Recovery from low back injury

Soft-tissue injuries of the back are a common and important cause of morbidity. Fairbank (1986) found that 46% of a randomised sample of the population of the United Kingdom had at one time or another suffered from back pain, and 18% of those who reported pain had had time off work in the preceding year. The cost to the UK National Health Service for treatment of low back pain has been estimated as 1.15% of the total budget (Wells 1985). In 2000 cases of compensated back injuries in Canada the average time off work was 74 days, and 10% of the patients were off work for more than six months (Rossignol, Suissa and Abenhaim 1988). In 1987 in the United States of America 5.3 million people were disabled due to low back pain and a further 11.7 million had impairment. Compensation and medical costs due to back pain in 1984 were $7.2 billion (Frymoyer and Cats-Baril 1987).

In predicting recovery from low back pain of acute onset, patient related factors have been found to be of great significance. In a controlled retrospective study of 300 patients, all treated conservatively, I examined 16 possible prognostic factors using multiple regression analysis (Greenough 1993). Of these, seven variables significantly affected the outcome: the presence of a compensation claim, psychological disturbance at presentation, length of time off work, age at injury, sex, social group and a history of onset after a slipping or jerking injury. No prognostic significance was shown for diagnosis, severity of injury, length of follow-up or presence or absence of neurological deficit. The total variance explained ($r^2$) was 48.3%. Two variables, compensation claim and psychological disturbance at presentation, together accounted for 35% of the variance, or more than half of the explained variance.

As the diagnosis was not of prognostic significance, specific treatments were unlikely to prove effective. Of a number of treatments including educational classes, exercises, facet injections and epidural injections, only educational classes had a significantly beneficial effect and then only in a small subset of patients (Greenough and Fraser 1994). The effect of educational classes was also noted to be valuable by Bergquist-Ullman and Larsson (1977) and by Sikorski (1985). Patients with no compensation claim improved after facet injection, but patients seeking compensation became worse. In summary, patient-related factors outside the control of the clinician had far more influence on the outcome than did the diagnosis or the treatment.

Psychological disturbance has been noted in many patients after back injuries (Dzioba and Doxey 1984; Mendelson 1984; Waddell et al 1984) and has been shown to reduce the response of patients with low back pain to conservative therapy (Beals and Hickman 1972), chemo-nucleolysis (Wiltse and Rocchio 1975) and surgery (Pheasant et al 1979). A relationship between psychological disturbance and litigation has been proposed, although the correlation varies with the type of population studied (Miller 1961; Parker 1977; Repko and Cooper 1983).

Since Rigler coined the term ‘compensation neurosis’ in 1879 (Parker 1977) several authors have suggested that the presence of a compensation claim retards and impairs recovery from injury (Krusen and Ford 1958; Dworkin et al 1985; Trief and Stein 1985; Sander and Meyers 1986). Krusen and Ford (1958) studied the response to a rehabilitation programme of 272 compensation claimants and 237 non-compensation patients. They found that 88.5% of the latter group improved compared with only 55.8% of the compensation group, though these had had significantly more treatments. Sander and Meyers (1986) studied two groups of railroad workers, 35 who had been injured at work and 30 injured while off duty. Although the groups were otherwise very similar, those injured on duty were off work for a mean 14.9 months whereas those injured off duty were off work for a mean 3.6 months.

Similar findings in relation to compensation have been observed after surgical treatment (Sacks 1966; Stauffer and Coventry 1972; Greenough et al 1994). Greenough et al (1994) studied 150 single level interbody lumbar fusions and found that compensation status was a significant prognostic factor for outcome score, patient satisfaction and reported pain at review. Psychological disturbance at presentation was also a significant prognostic factor of outcome score.

The type of compensation claimed appears to be
important. There was a marked difference between self-employed patients with a private sickness benefits policy, which paid only a subsistence income, and claimants for a lump sum (Greenough 1993). The former patients behaved similarly to the non-compensation group, as has been reported also by Carron, DeGood and Tait (1985). The reported incidence of ‘whiplash’ injuries of the neck, a condition with some similarities to low back pain, was reduced six-fold in the State of Victoria, Australia over a period of five years after adjustments to the eligibility regulations for compensation claims (McDermott 1993).

I found that settlement of the claim was associated with a small increase in the outcome scores of men (not women), but that there was no change in reported pain and no improvement in employment status or psychological disturbance. Others have reported similar findings (Mendelson 1982; Tarsh and Royston 1985; Talo, Hendler and Brodie 1989). These observations contrast with those of an earlier study by Miller (1961a,b) who believed that patients lost their psychological symptoms and returned to work shortly after settlement of their legal claims.

