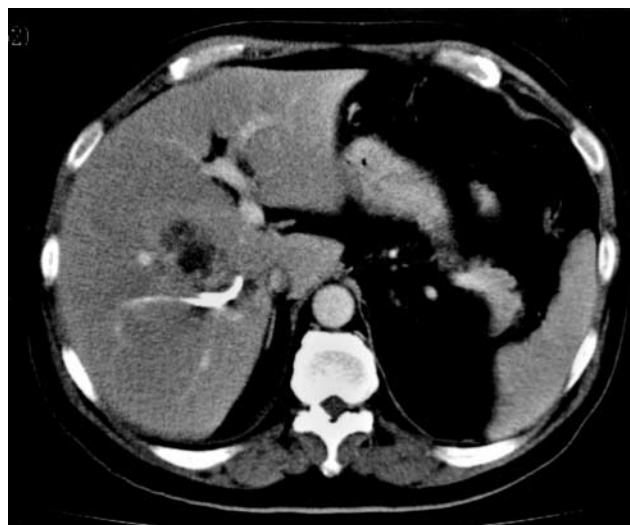


Figure 1 Liver abscess drained via a percutaneous catheter (day 7) inserted under ultrasound guidance



Figure 2 Bilobar prostatic abscess metastatic from liver abscess

multiple cavitating lesions in the right lung suggestive of abscesses, and lower respiratory cultures were positive for *Klebsiella*. On urine microscopy there were 15 white cells per high power field, with micro-organisms. Repeat CT of the abdomen and pelvis showed adequate drainage of the liver abscess (Figure 1) but multiple prostatic abscesses (Figure 2). These were drained transurethrally and cultures grew *Klebsiella* with superimposed *Morganella morganii*. Since the *Morganella* was resistant to ciprofloxacin, intravenous aztreonam was added to the antibiotic regimen. Treatment for the lung abscesses also included supplemental oxygen and intensive chest physiotherapy.

The fever and symptoms gradually subsided over the next seven days. He was switched to oral ciprofloxacin for another four weeks and then discharged. Follow-up CT at three months showed complete resolution of the lung, liver and prostatic abscesses.

COMMENT

Although pyogenic abscesses commonly result in septicaemia, subsequent formation of septic foci is rare¹. When it occurs, it is usually confined to a single extrahepatic site², though multiple sites have been described³. For unknown reasons the commonest remote site of infection from a metastatic pyogenic liver abscess is the eye. Endogenous endophthalmitis occurs in up to 61% of patients with disseminated sepsis¹, and can lead to grave visual loss⁴. Warning signs are orbital pain, blurring of vision and conjunctival chemosis. Other sites of visceral involvement are lung and brain.

What is the explanation for this metastatic phenomenon? First, it seems to be related to the virulence of the gram-negative organism *K. pneumoniae*, which is the main organism isolated from pyogenic liver abscesses in Asia⁵ and is also on the rise in western countries⁶. The underlying nature of its virulence remains unclear; the serotype K1 is reported to be particularly associated with metastatic endophthalmitis⁷. Secondly, these patients tend to have underlying diabetes mellitus. Two-thirds of the patients in the series of Cheng *et al.* had this comorbidity. Diabetic patients have impaired chemotaxis, phagocytosis and bactericidal function. The intimal vascular abnormality seen in diabetes may also contribute to haematogenous seeding. Thirdly, diagnosis and treatment are often delayed because of a subtle clinical presentation⁴ with only vague abdominal symptoms.

Awareness of the natural history of *Klebsiella* liver abscess in diabetic patients is important for clinical management. To detect extrahepatic sites of involvement, repeated imaging and cultures should be considered if fever or leucocytosis persist after initial treatment.

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Acute glaucoma with abdominal pain

G Galloway MB MRCP(h) M Wertheim MB MRCP(h)
D Broadway MD FRCP(h)

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The symptoms of acute glaucoma include ocular pain, decreased vision and epiphora. Associated systemic symptoms are headache, nausea and abdominal discomfort¹. We propose a direct relation between the ocular and abdominal symptoms.

