as meningococci holds exciting promise for the future. More immediately, we may look forward with confidence to a rapid and dramatic reduction of *H influenzae* b disease in Britain.

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Managing the persistent vegetative state

Early, skilled treatment offers the best hope for optimal recovery

The persistent vegetative state is one of the least understood conditions in rehabilitation medicine. Originally coined by Jennett and Plum, the term describes the behavioural features of profoundly brain damaged people who, though having a sleep-awake pattern, respond on a reflex level without evidence of cognitive functioning.[1]

The term is unfortunate. Many people understand "persistent" to mean "permanent"—that is, a statement of final outcome rather than a comment on the present state. "Vegetative" has the unfortunate connotation of "vegetable-like." Neither of these interpretations encourages a positive approach to treatment.

Knowing when persistent becomes permanent is difficult. Berrol found that when the persistent vegetative state lasted less than six months one third of patients had moderate levels of disability; when it lasted longer than six months all remained severely disabled.[2] In a study of 84 patients who were in a persistent vegetative state 34 became aware by six months, a further 10 by one year, and a further 5 by three years.[3] There have also been several reports of recovery taking place after up to five years in a persistent vegetative state. These all confuse the picture as to what should be done and when.

Early on in management most attention is directed towards diagnosis and lifesaving measures, and this stage is usually carried out with great skill. Unfortunately, as Jennett pointed out, "in some hospitals, there seems not much middle ground left between intensive care and relative neglect."[4] This is probably unsurprising as each health authority will have only two or three people in a permanent vegetative state. Rehabilitation units are often unable to accept these patients as a priority, and therefore they remain on general medical, surgical, or orthopaedic wards, where there is little opportunity to develop the skills to manage them. At present, Britain has only one dedicated unit for rehabilitating and managing people with this condition.

What can be achieved? General management is based on good standards of nursing care—preventing pressure sores, controlling bowel and bladder function, managing the tracheostomy, controlling infections, and avoiding contractures. Clinical observation suggests that sitting the patient in a chair results in increased eye opening, and many patients benefit from specialist seating systems to maintain the control of muscle tone.

Nutrition is often neglected. Brain damaged patients admitted for rehabilitation are on average 85% of their ideal weight.[5] This is unsurprising as maintaining nutrition through a nasogastric tube may take up to three hours of nursing time a day. Endoscopically placed percutaneous gastrostomy tubes are an important advance in managing nutrition for such severely disabled people.[6]

The role of drugs in the management of the persistent vegetative state is still uncertain. Many patients receive antiepileptic drugs; those with a lower cerebral inhibiting effect, such as carbamazepine, should be considered. Clinical observation suggests that bromocriptine may improve levels of awareness, though this has yet to be formally assessed.

Coma arousal programmes are attracting interest. These use stimulation of vision, hearing, touch, taste, and smell, starting at a simple level and then building up to more complex stimuli as the conscious level improves. There is still much to learn—for example, whether familiar sounds are more effective than noise or unfamiliar sounds. Similarly, with the duration of stimulation: at the Royal Hospital it is our impression that short bursts of less than a minute, repeated intermittently with periods of silence over quarter of an hour, are all that patients in a persistent vegetative state can tolerate. Because of this the unit schedules quiet periods for the whole ward several times a day.

Some evidence is emerging that stimulation programmes can affect responses. Wilson *et al* found that a multimodal stimulation programme significantly benefited four patients, though a unimodal programme did not.[7] Other researchers have found changes in the ratio of θ to β activity in the electroencephalogram of half the patients entered into multimodal stimulation programmes[8]; Sisson found electroencephalographic changes and eye opening responses to a stimulation programme.[9] Although these effects are encouraging, they are unlikely to make a clinical difference.[10]

Of more clinical relevance is 10 years' experience of training relatives of more than 250 patients in a persistent vegetative state to use a programme of stimulation every quarter of an hour for up to 11 hours a day.[10] In this study only 4% of patients did not improve; one third became functionally independent. In a randomised controlled trial a stimulated group had a shorter duration of coma, which lightened more rapidly, than that in the control group.[11] Methodological difficulties exist with all of these studies—because of the small number of affected patients available for study there is a tendency to bring together, for purposes of statistical testing, groups who ought to be kept distinct.[12] New arousal programmes of deep brain stimulation are being developed,[13 14] which may offer further options for treatment in the relatively near future, though these need full evaluation.

