ON SPLITTING PLASTERS

A USEFUL ANALOGY

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An inner tube was inflated and then surrounded with plaster wool and plaster-of-Paris bandages. The plaster and the wool were next progressively divided. There was no significant reduction of the pressure inside the tube until both the plaster and the wool had been divided and separated from the inner tube along the entire circumference. These findings demonstrated that wool and plaster applied to limbs likely to swell should be split right down to skin and widely separated immediately after their application. A plaster slab is safer still, but the wool must be cut before the crepe bandage is applied.

Most textbooks agree that with a recent injury or operation to a limb, the plaster and wool should be extensively split, but in practice many orthopaedic surgeons pay only lip-service to this recommendation. Some consider that it is sufficient to divide the plaster on one side and leave a tie of 2.5 centimetres at the top and the bottom of the cast without disturbing the underlying wool (Fig. 1), whereas others hold that the only safe

procedure is a plaster slab held in position with a crepe bandage applied after the wool has been divided.

In order to test the validity of these opposing views, a series of experiments was designed using the inner tube of a tyre.

EXPERIMENTS

A Michelin inner tube was fully inflated. Three layers of plaster wool (10-centimetre wide Velban) were next wrapped round the tube followed by five layers of plaster of Paris. The specimen was allowed to dry overnight.

The starting pressure was 69 kilopascals (518 millimetres of mercury). The outside diameter of the tube was 68 centimetres and the internal diameter 27 centimetres. At diametrically opposite points a length of 6 centimetres was marked on the upper surface on which the experiments were performed in order to facilitate photography. The plaster was then cut with an oscillating saw, leaving the wool intact. At first, only the portion between the marks was divided (Fig. 2). The pressure dropped to 62 kilopascals. Next the opposite portion was cut but no further fall in pressure resulted. One of the “ties” was now divided; still the pressure remained unchanged. Only when the plaster was divided completely and opened up to 1,25 centimetres (Fig. 3) did the pressure fall and then only to 55 kilopascals.

The plaster wool was next cut with bandage scissors. Exposing 44 centimetres of the tube reduced the pressure to 48 kilopascals (Fig. 4) and on exposing 64 centimetres or half the circumference it fell to 27.5 kilopascals. Leaving only a 14-centimetre bridge of wool resulted in a further fall to 21 kilopascals. The pressure dropped to 14 kilopascals after all the wool had been divided. Using spreaders and substantially

increasing the width of the exposed portion of the inner tube (Fig. 5) led to a pressure of 13.8 kilopascals. Pushing the inner portion of the plaster completely into the centre of the tube (Fig. 6) reduced the pressure to just over zero.

DISCUSSION

In these experiments the tube is taken to resemble a limb which is likely to swell after an injury or an operation. The increased pressure produced by the swelling is not reduced significantly by merely cutting the plaster; the wool must be divided as well. After opening the whole circumference of the plaster to 1.25 centimetres, but leaving the wool intact, the pressure inside the tube was only reduced by 20 per cent, but division of half the circumference of the wool resulted in a 60 per cent drop. When the entire circumference of the wool was divided the pressure fell by 80 per cent. By pushing the plaster and wool off the tube more liberally (Fig. 6) the pressure became almost unrecordable.

These results can be applied to plasters put on limbs which are likely to swell. Nowadays it is customary to surround the limb with plaster wool first so that an oscillating saw can be used for cutting the cast without fear of damaging the skin. The safest method of anticipating the swelling of the limb is the one that corresponds to Figure 6, namely to bivalve the plaster and all the wool covering one surface completely. The limb is no longer constrained and can expand. An alternative is to apply a slab to one surface only and divide the wool down to the skin, keeping the plaster in position with a bandage which will stretch. The next best method is to open the plaster and wool widely, as shown in Figure 7, which corresponds to Figure 5. All other methods are unsafe—in particular, splitting the plaster only between a tie at the top and another at the bottom (Fig. 1).

These conclusions are in agreement with the advice given by Watson-Jones that “at the first sign of circulatory embarrassment, the plaster must be cut until the skin is widely exposed in the gap” (Wilson 1976). Since this circulatory embarrassment tends to occur quite regularly in the small hours of the morning it is wiser to use ab initio a harmless method of immobilising any limb which is likely to swell.

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REFERENCE