The Pneumatic Tourniquet is widely used in limb surgery. It has been found to be a very safe device and the incidence of major complications associated with its use is as low as 1:13,000. Skin damage is a rare complication associated with the use of a pneumatic tourniquet. A few cases of chemical burns have been reported due to the use of alcohol based preparations, but friction burns due to the use of a tourniquet in a healthy person with normal skin have only found a passing remark in the literature. We report such a case referred to us by our Orthopaedic colleagues for management.

Case report

JG, a 48-year-old Caucasian male underwent a second stage total knee replacement on the right side in early May 1997. The indication was an infected prosthesis which had been taken out 6 weeks previously as the first stage of revision. The initial total knee replacement had been performed for post-traumatic osteoarthritis of the right knee.

The patient's operation for the second stage total knee replacement was performed under tourniquet control. The tourniquet cuff used was a standard thigh cuff of 11·92 cm size and was applied with adequate wool padding. Aqueous Chlorhexidine was used for skin preparation as there was a suggestion by the patient that he might be sensitive to alcohol based preparations. On retrospective investigation it was found that alcohol based skin preparation had been used in his previous surgeries without harmful effect and it was not very clear why the patient suggested otherwise. After the skin preparation the tourniquet was sealed off from the operation site by an adhesive surgical drape. The tourniquet was inflated to 300 mmHg for 2 h and 13 min. At the end of the procedure it was found that the tourniquet had overrun the wool padding with almost half of its width lying in direct skin contact. The whole complex had slipped down the thigh by approximately 10 cm. On removal, the wool padding under the tourniquet was not found soiled with any fluid or blood.

On the first postoperative day the patient developed almost circumferential blisters on the thigh. This corresponded to about half the width of the tourniquet and was underlying the area where tourniquet had been found in direct contact with the skin due to slippage. This demarcated into full thickness friction burns of two thirds of the circumference of the thigh, anteriorly by the third postoperative day (Fig. 1). At this point the patient was referred to the Plastic Surgery team by our Orthopaedic colleagues. As the wound looked infected it was initially managed conservatively to prepare it for skin grafting. Two weeks postoperatively the patient underwent debridement and split skin grafting to his friction burns (Fig. 2). Graft take was good, as seen on the fifth postoperative day and the patient was subsequently discharged home.

Discussion

Skin necrosis after a pneumatic tourniquet is known to occur due to chemical burns but full thickness friction burns have not been reported. In this particular case the patient had no skin problems, was not on any steroid medication and the tourniquet pressure and duration were within standard normal limits. Adequate wool padding was used under the tourniquet and full precautions were taken to prevent seepage of any fluid or blood under the tourniquet cuff during the operation.

We requested the Medical Physics department to calibrate the offending tourniquet and also randomly check other tourniquets in the operating theatres. All the tourniquets showed pressures within normal limits of error i.e. ±10 mmHg.

We did entertain the possibility of chemical burns but dismissed it in favour of friction burns in the light...
of following facts: (i) Chemical burns are known to occur with alcohol based skin preparations but in this particular case aqueous Chorhexidine had been used. (ii) Wool padding under the tourniquet was not found to be soiled with any fluid or blood, when removed after the surgery. (iii) The fully inflated tourniquet had slipped down the thigh during the surgery and in doing so, it overran its wool padding and came in contact with bare thigh skin. We presume that the movement of the fully inflated tourniquet, over the bare-skin due to its slippage during the surgery, led to friction burns.

It seems likely that the tourniquet had not been tied tightly enough prior to inflation, predisposing it to slippage especially when the knee was manipulated vigorously during the operation. We also feel that the conical shape of the thigh may predispose it to this kind of problem (i.e. slippage of the tourniquet) and wonder whether any modification in the shape of the thigh tourniquet would improve its safety.

References

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Paper received 25 July 1997
Accepted 24 November 1997