Much remains to be learnt about the effect of treatment on the persistent vegetative state. One problem is the possibility of self fulfilling prophecy—the prognosis is poor, therefore no treatment is given, therefore the prognosis is poor. Doctors increasingly believe that these patients should be offered the opportunity of admission to a rehabilitation programme. Because of the small number of patients this is unlikely to be available locally and may require regional or supraregional services. As patients in a persistent vegetative state may live for many years attention to basic care is likely to have an appreciable effect on their quality of life. Specialist treatment, especially if provided early, probably offers the greatest opportunities for optimal recovery and improvement in quality of life for both patient and family.

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Balloon dilatation of heart valves

No proper randomised trials yet but looks promising

Balloon dilatation of valvar stenosis is popular with patients as an alternative to surgery. It avoids a potentially painful operation, and usually the patient can return to normal life within a day or two instead of needing several months' convalescence.

Such advantages are meaningless unless the safety and efficacy of dilatation compare favourably with those of conventional surgery, yet no randomised comparisons of valvuloplasty and surgery have been made. Despite this a consensus regarding the place of balloon valvuloplasty is emerging: the technique is most likely to produce long term benefits if the edges of the affected valve cusps are fused (commisural fusion)[1-3] and the cusps are pliable and not heavily calcified. This is most likely in young people—unsurprisingly, therefore, it was paediatric cardiologists who led the way.

The pulmonary valve was the first to be dilated, and this proved so successful that soon balloon valvuloplasty became the preferred treatment of pulmonary stenosis. It is quick, safe, and effective in the long term, usually reducing the gradient across the pulmonary valve to negligible levels.[4] Very few children or adults now need surgical pulmonary valvotomy. In the neonatal period critical pulmonary stenosis is life threatening and much more difficult to manage. The tiny valve orifice can be difficult to cross,[5] and manipulating the catheter may produce considerable haemodynamic instability. A satisfactory haemodynamic result is not always obtained, and subsequent operative treatment may be needed, particularly when there is associated right ventricular hypoplasia.[6] Similarly, critical aortic stenosis in neonates is life threatening, and balloon dilatation yields similar results to open surgical valvotomy.[7] With either treatment the main determinant of survival is the state of the left ventricle.

After the neonatal period aortic stenosis remains difficult to manage. Stenosis tends to progress, and recurrence after surgical valvotomy is common. A wholly surgical approach may therefore require several operations before the child is big enough to accommodate an aortic prosthesis of adequate size. Although aortic balloon valvuloplasty may induce arrhythmias, damage the femoral artery, and cause appreciable aortic regurgitation, it often provides palliation,[8,9] thus minimising the number of operations required and occasionally producing such a good long term result that surgery is avoided. In young adults with aortic stenosis the situation is the same as in children; if the stenosed valve is not calcified balloon valvuloplasty is often very successful.

The situation differs in middle aged and elderly people because the pathology is different. Cardiologists who struggled to manipulate catheters through craggy, calcified stenotic aortic valves and the surgeons who operated on such valves were surprised by the early reports of successful balloon dilatation.[10] Enthusiasm was short lived: although definite early improvement in valve area and clinical state occurred, most patients slipped back to their previous condition within six months. Follow up studies have confirmed that the procedure hardly affects the dismal outlook of untreated symptomatic aortic stenosis.[11-13] Although patients who were truly "unfit for surgery" may have contributed to these poor results, some patients had balloon valvuloplasty rather than surgery purely on grounds of advanced age.[14] Most of the failures, however, are likely to have resulted from the nature of the lesions: in most cases commisural fusion is not present, and any early improvement is due to fracture of calcified leaflets,[15] which would be expected to reset in their former position.

The good results of surgery compared with balloon valvoplasty in elderly patients[16] make aortic valve replacement the preferred treatment provided that there are no other major contraindications to major surgery such as renal or pulmonary impairment. Occasionally balloon valvuloplasty may be used to buy time in a very ill patient even with a heavily calcified valve, allowing safer surgery a few weeks later,[13] or as palliation in a very symptomatic, and usually extremely elderly, patient with multisystem disease in whom surgery is unrealistic.[14]

Mitral stenosis is the lesion in which balloon valvuloplasty has its greater effect in adults, particularly in the developing world where this lesion is common and cardiac surgical resources are sparse. The best results are obtained when the valve shows commissural fusion, is pliable, has little or no disease of its subvalvar apparatus, and is not heavily calcified.[17-19] Good palliation, however, can sometimes be obtained