BRIEF REPORTS

CARDIAC ARREST DURING INTRAMEDULLARY NAILING FOR FEMORAL METASTASES

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Intramedullary nailing is an accepted method of managing femoral metastases. The operation usually relieves pain and allows mobilisation, but we report several intraoperative cardiac arrests.

Patients and results. From October 1989 to December 1992, 23 patients had intramedullary nailing at the Bristol Royal Infirmary for femoral shaft metastases. Three patients required bilateral surgery; in two it was staged with intervals of 9 and 12 days, and in the third the operations were performed under a single anaesthetic. A standard closed technique was used, but since May 1992 we have inserted a 5 mm distal vent to minimise the vascular dissemination of fat or air during reaming and nailing (Kallos et al 1974).

nailing had no respiratory problems associated with the first nail, but all three had cardiac arrest during insertion of the second nail, giving an incidence of 100% for second-side nailings, compared with 13% for unilateral procedures. The operative mortality for bilateral surgery was 67% and for unilateral surgery, 9%. The cause of death was fat embolism in three cases and air embolism in one.

In case 5 a distal vent was used, and in two others (cases 3 and 6) there was an established pathological fracture.

Discussion. The cause of fat and air embolism is probably the raised pressure produced by reaming a closed medullary canal. This is more likely to occur during the

Table I. Details of patients having cardiac arrest during intramedullary nailing procedures for femoral metastases

Case	Age	Sex	Primary tumour	Unilateral/bilateral	Device	Pathological fracture	Site	Outcome
1	44	F	Cervix	Unilateral	AO nail	No	Mid-shaft	Died from fat embolus
2	51	F	Breast	Bilateral (single anaesthetic)	AO nail	No	Multiple	Survived 5 months
3	72	F	Breast	Unilateral	Reconstruction nail	Yes	Subtrochanteric	Survived 24 months
4	68	F	Breast	Bilateral (staged)	Reconstruction nail	No	Multiple	Died from air embolus
5	61	F	Breast	Bilateral (staged)	Reconstruction nail	No	Multiple	Died from fat embolus
6	65	M	Prostate	Unilateral	Reconstruction nail	Yes	Subtrochanteric	Died from fat embolus

There were six cases of cardiac arrest with four fatalities (Table I), all during reaming or nail insertion. None was predictable from the preoperative assessment of the patients. The three patients who had bilateral

prophylactic nailing of an unfractured femur, but could occur in the distal fragment of a fractured bone. Our cases 3 and 6 both had subtrochanteric fractures.

Kallos et al (1974) showed in animal studies that a large rise in intramedullary pressure during cement and medullary rod insertion was prevented by a venting hole. We used such a decompression vent before reaming in case 5, but it did not prevent death due to fat embolism. It seems possible that neoplastic tissue in the medullary canal, with its abnormal vasculature, may allow fat or air to enter the venous circulation during reaming.

The 100% incidence of cardiac arrest during surgery on the second side in our three bilateral cases, suggests a cumulative phenomenon, and it seems reasonable to

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©1993 British Editorial Society of Bone and Joint Surgery
0301-620X/93/6R87 \$2.00
J Bone Joint Surg [Br] 1993; 75-B:972-3.
Received 9 February 1993; Accepted 16 March 1993

assume that some pulmonary insult occurred during the first operation that predisposed to the subsequent arrest.

We no longer perform prophylactic nailing of a second femur during the same admission, and delay the second operation for as long as possible. As yet we have been unable to detect changes in basic pulmonary function after unilateral surgery, but feel that further research is needed to offer guidance on a minimum safe interval.

We conclude that caution should be exercised in these cases and that adequate counselling of patients and

relatives is needed before surgery. Bilateral operations in particular should be carefully considered, and perhaps should only be performed when there are established fractures.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

REFERENCE

Kallos T, Enis JE, Gollan F, Davis JH. Intramedullary pressure and pulmonary embolism of femoral medullary contents in dogs during insertion of bone cement and a prosthesis. *J Bone Joint Surg [Am]* 1974; 56-A:1363-7.

EVIDENCE FOR A VIRAL AETIOLOGY OF TRANSIENT SYNOVITIS OF THE HIP

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In children a painful hip is commonly due to transient synovitis, but the cause is unknown. We aimed to study the aetiological basis of the condition.

Patients and methods. Over a six-month period in 1991, 80 children were admitted with acute transient synovitis of the hip. The protocol for their management was:

- 1) Clinical examination.
- 2) Venous blood samples taken for full blood count, ESR, C-reactive protein (CRP) level, uric acid, rheumatoid latex tests, interferon levels and viral serology.
- 3) Synovial fluid samples, taken when ultrasound had detected an effusion and studied for type of cell, bacterial culture, viral culture and interferon levels.
- 4) Recall after three to four weeks for clinical examination and to take samples for convalescent viral titres.

Interferon levels were tested in the serum and in the synovial fluid by the ELISA test (GIBCO BRL, Uxbridge, UK). Viral serology was by complement fixation using antigen supplied by the Public Health Laboratory Service (Colindale, London, UK). The pathogens tested for were enterovirus, adenovirus, measles virus, rubella virus, cytomegalovirus (CMV), herpes simplex virus (HSV),

Mycoplasma pneumoniae, mumps virus s and v antigens, *Toxoplasma gondii* and Epstein-Barr virus. Antibodies to the last were estimated by an immunofluorescence test using virus-infected cells.

An infective agent was considered to be present when there was:

- a) a fourfold or greater rise from the acute to the convalescent viral titres;
- b) a high titre to an infective agent; or
- c) the presence of a pathogen detected by culture or antigen methods.

Statistical analysis was by the paired and unpaired Student's *t*-test.

Results. White cell counts did not show great variation from normal, but 17 patients had a tendency to lymphocytosis. Of these, 14 (82%) had raised interferon levels or positive serology. The ESR varied widely (0 to 53 mm/hr) from the normal range of 3 to 7 mm/hr. The CRP level was within normal limits for all but two patients, both of whom had a concurrent ear infection. It was not possible to carry out serological tests on all patients as it was difficult sometimes to collect the required amount of blood.

Twenty-eight of 65 patients (43%) had raised blood interferon levels. Fifteen of the 16 patients with an effusion which was successfully aspirated (94%), showed raised interferon levels in the synovial fluid. These did not necessarily coincide, however, with raised levels in the blood. Bacterial and viral cultures of all synovial fluid samples were all negative. Cells were difficult to identify, because of admixed red blood cells and the small volumes available.

Viral serology in 67 patients showed raised antibody titres to viruses (Table I). By the criteria given above, pathogens were detected in:

- a) 8 patients with fourfold or greater increase in titre to *M. pneumoniae*, enterovirus or mumps;

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0301-620X/93/6R88 \$2.00

J Bone Joint Surg [Br] 1993; 75-B:973-4.

Received 30 October 1992; Accepted after revision 29 March 1993