CASE HISTORY

A woman of 84 came to the accident and emergency department after five hours of episodic haematemesis, generalized abdominal discomfort and malaise. The abdominal discomfort was a constant dull ache without altered bowel activity; she also had a diffuse headache. On clinical examination the only remarkable finding was a red right eye. Urgent oesophago-gastro-duodenoscopy showed mild gastritis. Clinical review now revealed a changing pattern to her headache, which had become a deep right periorbital pain. An ophthalmological opinion was sought. Best corrected visual acuities were counting fingers (right) and 6/12 (left). The right globe was injected, with an oedematous cornea, a shallow anterior chamber, a fixed oval mid-dilated pupil and significant cataract.

Ophthalmology, Norfolk and Norwich Hospital NHS Trust, Colney Lane, Norwich NR4 7UZ, UK

Correspondence to: Mr Gavin Galloway
E-mail: gavgal@doctors.org.uk

On applanation tonometry pressures were 54 mmHg (right) and 19 mmHg (left). Fundoscopy, albeit through hazy media, was normal. Medical management of her glaucoma included 500 mg intravenous acetazolamide, topical pilocarpine 2% to both eyes, topical carteolol 1% twice daily with dexamethasone 0.1% four times daily to the affected eye. Analgesics and antiemetics were provided. Once the intraocular pressure (IOP) had become normal, bilateral laser peripheral iridotomies were performed. After one month her right vision had stabilized at 6/18 with an IOP of 12 mmHg without antiglaucoma medication. The cataract was extracted once the inflammation had settled.

COMMENT

In this patient the acute glaucoma may have been precipitated by enlargement of the cataractous lens, with sudden closure of an already narrow iridocorneal angle. We presume that the haematemesis was secondary to vomiting. The mechanism for abdominal symptoms in acute glaucoma is poorly understood. During squint surgery, manipulation of the extraocular muscles and pressure on the globe can elicit the oculocardiac reflex, causing bradycardia². Abdominal symptoms, perhaps erroneously attributed to the oculocardiac reflex, are also well documented after squint surgery³. On the basis of early postoperative vomiting associated with squint surgery, Van den Berg suggested a direct oculoemetic reflex⁴.

The oculocardiac reflex is one of several trigeminal nerve reflexes. Noxious stimulation of trigeminal nerve afferents activates the paratrigeminal nuclei in the medulla with secondary stimulation of the vagus nerve. Orbital trigeminal afferents project via the trigeminal ganglion to the spinal trigeminal nucleus (STN). The STN, extending from the pons to the upper cervical spinal cord, is divided into three subnuclei—subnucleus oralis, interpolaris, and caudalis (SNc). Nociceptive-specific neurons do not respond to tactile input but only to noxious stimuli and are located mainly in SNc, indicating involvement in trigeminal pain processing⁵. Secondary neural stimulation of the dorsal afferent nucleus of the vagus nerve then occurs. Apart from manipulation of proprioceptive/stretch reflexes in the extraocular muscles⁶, stimuli to the lids, orbital structures, and, of particular importance, the cornea, have been implicated in the oculocardiac reflex. Perhaps in acute glaucoma, where the pressure rise can be as high as 1 mmHg/minute, corneoscleral stretch may be sufficient to excite an oculo-trigemino-vago-abdominal (oculoabdominal) reflex which directly results in abdominal symptoms such as nausea, vomiting, cramping and pain. This occurs without cardiac involvement and can precede ocular pain or headache.

We propose that there is a direct oculoabdominal reflex triggered via the trigeminal nerve and completed via a loop in the vagus nerve nuclei by way of the visceral motor and visceral sensory branches of the vagus nerve. Abdominal symptoms are seen in other eye conditions with pain derived from the ophthalmic branch of the trigeminal nerve, such as herpes zoster ophthalmicus and migraine. Further studies of the trigeminal-vagus nuclei interface might establish whether there is in fact a separate oculoabdominal reflex.

