level with the hyoid bone, and are closely related to the carotid artery pulsation. A single lump just in front of the anterior edge of the upper third of the sternomastoid muscle, closely related to an arterial pulse, must always be regarded with suspicion and investigated by Doppler or conventional arteriography. The arteriographic features—a vascular tumour between a widened carotid bifurcation—are diagnostic. Both sides of the neck should be investigated as carotid body tumours may be bilateral.¹⁻³ They may also be familial.^{1,4}

The second and third problems are inseparable: the pathological nature of the tumour and its treatment. Macroscopically these tumours have been divided into three varieties—those loosely attached to the vessels, those adherent to the adventitia of the carotid artery but dissectable from it, and those so intimately adherent that they are difficult to remove without making a hole in the adjacent arteries.⁴ In my experience these are technical subdivisions related more to the size of the tumour, the degree to which it surrounds the main arteries, and the difficulty of the operation than to real pathological variations. Local invasion does occur in a few cases (5%) and must be accepted as true local malignancy, but even in these cases the histological confirmation of malignant change can be difficult.^{5,6} Fewer than 5% of all tumours are eventually associated with distant metastases.³ These are only estimates of the incidence of malignant change because all the published series are small.

If left untreated carotid body tumours slowly but inexorably get larger. Eventually they will obstruct the adjacent internal carotid artery and possibly cause a stroke, but the precise chances of this catastrophe occurring have not been documented.

No surgeon should attempt to remove a carotid body tumour unless he is experienced in the surgical techniques used for carotid artery surgery for atheromatous disease. This means that any surgeon who finds such a tumour unexpectedly should stop the operation, without a biopsy, and arrange for the patient to have further investigations and re-exploration by an experienced vascular surgeon. To proceed unprepared with excision without the correct vascular instruments and surgical skill is hazardous and might cause a stroke—an unacceptable complication of what the patient had probably been told was to be a simple biopsy of a node.

In most cases the tumour can be removed without damaging the carotid artery by dissecting within or just deep to the adventitia.⁷ This dissection is always bloody but the oozing stops as soon as the tumour is free. An essential preliminary is the isolation of the vessels above and below the tumour so that they can be controlled in the event of sudden bleeding. Large tumours which completely surround the common or internal carotid artery and tumours which seem to be infiltrating the artery wall must be excised en bloc.^{8,9} If this is to be done safely the cerebral circulation must be maintained with a shunt and the excised vessel replaced with a reversed autogenous graft of saphenous vein. It is the impossibility of prediction before the operation that such a major procedure will be required that must restrict performance of the operation to vascular surgeons. The patient should be made fully aware of the risks before surgery.

Apart from the risk of stroke, which should be minimal (less than 1%), the only other risk is damage to the hypoglossal or vagus nerves resulting in an awkward tongue or a husky voice. There are no clinically apparent problems from the removal of both carotid bodies in bilateral cases, but a bilateral subintimal dissection around the carotid sinuses may leave the patient with an unstable blood pressure.

There is no evidence to indicate whether radiotherapy after incomplete removal of a locally invasive lesion delays recurrence, but radiotherapy to distant metastases, especially in bone, can reduce pain and cause regression. Patients with metastases may live for many years, and aggressive palliation of symptoms is worth while.

Most of the surgical difficulties would be averted if clinicians were to remember this tumour when examining a patient with a lump in the neck and advise surgical removal when the tumour is small.

N L BROWSE

Professor of Surgery,
St Thomas's Hospital Medical School,
London SE1 7EH

¹ Wilson H. Carotid body tumors. *Surgery* 1966;59:483-93.

² Hewitt RL, Ichinose H, Weichert RF 3rd, et al. Chemodectomas. *Surgery* 1972;71:275-82.

³ Shamblyn WR, ReMine WH, Sheps SG, et al. Carotid body tumor (chemodectoma). Clinicopathologic analysis of ninety cases. *Am J Surg* 1971;122:732-9.

⁴ Katz AD. Carotid body tumors in a large family group. *Am J Surg* 1964;108:570-3.

⁵ Pryse-Davis J, Dawson IM. Some morphologic, histochemical, and chemical observations on chemodectomas, and the normal carotid body, including a study of the chromaffin reaction and possible ganglion cell elements. *Cancer* 1964;17:185-202.

