MULTIFOCAL AVASCULAR NECROSIS AFTER SHORT-TERM HIGH-DOSE STEROID THERAPY

A REPORT OF THREE CASES

L. J. TAYLOR

From St George's Hospital, Tooting, London, and the South West Thames Regional Orthopaedic Training Scheme

Avascular necrosis of bone is a well-recognised phenomenon in patients on long-term steroid therapy, especially after renal transplantation. There are only four cases reported in the literature of multifocal avascular necrosis after short-term high-dose steroid therapy, and three additional cases are reported in this paper. All the hips have needed reconstructive surgery within two and a half years of the onset of symptoms; in one patient, however, this has been prevented by other medical problems. In two of the three patients reported in this paper the shoulders also were affected; eventually they became pain-free but movement was restricted. Short-term high-dose steroid therapy has only recently been recognised as a cause of avascular necrosis and attempts should be made to prevent the incidence increasing.

Although avascular necrosis of bone is a well-recognised phenomenon after prolonged steroid therapy, it has only recently been recognised after short-term treatment (Good 1974; Anderton and Helm 1982; McCluskey and Gutteridge 1982). In this paper, three patients are reported, all of whom had bilateral femoral head necrosis; two also had bilateral humeral head necrosis.

CASE REPORTS

In all three patients, detailed histories excluded all other known causes of avascular necrosis. Thus, there was no evidence of osteoblastic episodes, liver disease, alcoholism, pancreatitis, antirheumatic drug therapy, hyperuricaemia, diabetes mellitus, haemoglobinopathy, or Gaucher's disease. Serological screening was performed on all patients and no abnormalities were detected.

All three presented within two and a half years of receiving short-term dexamethasone treatment, and this agrees with the findings of Anderton and Helm (1982) and McCluskey and Gutteridge (1982).

Case 1. In September 1975 a 21-year-old man was seen at Crawley Hospital. He had been assaulted in Spain two days previously, where a small left temporoparietal laceration had required suturing. On admission he was conscious but drowsy and confused. There were no localising neurological signs but radiography revealed a depressed fracture of the left temporal bone. The patient was transferred to the neurosurgical unit of Atkinson Morley's Hospital later that day as he had developed a nominal and expressive dysphasia, a right hemiparesis and a temperature of 39°C. A computerised axial

tomogram (CAT scan) confirmed a left temporal space-occupying lesion. He was started on dexamethasone treatment to decrease cerebral oedema. A left temporal craniotomy was performed and this revealed a lacerated dura and contusion of the underlying brain.

Postoperatively he remained dysphasic but his right hemiparesis slowly improved. His persistent facial twitching was controlled with diazepam, phenobarbitone and phenytoin. At discharge after 15 days he still had some right-sided facial weakness and was unable to recognise the right side of his body. This has since recovered. During his seven-day stay in hospital he received a total of 98 mg of dexamethasone.

Fig. 1

Case 1. Radiological appearance of the hips at presentation, showing advanced changes of avascular necrosis of both femoral heads.

In late 1976, 12 months after receiving the steroid therapy, he began to complain of pain in both hips. Radiographs revealed avascular necrosis of both femoral heads (Fig. 1). The clinical symptoms, signs and radiographic features deteriorated until in 1978, two and a half years after receiving the steroid therapy, his two stiff painful hips warranted replacement.

Case 2. A 35-year-old man was admitted to Epsom District Hospital in March 1977 having collapsed during sexual intercourse. He developed a severe occipital

L. J. Taylor, FRCS, Senior Registrar in Orthopaedics
Middlesex Hospital, Mortimer Street, London W1P 1LD, England.

© 1984 British Editorial Society of Bone and Joint Surgery
0301-620X/84/3052 \$2.00

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Case 2. Figure 2—Radiological appearance of the hips at presentation, with early signs of avascular necrosis especially obvious in the right hip. Figure 3—Radiological appearance six months later, with advanced changes in the right hip and early collapse and flattening of the upper segment of the left femoral head. Figures 4 and 5—Radiological appearance of the shoulders after a further six months, showing advanced changes of avascular necrosis in both humeral heads.

headache followed by vomiting. On admission he was conscious but drowsy. There were signs of meningism, but no localising neurological signs. Lumbar puncture confirmed that he had suffered a subarachnoid haemorrhage.

He was transferred to the neurosurgical unit at Atkinson Morley's Hospital where a CAT scan and an angiogram revealed the cause to be an angiomatic malformation of the left side of the cerebellum. As the lesion was surgically inaccessible it was treated with radiotherapy at the Royal Marsden Hospital. There was an encouraging response but unfortunately he had a further haemorrhage in February 1982 from which, however, he made a satisfactory recovery. At the time of writing he was recovering from a third haemorrhage.

After his first admission to hospital he received a total of 148 mg of dexamethasone over 11 days; and after his second, a total of 274 mg of dexamethasone over 32 days.

In November 1979, two and a half years after the first course of steroid therapy, he began to complain of pain in his right hip and thigh, especially on walking. Radiographs taken at that time showed established avascular necrosis of the right hip with early cystic changes in the left hip (Figs 2 and 3). Although this necrosis has progressed to the stage where total hip replacement is indicated, this is prevented by the primary condition.

In November 1980, three and a half years after the first course of steroid therapy, he began to notice pain and stiffness of both shoulders. Radiographs revealed bilateral avascular necrosis of the humeral heads (Figs 4 and 5). Although the radiographic appearances have since deteriorated, his symptoms have lessened and currently cause him little disability.