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Bruising in a man with aortic aneurysms

A D B Nikapota MRCP S C M Stern MRCP MRCPATH

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The combination of easy bruising and an aortic aneurysm demands special caution.

CASE HISTORY

A man of 79 was referred for investigation of thrombocytopenia. He had originally consulted his general practitioner because of spontaneous bruising and epistaxis, and his platelet count had been $81 \times 10^9/L$. 20 years earlier the patient had undergone an infrarenal abdominal aortic aneurysm repair; and the previous year, during an admission for small bowel obstruction, he had been found to have an 8 cm suprarenal abdominal aortic aneurysm (Figure 1), a 7 cm right common iliac artery aneurysm and a 7 cm right

Department of Haematology, East Surrey Hospital, Redhill, Surrey RH1 5RH, UK
Correspondence to: Dr A D B Nikapota

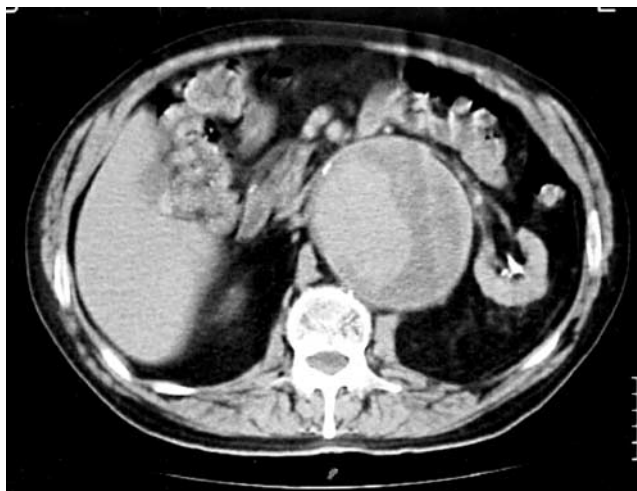


Figure 1 Computed tomogram showing large abdominal aortic aneurysm

internal iliac artery aneurysm. He also had severe aortic stenosis. In view of his general frailty, the operative risks of any form of major surgery were considered too high and he was managed conservatively.

On examination he had several bruises on the limbs but there was no lymphadenopathy or hepatosplenomegaly. Haemoglobin was 9.6 g/dL, white cell count $4.8 \times 10^9/L$, platelets $70 \times 10^9/L$. The most likely diagnosis was thought to be myelodysplasia, and to confirm this a bone marrow aspirate and biopsy was taken from the right posterior iliac crest. Haemostasis at the puncture site was achieved more slowly than usual, and later that day bleeding restarted. At that time he was discovered to be in disseminated intravascular coagulation (DIC), with the following coagulation profile: prothrombin time 17.7 s, activated partial thromboplastin 42 s, fibrinogen concentration 0.7 g/L, D-dimer assay strongly positive. Bleeding continued and before it stopped he had received 9 units of packed red cells, 2 pools of platelets, 9 units of fresh frozen plasma and 35 packs of cryoprecipitate. The patient was investigated further to establish a cause for his DIC. A routine sepsis screen was negative, and tumour markers including prostate specific antigen were normal. His chest X-ray was clear. The bone marrow aspirate and trephine biopsy revealed neither myelodysplasia nor any evidence of marrow infiltration. Therefore, in the absence of other identifiable causes of DIC, it was concluded that the patient was in chronic DIC secondary to his abdominal aortic

aneurysms. Once his condition was stable he was discharged home, with a view to treating any future bleeding episodes in the same supportive way.

COMMENT

The association of DIC with abdominal aortic aneurysms is well recorded. The DIC can occur perioperatively, in relation to the release of the aortic cross-clamp¹, and after dissection or rupture². Studies with indium-111-labelled monoclonal antibody against human tissue plasminogen activator and with indium-labelled platelets have shown increased uptake within the wall of the aneurysm consistent with, respectively, increases in fibrinolytic activity³ and platelet deposition⁴. This continuous process is thought to account for the presence of chronic DIC in some patients with abdominal aortic aneurysms. In such cases operative repair of the aneurysm can be curative^{5,6}.