⁶ Staats EF, Brown RL, Smith RR. Carotid body tumours, benign and malignant. *Laryngoscope* 1966;76:907-16.

⁷ Van Asperen de Boer FRS, Terpstra JL, Vink M. Diagnosis, treatment and operative complications of carotid body tumours. *Br J Surg* 1981;68:433-8.

⁸ Javid H, Chawla SK, Dye WS, et al. Carotid body tumor. Resection or reflection. *Arch Surg* 1976;111:344-7.

⁹ Lees CD, Levine HL, Bevan EG, Tucker HM. Tumors of the carotid body. Experience with 41 operative cases. *Am J Surg* 1981;142:362-5.

Vancomycin: a reappraisal

Vancomycin was introduced into clinical use in 1958 and appeared a promising antistaphylococcal agent. Two years later, however, methicillin, the first antistaphylococcal penicillin, was developed and first this and later the cephalosporins and lincomycin overshadowed vancomycin. In Britain its use declined almost to zero. In the past few years, however, vancomycin has re-emerged as a valuable antibiotic in three clinical settings: endocarditis, multiresistant staphylococcal infections, and as the first-line treatment of pseudomembranous colitis.

Vancomycin was isolated from *Streptomyces orientalis* in the mid-1950s. It is bactericidal for many Gram-positive bacteria and acts by inhibiting cell-wall synthesis but at a different site from that of the penicillins. Vancomycin may also alter the permeability of the cell membrane¹ and selectively inhibit synthesis of RNA.² Since vancomycin is not absorbed after oral ingestion and causes pain and necrosis when given intramuscularly it must be given intravenously (except for treating colitis). High and prolonged drug concentrations can be achieved after its intravenous infusion as it has a long half life (about seven hours).

Before the development of penicillinase-resistant penicillins and other potent antistaphylococcal agents vancomycin was used fairly extensively for treating severe staphylococcal infections such as septicaemia and endocarditis. After methicillin (and other beta-lactamase-stable penicillins) had been used for several years methicillin-resistant strains of *Staphylococcus aureus* appeared; and in practical terms such strains are best considered also resistant to the cephalosporins. Vancomycin

has been found the most effective agent for treating infections caused by these bacteria.³ A recent symposium on vancomycin in Geneva was told that as many as 40% of hospital staphylococci in some European centres are now methicillin resistant—but in Britain the proportion is still only around 2%.

Vancomycin is recommended for patients who are allergic to penicillin and need protection against *Streptococcus viridans* endocarditis associated with dental extraction. Many bacteriologists would consider erythromycin preferable, however, and it is certainly cheaper. If vancomycin is chosen a single dose of 1 g should be injected intravenously shortly before extraction.⁴ Hook and Johnson⁵ reviewed 15 patients treated for bacterial endocarditis with vancomycin. This drug was chosen because of allergy to penicillins and cephalosporin in six patients, bacteria resistant to other antibiotics in another six patients, culture-negative endocarditis in two patients, and one patient was given vancomycin as initial treatment. Thirteen patients were cured with no serious drug toxicity. These authors recommended vancomycin as the reserve drug for *Str faecalis* and *Str viridans* endocarditis.

Vancomycin has also been used for staphylococcal infections at the site of the shunt in patients being treated with regular haemodialysis.⁶ Six anuric patients were treated with a 1 g dose of vancomycin every seven days and a satisfactory response was obtained in five. As it is bactericidal, normally almost entirely excreted by the kidney, and is not removed by dialysis, vancomycin is particularly suitable for such difficult infections.

It is, however, in the management of pseudomembranous colitis that vancomycin has found an undisputed role as first-line treatment. A regimen of 500 mg vancomycin daily by mouth will result in the disappearance of *Clostridium difficile* and its toxin which are responsible for the colitis. Keighley *et al*⁷ gave vancomycin for the treatment of pseudomembranous colitis in a randomised controlled trial. Of 16 patients with high titres of the neutralised *Cl difficile* toxin, nine received 125 mg vancomycin four times a day and seven placebo. At the end of five days' treatment faecal toxins were present in one patient given vancomycin and in five controls. Vancomycin caused disappearance of *Cl difficile* from the stools in all except one patient, whereas toxicogenic strains persisted in all but one of the controls. Possibly a lower dose may be just as efficacious, and this is under investigation.