Case 3. This 45-year-old man presented in November

1976 at St James' Hospital, Balham, with a six-week history of electric-shock-like pains radiating down both arms associated with pain in the neck which had suddenly become worse while swimming. The arm pain was exacerbated by extension of the neck and he had also noticed increasing weakness of all four limbs with decreasing ability to climb stairs and to stand up from a sitting position. Examination revealed bilateral motor and sensory changes below the fourth cervical segment. Investigations revealed a protrusion of the C4-5 disc. Dexamethasone treatment was started and he was transferred to the neurosurgical unit of Atkinson Morley's Hospital where he underwent removal of the C4-5 disc and anterior cervical fusion at the same level. During his stay in hospital he received a total of 380 mg of dexamethasone in 32 days, 328 mg being taken in the first 16 days. After operation he recovered completely over six weeks.

In November 1978, two years after the steroid therapy, whilst working as a painter and decorator he felt pain and stiffness in his shoulders, which restricted his work. Radiographs revealed avascular necrosis of both humeral heads (Figs 6 and 7). His shoulders were manipulated under anaesthesia and this was followed by physiotherapy, with improvement in his symptoms.

Fifteen months later, in January 1980, three years three months after the steroid therapy, he began to experience pain and stiffness in his right hip; in October 1981 similar symptoms developed in his left hip. Radiographs revealed avascular necrosis of both femoral heads (Figs 8 and 9). By June 1982, six years after the steroid therapy, he was unable to continue working and has had one hip replaced with an uncemented Ring prosthesis and the other treated with a bone graft. His shoulders are now free of pain although movement is restricted.

DISCUSSION

All these three patients developed significant joint problems as a complication of their steroid therapy. Although the place of dexamethasone therapy in malignant brain tumours is supported by good evidence (Gutin 1977), the value of its use in strokes (Mulley, Wilcox and Mitchell 1978), head injuries (Pitts and Kaktis 1980) and other neurological conditions is less convincing.

Four cases of avascular necrosis after short-term dexamethasone therapy have previously been reported

fact that the shoulders are non-weight-bearing joints.

Although steroid-induced avascular necrosis after short-term therapy is rare, it is well-recognised in patients on long-term therapy, especially after renal transplantation (Ibels *et al.* 1978). Of the seven patients reported by Ibels *et al.*, all have developed symptoms in their hips within two and a half years of the first course of steroid therapy, and six have had bilateral reconstructive surgery; the seventh has not, due to recurrent subarachnoid haemorrhages.

Fig. 6

Fig. 7

Case 3. Figures 6 and 7—Radiological appearance of the shoulders at presentation with advanced changes of avascular necrosis in both humeral heads. Figure 8—Tomogram of the right hip showing early changes of avascular necrosis before collapse of the head. Figure 9—Radiological appearance of the hips three years after presentation, with advanced destruction in the right hip.

Fig. 8

Fig. 9

(Anderton and Helm 1982; McCluskey and Gutteridge 1982). Good (1974) reported a solitary case of bilateral femoral head necrosis after a 16-day course of corticotrophin after hypophysectomy. Although avascular necrosis of the shoulders was mentioned by McCluskey and Gutteridge, no mention was made of the fate of the shoulders. My two patients with bilateral humeral head necrosis have both responded well to physiotherapy; both are free of pain but have restriction of movement. This lack of deterioration may well be explained by the

Until there is more convincing evidence available about the use of short-term steroid therapy for head injury, strokes and other neurological conditions, perhaps there should be more caution in prescribing these drugs. Many of these patients are young and otherwise fit, but these complications prevent them from working. As the changes of avascular necrosis are already advanced at the time of presentation, total hip replacement offers the best results in treatment; in young patients, however, this carries a high risk of long-term complications.

I would like to thank Mr Geoffrey Walker and Mr Peter Ring for allowing me to report their patients and Mr Geoffrey Walker for reading the manuscript. I would also like to thank the photographic department at St James' Hospital, Balham, and Miss S. Wadd for secretarial assistance.

REFERENCES

- Anderton JM, Helm R. Multiple joint osteonecrosis following short-term steroid therapy: case report. *J Bone Joint Surg [Am]* 1982; **64-A**:139-41.
- Good AE. Bilateral aseptic necrosis of the femur following a 16-day course of corticotropin. *JAMA* 1974; **228**:497.
- Gutin PH. Corticosteroid therapy in patients with brain tumors. *Natl Cancer Inst Monogr* 1977; **46**:151-6.
- Ibels SL, Alfrey AC, Huffer WE, Weil R 3d. Aseptic necrosis of bone following renal transplantation: experience in 194 transplant recipients and review of the literature. *Medicine (Baltimore)* 1978; **57**:25-45.
- McCluskey J, Gutteridge DH. Avascular necrosis of bone after high doses of dexamethasone during neurosurgery. *Br Med J* 1982; **284**:333-4.
- Mulley G, Wilcox RG, Mitchell JRA. Dexamethasone in acute stroke. *Br Med J* 1978; **ii**:994-6.
- Pitts LH, Kaktis JV. Effects of megadose steroids on ICP in traumatic coma. In: Shulman K, Marmarou A, Miller JD, Becker DP, Hochwald GM, Brock M, eds. *Intracranial pressure 4: proceedings of the fourth international symposium on intracranial pressure*. Berlin: Springer, 1980:638-42.