END-STAGE AVASCULAR NECROSIS OF BONE
IN RENAL TRANSPLANT PATIENTS

THE NATURAL HISTORY

M. A. CHURCHILL, J. D. SPENCER

From the United Medical and Dental Schools, Guy's Hospital

We report the results of conservative treatment of stage III and stage IV avascular necrosis of bone (AVN) affecting the hip or knee in renal transplant patients. Twenty-nine patients were followed for a mean period of five years. Conservative management was successful in controlling symptoms in 40% of those with AVN of the hip and in 70% of those with AVN of the knee. Knowledge of the natural history of AVN is important because of the long survival times after renal transplantation.

Avascular necrosis of bone (AVN) is associated with a wide variety of systemic disorders and drugs (Nixon 1983). Ficat and Arlet (1980) have classified AVN into four stages based on symptomatic, radiological and haemodynamic criteria. Stages I and II are defined as early, with potentially reversible bone changes. Spencer and Brookes (1988) have studied the pathogenesis of these stages, and Marcus, Enneking and Massam (1973) and Ficat (1985) described treatment to prevent joint destruction. By contrast, stages III and IV are end-stages with irreversible destruction of bone and joint surfaces. Reconstructive surgery has been recommended for such joints (Merle d'Aubigné et al 1965; Kerboul et al 1974; Cornell, Salvati and Pellicci 1985) whereas the place for conservative (non-operative) management has attracted little attention. There is a paucity of information on the natural history of joints affected by late-stage AVN. Such data are essential to evaluate surgical treatment, especially because of the increased life expectancy of patients following renal transplantation.

PATIENTS AND METHODS
Between 1978 and 1988, 29 patients with stage III or IV AVN affecting the hip or knee were identified from amongst the renal transplant patients at Guy's Hospital.

All were under the care of one orthopaedic consultant (JDS). The diagnosis of AVN was established by radiographs and scintigraphy, and confirmed histologically from surgical specimens. The stage of AVN was assessed using the classification described by Ficat and Arlet (1980). Conservative management comprised rest, relief of weight-bearing where appropriate, physiotherapy and simple analgesics (non-steroidal anti-inflammatory drugs were usually contra-indicated). Surgery was offered only for persistent, severe or disabling symptoms.

There were 19 males and 10 females of mean age 37.5 years (range 19 to 79). Twenty-eight patients had been on dialysis prior to treatment. Fifteen patients had had a single successful renal transplant but 13 required one or more transplant operations. Renal function remained good in 21 patients, fair in four, and poor in four. All patients were maintained on steroids and azathioprine or cyclosporin A from the time of transplantation. There were a total of 52 hips and knees affected by stage III or IV AVN. Eighteen patients had multiple joint involvement, 11 had only one joint affected.

RESULTS
Of the 35 hips studied, 18 presented with the radiological signs of stage III disease. Eight joints progressed from stage III to stage IV, during the study period and 10 did not deteriorate radiologically. Stage IV had already been reached in the remaining 17 hips at the time of presentation, and 15 of these subsequently required surgery. At the time of surgery, 22 of the 24 femoral heads were classified radiologically as stage IV.

Ten of the 15 knees had small focal osteochondritic lesions with occasional loose body formation (stage III). No radiological progression or secondary joint degener-
ation occurred in these cases. Three other knees with stage III AVN required drilling of the osteochondritic defect. Two knees had massive necrosis of a femoral condyle at presentation (stage IV) and these went on to develop progressive collapse.

Symptoms of AVN were first felt at an average 33.2 months after renal transplantation (range 6 to 96, Fig. 1). Survival curves (where 'survival' represents non-operative treatment and therefore mild symptoms) depict the progress of symptomatic deterioration (Fig. 2). Five knees deteriorated and required operative intervention within two years of presentation, but a much greater proportion of hips developed severe symptoms and came to surgery. Progression in these cases was rapid with two-thirds of the hip operations carried out within three years of the onset of symptoms (Fig. 2).

At the end of this study, 23 hips and knees with AVN (44%) had been managed successfully by conservative means (Fig. 3). Symptoms were minimal or improved in 19 of these joints but four (three knees and one hip in two patients) deteriorated with increasing symptoms. Both patients, however, declined the offer of asymptomatic disease is often overlooked. Patients whose life style and life span have been considerably improved by renal transplantation may be disabled with AVN of at least one of their major joints. Although newer immunosuppressive drugs such as cyclosporin A may decrease the incidence of AVN, a knowledge of the natural history of this disorder is important. Merle d'Aubigné et al (1965) wrote that the course of end-stage AVN is variable and unpredictable but that 75% of hips with AVN will deteriorate with time. Kerboul et al (1974) quoted similar figures and bilateral joint involvement has been reported to have a worse prognosis (Merle d'Aubigné et al 1965; Ficat 1985). In our series, although the great majority of joints with stage IV AVN required surgery, two did not. Treatment is not therefore based solely on radiological criteria.

There has been wide variation in the experience of other authors managing end-stage AVN conservatively. Fisher and Bickel (1971) treated 25 of their 77 patients conservatively. Cruess et al (1968), Cruess (1976) and Nixon, Hughes and Castro (1980) have all undertaken conservative management for certain cases of AVN of surgery in favour of continued conservative management. Of the 52 hips and knees in this study, 29 required surgery for symptomatic relief, with the hip featuring most frequently (Fig. 3).

DISCUSSION

Avascular necrosis of bone affects between 3% and 37% of all renal transplant patients (Spencer and Maisey 1985). Its exact aetiology and pathogenesis are still debated (Bewick et al 1976; Glimcher and Kenzora 1979; Ficat and Arlet 1980; Kawai, Tamaki and Hirohata 1985; Cruess 1986; Spencer and Brookes 1988). Whilst the detection of early AVN is possible (Ficat 1985),
the hip. In our series two-thirds of the knees and one-third of the hips affected by end-stage AVN were symptomatically well controlled by conservative treatment.

Intertrochanteric osteotomy for AVN of the hip gives generally poor long-term results particularly in older patients and in those with extensive hip involvement (Kerboul et al 1974; Maistrelli et al 1988). Cornell et al (1985) described a 10-year failure rate of 37% for cemented total hip replacements in AVN and even worse results for patients under 40 years of age with bilateral steroid-related hip disease. Radford et al (1989) found that of renal transplant patients who had a total hip replacement, 13% suffered symptomatic loosening at six years.

Conclusion. Our study confirms that in stage IV AVN of the hip, surgery is often required. In stage III disease of the hip or the knee conservative management succeeds in over half the cases.

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REFERENCES