Presenting features in our patient were spontaneous bruising and bleeding, both of which are very uncommon with a platelet count as high as $70 \times 10^9/L$. In retrospect, it would have been advisable to do a coagulation screen before the bone marrow examination, particularly in the light of the known aneurysms. Any patient with an aortic aneurysm who reports easy bruising should have a platelet count and a coagulation profile performed.

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Dyspnoea worsened by salmeterol

John Fraser FRACGP FAFPHM

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In a wheezy patient, bronchoconstriction by salmeterol does not rule out asthma, but other possibilities must be thought of.

CASE HISTORY

A woman of 61 sought advice after a month of persistent cough, intermittent wheeze, dyspnoea on exertion and productive white sputum. She was an active farmer, a non-smoker. 12 years previously she had undergone a left mastectomy for breast carcinoma, with tamoxifen treatment but no radiotherapy. No history of occupational lung exposure was recalled.

On examination there were crepitations at the left base. Body mass index was normal (25 kg/m²) and peak flow was 300 L/min (expected 435). Heart sounds were dual with a prominent S1. There was no sign of cardiac failure. The provisional diagnosis was bronchitis progressing to late-onset asthma. Over several months there was little response to inhaled salbutamol, ipratropium and beclomethasone and oral doxycycline. The patient reported that her dyspnoea became much worse when she gave herself salmeterol via a metered dose inhaler. She had rechallenged herself with salmeterol on two occasions over two weeks and noted the same pattern of worsening. Two months later, a chest radiograph showed mild cardiac enlargement (cardio-thoracic ratio 15:29) with some parenchymal bands in the lingual area suggestive of infection or scarring. There was slight prominence of the left hilar area within normal limits. Forced expiratory volume in 1 second was 1.6 L, with negligible improvement after nebulized salbutamol.

On repeat chest radiography after three months the left hilar shadow had increased in size with worsening atelectasis (Figure 1). High-resolution helical chest CT subsequently demonstrated a concentric stenosing tumour of the proximal left upper lobe bronchus and also suggested previously undetected mild mitral stenosis, confirmed by



Figure 1 Chest radiograph three months after presentation

echocardiogram. Bronchoscopy and mediastinoscopy revealed recurrent adenocarcinoma within the left major bronchi with mediastinal lymphadenopathy, and positron emission tomography suggested that the most likely origin was a new focus of breast carcinoma in the right breast.

COMMENT

Dyspnoea is a common symptom of bronchial carcinomas, and about half the patients in one series had airflow obstruction that was relieved by inhalation of fenoterol or ipratropium or salbutamol¹. Restrictive lung disorders are also seen in association with carcinoma—in advanced disease involving the lungs², after chemotherapy^{3,5}, and after radiotherapy—but the present patient had only a localized tumour of the bronchi, not the kind of generalized parenchymal disease usually associated with a restrictive spirometric pattern². Why should her lung function have been worsened by salmeterol? The agent is a long-acting beta-1 and beta-2 agonist causing bronchodilation, vasodilation and tachycardia, and vasodilation in her stenosing tumour might have reduced air flow to the left lung. Another possibility is that tachycardia, coupled with her mitral stenosis, lowered her cardiac output. Oddly, this patient was tolerant of short-acting beta agonists such as salbutamol. This drug, with its shorter half-life, might have caused less vasodilation. Paradoxical bronchoconstriction with salmeterol has been described in patients with asthma who were tolerant of salbutamol⁷. The propellants in the inhaler were believed to be responsible, whereas with salbutamol any bronchoconstrictor effect might have been neutralized by the faster acting agent. This is unlikely to be the explanation in the present case since the pattern was restrictive rather than obstructive, and lung function did not improve with nebulized salbutamol, which lacks propellant.

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