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EDITORIAL

ARTERIAL INJURIES AFTER TOTAL HIP REPLACEMENT

Arterial injuries after total hip replacement are very rare. In a study of the statistics published in *Clinical Orthopaedics and Related Research* in 1973 the results of over 15 000 hip replacements were analysed by authors from many countries. No arterial complication was reported in any of these papers. More recently, however, Nachbur *et al.* (1979) described 15 cases of severe arterial injury collected during the period 1970 to 1978. Bergqvist, Carlsson and Ericsson (1983) reported four cases and summarised 25 from the literature; and Ratliff (1984) analysed 32 cases (including those published by Nachbur). These figures need to be considered carefully. Has the incidence increased? "It is estimated that about 35 000 hip replacements are performed in Great Britain annually and the world figure is 350 000" (Swann 1984). Possibly, where an operation has become common and regarded by some as an easy procedure, the incidence of complications will inevitably increase. There now appears to be a gradual realisation that major vascular injuries can occur with the experienced surgeon performing a difficult revision procedure and also with the less experienced surgeon performing a routine replacement; either may damage vessels he had not expected to encounter. All surgeons should now be aware of this problem, however rare, since a limb or even a life is at risk.

The external iliac or the common femoral artery (or one of its main branches) has usually been affected. It needs to be remembered that only the psoas and the capsule separate the head of the femur and the acetabulum from the major vessels. However, Small (personal communication, 1985) has carried out an extensive search in the literature and can find no study that describes the precise distance between these vessels and the front of the hip joint. This distance may be very relevant when the head of the femur is dislocated anteriorly during the operation.

Several patterns of injury have been established and one occurring during surgery is due to laceration of the large vessels, resulting in severe haemorrhage. It is noteworthy that the approach to the hip in such cases has usually been through an anterolateral incision. The

writer is aware of only four cases of damage to major vessels during a posterior approach (Lozman and Robbins 1983; Reiley *et al.* 1984; Ratliff 1984; and one unpublished) and none during the lateral approach with division of the greater trochanter as described by Charnley (1979). The surgeon should be aware of a number of well-described mechanisms of injury since these are avoidable. One of the most frequently quoted is perforation of the vessels with a narrow long-pointed Hohmann retractor. If this instrument is used, the surgeon must avoid damage by keeping close to bone and avoiding strong retraction over the lip of the acetabulum. Great care must be taken with a thin acetabulum associated with rheumatoid disease. It is probably wise not to pierce the medial wall with a Charnley reamer in these cases and to avoid excessive reaming in patients with protrusio acetabuli. The surgeon must be especially careful during revision operations when the socket is displaced medially and perhaps loose with attached cement; removal of the old socket has resulted in tears of major intrapelvic vessels and severe haemorrhage (Scullin, Nelson and Beven 1975; Bergqvist *et al.* 1983).

The paper by Heyes and Aukland (on page 533) is important as a reminder that, although rare, spontaneous occlusion with thrombosis of a major vessel may occur after hip replacement. Symptoms due to ischaemia result, with a cold, painful foot. In this paper the occlusion was of the common femoral artery. Other similar cases have been reported previously though involving the more proximal external iliac artery (Hirsch, Robertson and Gorniewsky 1976; Nachbur *et al.* 1979; Crispin and Boghemans 1980; Aust, Bredenberg and Murray 1981). What caused the occlusion? This is debatable, but there are two obvious possibilities. In the four papers quoted, the occlusion was thought to be related to intimal damage by the heat of polymerisation of the cement, with subsequent thrombosis. Heyes believes this may have been the cause in one of his cases since, when the damaged vessel was being replaced, fibrosis was found in the tissues immediately posterior to the artery and in front of the hip. However, no cement was found pressing on the vessel. The other obvious cause is rupture of an atherosclerotic plaque with secondary thrombosis; this has been described in the common femoral artery (Aust *et al.* 1981) and Heyes considers it to be the likely cause

in his second case. If this is correct, what is the mechanism? Patients requiring hip replacement are usually elderly and many have atherosclerosis of their major vessels. Does retraction of these vessels cause damage as suggested by Aust? Alternatively, Stamatakis *et al.* (1977) have clearly demonstrated distortion of the common femoral vein producing almost total occlusion during the manoeuvres for dislocation of the head in hip replacement. Can thrombotic occlusion of major arteries be produced in this way?

The paper by Heyes and Aukland has an important practical message. Whatever the cause, it is now established that ischaemia can occur after a hip replacement, without haemorrhage occurring during the operation. Careful postoperative assessment of the vascular condition of the leg is therefore essential.

Another practical problem is that of a patient with severe degenerative disease of the hip and in whom marked calcification of the vessels is unexpectedly found in the radiographs. What should be the management before operation? A careful history and examination seeking evidence of ischaemia are obviously essential, but it may also be wise to perform Doppler pressures and if necessary, to seek the advice of a vascular surgeon. Matos, Amstutz and Machleder (1979) have described four cases of ischaemia of the lower limb following perioperative interruption of the critical collateral circulation, with the blood supply already impaired before operation. The writer is not aware of any other reference to this subject.

