TABLE II—Existing workload and notional half days required if undertaken by consultants

Nature	No of sessions	Currently done by	Notional half days if done by consultant
Operating theatre lists plus pre/postoperative assessment	38.5	Consultants	64.0
Operating theatre lists plus pre/postoperative assessment	8.0	Junior doctors	12.2
Operating theatre lists	10.0	Associate specialist/clinical assistant	No change
Intensive care sessions	3.0	Consultant	5.7
Obstetric sessions	2.0	Consultant	5.7
Intensive care/obstetric cover		Registrar/clinical assistant	6.5
Teaching and administration	0.0	Registrar	28.0
First consultant on call at night		Consultant	8.0
Second consultant on call at night		Registrar	11.4
Day time duty doctor			
Total			141.5

doubling of the consultant staff to replace three registrars and 1.6 whole time equivalent clinical assistants was compared with the staffing at Milton Keynes Hospital. There, 10 consultants, one registrar, and four senior house officers deal with a workload 86% of that in this hospital (using the workload indicator adopted for the calculations made by North West Thames region).

In addition, to provide internal cover for annual leave and study leave a further 27.0 notional half days would be required. Thus a total of 15.3 consultants would be required, an additional 8.8 whole time equivalents. The total cost of these extra consultant staff would be £296 000, although this would be offset by savings in the costs of registrars (£66 000) and locums (£89 000 in 1987), leaving the total cost of achieving a balance at £108 000. This figure assumes, perhaps unreasonably, that the 16 consultants would

be prepared to share the present one secretary in anaesthetics.

Discussion

In *Achieving a Balance* it was proposed that the numbers of consultants should increase by 2% per year. In this study we calculated that to maintain the existing workload an expansion of 9% per year would be required. When we compared this hospital with Milton Keynes Hospital our findings were not as far fetched as they at first seemed. Our estimates of consultant staffing are 30% greater than those pertaining in Milton Keynes, while our workload is 20% greater.

For the health authority the cost of achieving a balance would be prohibitive. If all specialties in all districts implemented such an increase in consultant staff not only would the costs be phenomenal but there would not be sufficient numbers of trained doctors to fill the vacancies. The balance would again be lost.

We thank Dr M J Cowen, consultant anaesthetist, Milton Keynes Hospital, and the consultant anaesthetic staff of Bedford General Hospital.

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Lesson of the Week

Unusual presentation of pseudomonas infection

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Colonisation in the patient with neutropenia often heralds impending invasive pseudomonas infection¹ which is associated with a high mortality.^{2,3} We describe three cases of an uncommon presentation of pseudomonas infection consisting of extensive oropharyngeal ulceration and facial cellulitis with pronounced swelling of the face and associated septicaemia.

Case reports

Case 1—A 24 year old woman developed a low grade fever and mild oedema of the face after a relapse of acute myeloid leukaemia. Examination showed that the mucous membranes of the mouth were normal; bacteriological cultures of the mouth and oropharynx failed to grow any pathogens; and the peripheral white blood cell count was $1.7 \times 10^9/l$ with 90% myeloblasts. She was treated with gentamicin, metronidazole, cefuroxime, and erythromycin. As the peripheral myeloblast count was rising she was given tumour necrosis factor, an experimental biological response modifier.⁴ Gum lesions developed which were thought to be leukaemic infiltrates. She had a fever during which *Pseudomonas aeruginosa* was isolated from repeated blood cultures and a mouth swab. The antibiotics were continued and her fever settled within 48 hours. She received a further course of tumour

necrosis factor, and 24 hours later had severe pain in the mouth and oropharynx and rapidly progressive oedema of the lower face and neck. Haemorrhagic necrosis was seen in the oral cavity, which was thought to be drug induced angio-oedema and she was treated with systemic corticosteroids and the same antibiotics. Her condition deteriorated, and she died within 12 hours. Necropsy showed tissue invasion with Gram negative bacilli compatible with pseudomonas (see figure).

Case 2—A 47 year old man who had a relapse of acute myeloid leukaemia and was undergoing re-induction chemotherapy developed severe bilateral oedema of the lower face and neck over 12 hours. He was neutropenic, with a white blood count of $0.1 \times 10^9/l$. He had had a temperature of 38°C to 40°C for the preceding six days and been treated with combinations of gentamicin, piperacillin, flucloxacillin, metronidazole, amphotericin B, and cefuroxime sequentially with no resolution of the fever. A strain of *Pseudomonas aeruginosa* resistant to piperacillin had been isolated from routine mouth swabs seven days before this. There were extensive areas of infected, necrotic tissue in the oral cavity affecting the hard palate and buccal mucosa. *Pseudomonas aeruginosa* sensitive to gentamicin, amikacin, and ciprofloxacin but resistant to piperacillin was isolated from blood cultures and repeat mouth swabs. Treatment was