The most serious toxic effects attributed to vancomycin are tinnitus, decreased auditory acuity, and deafness, all of which have been reported when serum concentrations exceed 90-100 mg/l. Ideally peak concentrations should be kept in the region of 10-20 mg/l⁸—which should be both therapeutic and safe for normal patients and also for those with diminished renal function. Vancomycin may cause thrombophlebitis, so that veins should be used in rotation and the antibiotic should be diluted in 250 ml physiological saline or 5% glucose and given over 30 minutes.

Vancomycin is expensive and it should be reserved for these specific indications. Intravenous treatment costs about £40 a day and oral treatment some £8 a day. Probably the high cost and potential toxicity will help to preserve this very useful agent from abuse, which experience shows usually leads to resistance emerging—a rare problem as yet with vancomycin.

RUTH BROWN
Registrar

RICHARD WISE
Consultant medical microbiologist

Department of Medical Microbiology,
Dudley Road Hospital, Birmingham B18 7QH

- ¹ Jordan DC, Mallory HD. Site of action of vancomycin on *Staphylococcus aureus*. *Antimicrob Agents Chemother* 1964;4:489-94.
- ² Jordan DC, Inniss WE. Selective inhibition of ribonucleic acid synthesis in *Staphylococcus aureus* by vancomycin. *Nature* 1959;184, suppl 24: 1894-5.
- ³ Peacock JE, Marsik FJ, Wensel R. Methicillin-resistant *Staphylococcus aureus*—introduction and spread within a hospital. *Ann Intern Med* 1980;93:526-32.
- ⁴ Anonymous. Antibiotic cover for dental extraction. *Br Med J* 1975;iii:191.
- ⁵ Hook EW, Johnson WD Jr. Vancomycin therapy of bacterial endocarditis. *Am J Med* 1978;65:411-5.
- ⁶ Eykyn S, Phillips I, Evans J. Vancomycin staphylococcal shunt site infections in patients on regular haemodialysis. *Br Med J* 1970;iii:80-2.
- ⁷ Keighley MRB, Burdon DW, Arabi Y, *et al*. Randomised controlled trial of vancomycin for pseudomembranous colitis and postoperative diarrhoea. *Br Med J* 1978;ii:1667-9.
- ⁸ Dutton AAC, Elmes PC. Vancomycin: report on treatment of patients with severe staphylococcal infection. *Br Med J* 1959;ii:1144-9.

The way ahead for rehabilitation

"Does every health district need a consultant in rehabilitation?" asked Dr A O Frank (consultant in rheumatology and rehabilitation at Northwick Park Hospital) at a conference at the hospital on the way ahead for rehabilitation after reorganisation. His starting point was to question some common medical assumptions: that disease intervention should take precedence over personal and environmental intervention and the acute sector over the chronic sector. What was needed, he argued, was the "holistic" approach, taking account of the whole person in his whole life context. This view, expressed many times during the day, is hardly novel in medicine but is often difficult for hospital doctors to put into practice. Dr Frank suggested that a consultant in rehabilitation should have responsibility for the management of patients with complex disabilities, those dependent people living in the community, and those with temporary disabilities. Few physicians in the acute sector, he argued, have the time or the training to negotiate the complex support that is often necessary for helping such people to achieve or maintain the best possible life, nor are they able to attend all the case conferences and other meetings. The rehabilitation consultant is ideally placed to take on this work. Most actual rehabilitation would be carried out by other professionals; but he could not foresee a time when every consultant could realistically be expected to organise rehabilitation for his own patients. A consultant in rehabilitation moreover had an important educational function—promoting the whole-person approach to patients both in his hospital and in his district, and organising courses for local workers and visitors.

Some of the themes of the meeting were taken up in the poster displays and other material—one, for example, described a successful domiciliary physiotherapy service that had started from a research project and with careful monitoring of referrals had proved economical enough to be taken over by the area health authority. Because the flexible hours enable married women with families to do this work the scheme makes use of experienced physiotherapists who would not otherwise be employed. Speech therapy services in Harrow are also being reorganised to get patients away from hospitals to local community clinics—the subject of another poster display.

Reorganisation will mean more local responsibility for health care and increasing emphasis on rehabilitation in the community