Some weeks or months after an operation for hip replacement, a patient may present with a painful pulsatile mass due to a false aneurysm. This occurs when there is a small laceration of the wall of a large artery with continuing leakage of blood into surrounding tissues, and has a characteristic to and fro murmur. Though rare, there appears to be a gradually increasing list of case reports (Dorr *et al.* 1974; Scullin *et al.* 1975; Aust *et al.* 1981; Hopkins, Vanhegan and Jamieson 1983; Akizuki, Terayama and Kobayashi 1984; Reiley *et al.* 1984). The case descriptions are often complicated, with problems occurring after difficult revision operations, sometimes in the presence of infection. The most frequent cause of a false aneurysm seems to be spicules of cement attached to the acetabular component and eroding through a large arterial wall, either anteriorly into the external iliac or femoral artery, or inferiorly into the medial femoral circumflex artery. Regarding treatment, it may be necessary to ligate the artery above and below the aneurysm. Hip disarticulation has been required (Dorr *et al.* 1974).

Thus, it seems that cement may, in several different ways, be an important factor in the aetiology of arterial complications. The reaction of polymerisation is an exothermic one and although the writer is aware of no histological evidence, it is possible that the hardening cement may burn important vessels and produce thrombosis. Abnormal kinking of vessels due to a bolus of

hardened cement may cause damage at the site of atherosclerosis. Sharp spicules of cement may erode vessels and produce false aneurysms. Lastly, one case has been described where cement eroded the posterior wall of the common femoral artery and produced peripheral embolism (Neal *et al.* 1979). If a reamer is employed in the acetabulum, care must be taken to prevent excess cement entering the pelvis. The writer routinely uses a Charnley cement restrictor and is not aware of complications after its use. Spicules of cement around the acetabulum should be removed to prevent injury to surrounding neurovascular structures.

In conclusion, it is hoped that awareness of these injuries and their effects may lead to their prevention by meticulous attention to detail before, during and after hip replacement.

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REFERENCES

- Akizuki S, Terayama K, Kobayashi S. False aneurysm of the external iliac artery during total hip replacement: a case report. *Arch Orthop Traumat Surg* 1984; **102**: 210-11.
- Aust JC, Bredenberg CE, Murray DG. Mechanism of arterial injuries associated with total hip replacement. *Arch Surg* 1981; **116**: 345-9.
- Bergqvist D, Carlsson AS, Ericsson BF. Vascular complications after total hip arthroplasty. *Acta Orthop Scand* 1983; **54**: 157-63.
- Charnley J. *Low friction arthroplasty of the hip: theory and practice*. Berlin etc: Springer-Verlag, 1979.
- Crispin HA, Boghemans JPM. Thrombosis of the external iliac artery following total hip replacement: a case report. *J Bone Joint Surg [Am]* 1980; **62-A**: 462-4.
- Dorr LD, Conaty JP, Kohl R, Harvey JP Jr. False aneurysm of the femoral artery following total hip surgery. *J Bone Joint Surg [Am]* 1974; **56-A**: 1059-62.
- Hirsch SA, Robertson H, Gorniowsky M. Arterial occlusion secondary to methylmethacrylate use. *Arch Surg* 1976; **111**: 204.
- Hopkins NFG, Vanhegan JAD, Jamieson CW. Iliac aneurysm after total hip arthroplasty: surgical management. *J Bone Joint Surg [Br]* 1983; **65-B**: 359-61.
- Kroese A, Møllerud A. Traumatic aneurysm of the common femoral artery after hip endoprosthesis: a case report. *Acta Orthop Scand* 1975; **46**: 119-22.
- Lozman H, Robbins H. Injury to the superior gluteal artery as a complication of total hip-replacement arthroplasty: a case report. *J Bone Joint Surg [Am]* 1983; **65-A**: 268-9.
- Matos MH, Amstutz HC, Machleder HI. Ischaemia of the lower extremity after total hip replacement: report of four cases. *J Bone Joint Surg [Am]* 1979; **61-A**: 24-7.
- Nachbur B, Meyer RP, Verkkala K, Zürcher R. The mechanisms of severe arterial injury in surgery of the hip joint. *Clin Orthop* 1979; **141**: 122-33.
- Neal J, Wachtel TL, Garza OT, Edwards WS. Late arterial embolization complicating total hip replacement: a case report. *J Bone Joint Surg [Am]* 1979; **61-A**: 429-30.
- Ratliff AHC. Vascular and neurological complications. In: Ling RSM, ed. *Complications of total hip replacement*. (Current problems in orthopaedics) Edinburgh etc: Churchill Livingstone, 1984: 18-29.
- Reiley MA, Bond D, Branick RI, Wilson EH. Vascular complications following total hip arthroplasty: a review of the literature and a report of two cases. *Clin Orthop* 1984; **186**: 23-8.
- Scullin JP, Nelson CL, Beven EG. False aneurysm of the left external iliac artery following total hip arthroplasty. *Clin Orthop* 1975; **113**: 145-9.
- Stamatakis JD, Kakkar VV, Sagar S, Lawrence D, Nairn D, Bentley PG. Femoral vein thrombosis and total hip replacement. *Br Med J* 1977; **ii**: 223-5.
- Swann M. Malignant soft-tissue tumour at the site of a total hip replacement. *J Bone Joint Surg [Br]* 1984; **66-B**: 629-31.