When routine cultures of swabs of the mouth show *Pseudomonas aeruginosa* this should be treated locally to reduce the degree of colonisation in an attempt to prevent systemic infection

changed to ciprofloxacin, metronidazole, and benzyl penicillin with intermittent doses of amikacin and amphotericin B as determined by his renal function. He also received infusions of single donor white cells, but he remained critically ill for seven days, with progressive oedema of the face, hypotension, and oliguric renal failure. His fever and the facial oedema finally abated, and the white cell count rose. He was discharged in remission 25 days after the onset of facial cellulitis.

Case 3—A 35 year old man was admitted with neutropenia (white blood count $0.1 \times 10^9/l$) after reinduction chemotherapy for relapse of acute lymphoblastic leukaemia. His temperature was $39^\circ C$ and he had had swelling on the left side of the face for six hours. He had had a minor injury to the buccal mucosa 24 hours earlier. *Pseudomonas aeruginosa* was isolated from blood cultures and mouth swabs taken on admission. He was treated with gentamicin, ciprofloxacin, flucloxacillin, and metronidazole and with infusions of single donor white cells. His fever settled within a day but the facial oedema increased over the next two days and he developed extensive necrotic areas of the buccal mucosa and hard palate. Five days later he had entered remission, his white blood count was $2.5 \times 10^9/l$. The oral lesions healed completely.

Discussion

Infection with *Pseudomonas aeruginosa* begins with colonisation, followed by a break in host defences with local invasion, and culminates in dissemination and systemic disease. Swabs taken routinely showed that in two of our patients infection was preceded by oral colonisation. Ulceration of the oral mucosa would have provided a largely unopposed initial break in host defences to tissue invasion during the period of neutropenia. A common complication of cytotoxic drug treatment is mucositis, which sometimes progresses to frank oral ulceration. But the first patient had in addition extensive gum lesions that were thought to be leukaemic in origin, and in the third patient injury to the buccal mucosa resulted in cellulitis developing within 24 hours.

Attempts at preventing colonisation, which may result in systemic infection, are aimed at either avoiding the organism or suppressing its growth. For this oral intestinal decontamination is used,⁵ combined

with sterile food and good oral hygiene. Though all three patients were instructed in oral hygiene, colonisation occurred because of poor compliance, persistence of organisms at inaccessible sites, such as the posterior pharynx, or the ineffectiveness of many antiseptics against pseudomonas.

For the two patients who responded to treatment we had chosen a combination of ciprofloxacin with an aminoglycoside for its antipseudomonal activity. Ciprofloxacin has the theoretical advantage of excellent tissue penetration when given either by mouth or parenterally.⁶

We had not seen this unusual presentation of pseudomonas infection before and cannot explain the occurrence of all three cases within one year. Over the year there had been no change in patient population or treatment regimens, and the results of serology and phage typing show the three strains of pseudomonas to be distinct. It may be argued that the first two patients (cases 1 and 2) showed unusual late manifestations of inadequately treated pseudomonas infection. A combination of an aminoglycoside and another antipseudomonal agent is generally regarded as the best treatment. For the patient in case 1, despite pseudomonas being isolated from both routine and blood cultures, only one of these agents was being used in treatment. Likewise, in the second patient the isolation earlier of a pseudomonas resistant to piperacillin from a routine culture, together with evidence of systemic infection shown by the high fever, should have prompted the earlier treatment with a second effective antipseudomonal drug.

Finding *Pseudomonas aeruginosa* in a routine culture requires careful attention as it often predates invasive infection in a patient with neutropenia. We now treat colonisation with colistin gargles and adapt systemic antibiotic treatment, when it is required, to provide intensive antipseudomonas drug cover.

We thank the PHLS Gram-Negative Reference Laboratory at Colindale for typing the strains of pseudomonas and the photographic department at our hospital for their help. We also thank the Leukaemia Research Fund and the Bud Flanagan Research Fund for support of this study.

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Gram stained section of pharynx showing extensive perivascular infiltration (arrows) with Gram negative bacilli, compatible with pseudomonas^{1,2}

ANY QUESTIONS

Is hormonal disturbance a possible cause of postnatal depression and if so is hormonal treatment recommended?

There is no convincing evidence of a hormonal basis for postnatal depression, but many believe that hormonal factors play an important part. At present there is no scientific basis for hormonal treatment of such depressions and abundant evidence of the importance of environmental factors.—SYDNEY BRANDON, professor of psychiatry, Leicester

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