Preventing the scars of neonatal intensive care

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Abstract
Two cases are reported of serious extravasation injuries due to parenteral nutrition in infants born at 24 and 28 weeks' gestation. Major scarring and the need for plastic surgery were prevented by using a technique of subcutaneous hyaluronidase and saline flushing.

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In the neonatal intensive care nursery it is often necessary to infuse solutions through peripheral veins. Parenteral nutrition, drugs, and elemental solutions are all potentially noxious to living tissue and after extravasation may cause serious damage to the skin and underlying tissues. Although every effort is made to detect extravasation early, inevitably it may not become apparent until a late stage. In the past, many of these babies have developed significant scarring and contractures. We report here two neonates with extravasation injuries who were successfully treated by subcutaneous hyaluronidase and saline flushes, which resulted in full and rapid healing with minimal scarring.

Case reports
CASE 1
An infant of 24 weeks' gestation weighing 747 g received parenteral nutrition via an umbilical venous catheter from days 3 to 16. His initial problems were severe respiratory distress syndrome and a patent ductus requiring surgical ligation.

On day 16 he developed pyrexia and metabolic acidosis. Blood cultures grew Staphylococcus epidermidis and candida; total parenteral nutrition was continued through a peripheral line after removal of the umbilical catheter.

On day 26 the skin at the infusion site on his left forearm became mottled and discoloured. Although the infusion was discontinued, and the cannula removed, his skin became increasingly necrotic, over an area approximately 3.2 cm (fig 1A). Using the technique described below, the area was infiltrated with hyaluronidase, and flushed out with saline with an immediate improvement in skin colour. Forty eight hours later, on removal of the dressing, the tissue looked healthy and well perfused, and has subsequently healed with minimal scarring (fig 1B).

CASE 2
An infant of 28 weeks' gestation required ventilation for respiratory distress syndrome for 17 days. She was initially fed via a long line until day 8 when suspected sepsis with hypotension and metabolic acidosis necessitated removal of the catheter. Parenteral nutrition was continued via a peripheral cannula. However, after three days she developed a deep area of purple skin discolouration measuring approximately 2.5×2.5 cm on her left forearm. This was treated within one hour using subcutaneous hyaluronidase and saline flushes with an immediate improvement in skin colour. Healing was rapid, with almost no sign of the injury after seven days.

TECHNIQUE OF FLUSHING THE EXTRAVASATED AREA
Under strict aseptic conditions, the discoloured area and surrounding skin are cleaned and infiltrated with 1% lignocaine. Hyaluronidase, 500–1000 units, is injected into the subcutaneous tissue beneath the damaged skin. Four small punctures are made in the tissue plane with a scalpel blade around the area to be treated. The central blunt cannula of a Verres needle is inserted subcutaneously through one of the puncture sites. (This is a needle used most commonly for insufflation of air at gynaecological laparoscopy. Downes Surgical Ltd, Sheffield; Rocket London Ltd, Watford.) Using a syringe attached to a three way tap, saline is injected; this should flow...
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Figure 2 Saline flushout technique using a Verres needle.

freely out from the other three incisions (fig 2). The process is repeated, injecting through each incision and using in total up to 500 ml of saline. If during the procedure the limb becomes oedematous, excess fluid can be removed by gentle massage towards the incisions. The damaged area is then dressed with Jelonet or a similar dressing and kept covered for 24 to 48 hours.

Discussion
The rate of extravasation of intravenous fluid in routine infusions in children and babies has been reported as 11–58%.1,2 In one study following up children discharged from the special care baby unit, 11% had cosmetically or functionally significant lesions caused by extravasation, chest drains, or skin tape.3 The mechanisms of extravasation necrosis are incompletely understood, but the degree of damage appears to be related to osmolality, pH, and the dissociability of ions. It has been described after extravasation of high concentration dextrose solutions, calcium, bicarbonate, and radiographic contrast materials, as well as alimentation solutions.

Free drainage of the extravasated fluid through skin puncture sites4 and the promotion of dilution and absorption of the substance by injection of saline with hyaluronidase5 has been tried. Some wounds require chemical or surgical debridement, with subsequent skin grafting. The effects of the chemicals on the tissues can be modified by administering a variety of antidotes.6 The technique we have used actually removes the harmful substance. This has been shown by analysis of the effluent fluid.6 We have now adopted the technique in our neonatal intensive care unit, after it was shown to be effective and safe in a series of 96 patients.6 In that study there was no long term tissue damage in any of the patients referred early (within 24 hours) compared with only eight of 52 patients referred late. There were no surgical procedures required in any of the group receiving early treatment, compared with 26 patients in the late group, some of whom required skin flaps and in three cases amputation. There were no complications reported from the technique in the study, or in the two cases reported here. The cannula of the Verres needle used is blunt, and we consider that because of this there have been no problems of trauma. Although the affected limb can become quite swollen during the procedure, careful massage of the fluid down towards the incisions prevents a compression effect on the underlying structures. The technique, once demonstrated to the neonatal medical staff, is straightforward and easy to perform, and in view of the excellent results obtained, we now have an equipment tray available for immediate use in any cases of extravasation injury on the neonatal unit.