

Lesson of the Week

Uncontrollable bleeding under tourniquet

T D BUNKER, A H C RATLIFF

Arterial calcification and joint degeneration are common in the elderly, and thus arterial calcification is often seen in the radiographs of patients undergoing joint replacement. The rigidity imparted to the femoral arterial tree by this calcification may be so great as to make the vessel incompressible by the tourniquet, which then acts as a venous obstruction and increases the amount of bleeding at operation.

We report a case of uncontrollable bleeding under tourniquet and a review of the published reports.

Case report

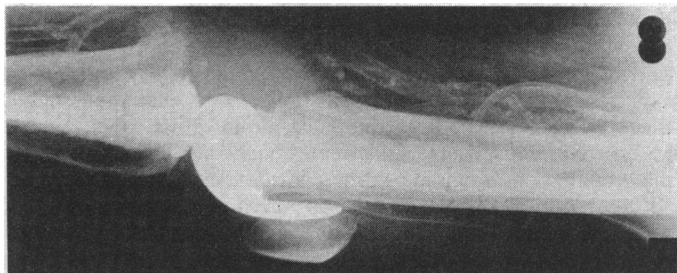
A 63 year old retired teacher of physical education with long-standing severe rheumatoid arthritis, for which he had been taking regular treatment with steroids, had undergone a total replacement of the left hip in 1980 and of the right hip in 1981. There were no operative problems, and he had an excellent result from both of these procedures.

He was admitted in 1982 for total replacement of the left knee, and on this admission a vascular surgeon was asked to see him before operation in view of his extensive vascular calcification (figure) and impalpable foot pulses. The vascular surgeon noted: "This is the most striking example of steroid induced vascular calcification that I have seen. Although impalpable, posterior tibial and dorsalis pedis pulses are easily heard on the Doppler. The posterior tibial pressure is 160 mm Hg and the dorsalis pedis pressure is 220 mm Hg (a falsely high figure because of vessel incompressibility). Clearly fracture of a calcific artery is a worry and the circulation should be checked postoperatively."

A Stanmore total replacement of the left knee was performed. During the operation the consultant surgeon noted that the dominant feature of the procedure was that despite the limb being "exsanguinated" with an Esmarch bandage and a pneumatic tourniquet being inflated to 500 mm Hg (the normal inflation pressure for the leg) there was excessive venous bleeding from the beginning of the operation. The tourniquet pressure was thus raised, but the subcutaneous flaps continued to bleed. The tourniquet was therefore abandoned, and despite a generalised ooze a routine Stanmore replacement of the knee was performed. At the end of the procedure there was no further bleeding, and clinical results were excellent.

In August 1983 he was again admitted, this time for Stanmore total replacement of the right knee. At this time he was taking 5 mg prednisolone daily and 50 mg azathioprine twice daily. The leg was prepared for operation as before. With the skin incision dark venous haemorrhage started and this continued through the initial stages. The operation was stopped, the leg raised, and the pneumatic tourniquet changed but with no effect. There was a venous ooze throughout the operation, the cancellous bone also oozing. At the end of the operation the tourniquet was removed and there was no arterial bleeding at all. He made a good recovery from both these operations, without any wound haematomas.

Arterial calcification of the femoral vessels may cause uncontrollable bleeding under tourniquet



X ray film showing extensive vascular calcification.

Discussion

The lesson here is quite clear. Any surgeon, orthopaedic or general, who operates on the leg of a patient with calcification of the arterial tree must be aware that these vessels may be incompressible. This incompressibility may not only cause failure of the tourniquet, but the tourniquet will then act as a venous obstruction, thereby actually *increasing* the amount of bleeding during operation. The only way to stop the bleeding is to remove the tourniquet and then obtain haemostasis. Thus not only should a surgeon be aware of the danger but he must be able to continue the operation with the tourniquet removed if necessary. The tourniquet pressure should not be increased in an attempt to control the bleeding as this could theoretically lead to fracture of calcified femoral vessel¹ or cause occlusion of the run off vessels by embolisation of an atheromatous plaque from the tourniquet site.²

There have been two published reports of uncontrollable bleeding from a failed tourniquet.^{1,3} In both of these reports, as in our case, a total knee arthroplasty was being performed; in the first case the operation had to be abandoned,¹ but in the second the operation was concluded after first changing the tourniquet and then abandoning it.³ In view of these dangers we suggest that the only course should be to remove the tourniquet completely and obtain haemostasis before continuing with the operation.

We acknowledge the help of Mr L. Klenerman in the preparation of this article.

References

- ¹ Klenerman L, Lewis JD. Incompressible vessels. *Lancet* 1976;i:811-2.
- ² Giannestras NJ, Cranley JJ, Lentz M. Occlusion of the tibial artery after a foot operation under tourniquet. *J Bone Joint Surg [Am]* 1977; 59:682-3.
- ³ Jeyaseelan S, Stevenson TM, Pfitzner J. Tourniquet failure and arterial calcification. *Anaesthesia* 1981;36:48-50.

Orthopaedic Department, Bristol Royal Infirmary, Bristol

T D BUNKER, BSC, FRCS, orthopaedic registrar

A H C RATLIFF, CHM, FRCS, orthopaedic consultant

Correspondence to: Mr T D Bunker.