It is established, then, that eligibility for lump-sum compensation is associated with poor results, but that settlement of the claim does not much improve those results. This implies that seeking lump-sum compensation causes some alteration which is permanent. An injured worker may be under pressure from work-mates, unions and family not to return to work ‘until he is better’. He may not enjoy his work or his supervisor may hold a poor opinion of him (Bigos et al 1986). All these factors will prolong time off work and reduce activity, resulting in reduced spinal muscular fitness and persisting low back pain, and in these circumstances, settlement may not improve the patient’s condition.

Three relevant factors are delay in return to work, the adversarial nature of the compensation system, and the effect of a history of litigation on prospective employers. Patients who returned to work less than six months after injury were more likely to be employed; return to work as part of a treatment programme increases the success rate (Catchlove and Cohen 1982).

The adversarial system requires patients to recount their symptoms and disabilities many times to lawyers and doctors and causes great delays. The stressful conditions of litigation (which may include covert observation) reduce compliance with rehabilitation regimes and delay adjustment to chronic back pain. Medical reports are often of little value for lack of quantifiable variables. The Physical Impairment Rating of Waddell (Waddell and Main 1984) proved unhelpful, since it was affected by psychological disturbance and correlated poorly with outcome. Haddad (1987) found that in 1818 compensation cases the claimants’ medical advisers awarded ‘no disability’ in 0.5% of cases whereas the insurance companies’ specialists awarded ‘no disability’ in 75% of cases.

Patients who have settled their cases and who are actively looking for work find that their history of a claim for back injury is a significant handicap. It was one of the most common reasons cited by patients for their determination never to go through a claim procedure again.

In conclusion, it appears that the compensation system, particularly the lump-sum system, acts directly and powerfully against the long-term interests of the patient, an effect which continues for some years after settlement. The lump-sum system of compensation for low back injury should be abolished in favour of a continuous payment system and legal involvement should be minimised.

C. G. GREENOUGH

REFERENCES


THE JOURNAL OF BONE AND joint SURGERY
Bioactive ceramics

The modern era of joint reconstruction using low-friction arthroplasty represents a surgical success story that ranks second to few. As with any human activity, however, success spawns attempts to do even better, and in this instance there is a case for improvement. The aims of the pioneers were to relieve pain and restore joint movement, and the techniques which they developed achieved these goals. The method of fixation, however, suffered from limitations, both theoretical and real. Bone cement can fragment and the formation of particles at the cement-bone interface can result in osteolysis and loosening. Osteolytic reactions have also been related to wear debris from ultra-high-molecular-weight polyethylene, another key material of the pioneering days. Since current methods fall short of achieving a lifetime of function, particularly when arthroplasty is performed in younger patients, it is of interest to review the future potential of bioactive ceramics in this and other fields.

The bioactive properties of ceramics such as hydroxyapatite, some calcium phosphates and various types of bioactive glass, are well known. When placed in bone tissue, these materials promote bone formation, and bond to bone at various rates. To assess their potential for long-term, successful performance, we need to understand the mechanism of this interaction. Over the last few years evidence has been mounting that there is a gradual change at the ceramic surface by dissolution, precipitation and ion-exchange reactions which results in a carbonate-containing, calcium-deficient hydroxyapatite with small crystal dimensions (Daculsi, Le Geros and Dendon 1990; Ducheyne et al 1990; Kokubo 1992). This change is the first step in the cascade of events which underlies bioactive behaviour and is accompanied by parallel reactions, such as solution-mediated and substrate-controlled effects on cellular activity, organic matrix deposition and mineralisation. Absorption and incorporation of proteins and other biological molecules occur and surrounding cells become attached to the changing material surface. All these phenomena lead to the gradual incorporation of the ceramic into developing bone tissue.

Calcium phosphate ceramics include several materials which differ not only in their chemical composition, but also in their specific surface area, crystal structure and macro- and microporosity. There are differences due to variations in the calcium to phosphate ratio; tricalcium phosphate, hydroxyapatite and tetracalcium phosphate have Ca/P ratios of 1.5, 1.67 and 2 respectively, and there are other materials with ratios in between these (de Groot 1980). Furthermore, hydroxyl ions may be missing from the structure, as in oxyhydroxyapatite, and other trace ions may be present.

The importance of these compositional variations is not merely academic; they affect the biological response as the following examples show. Dense, stoichiometric hydroxyapatite (Ca_{10}(PO_{4})_{6}(OH), for instance, is among the more stable of the calcium phosphates and in vitro, the rate of precipitation on the ceramic surface is slow and the initial precipitate is very deficient in calcium. In animals, this material bonds to bone tissue present in the immediate vicinity. However, multinuclear giant cells can be seen resorbing the material for as much as two years after implantation (Schepers et al 1991). The second