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Recognition and Management of Contrast Media Extravasation:

How Europe can Learn from the Australian Experience

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Despite the well-recognised complications of contrast media extravasation (CME), its treatment remains an enigma to many. Reported morbidities range from minor skin reactions, to severe skin necrosis/ulceration and vascular and nerve compression (compartment syndrome). There is no clear consensus in the current literature regarding CME treatment. Confusion in the application of appropriate care may not only delay treatment for these patients, but also potentially place the patient at increased risk of complications. This paper highlights the key points in CME management.

Examining the Evidence

Information from Medline and the Australian Adverse Drug Reactions Advisory Committee (ADRAC) databases was used to review the incidence and management of CME. A CME policy was then established in our institution and a prospective study performed over a twelve month period on the extent of injuries encountered following implementation of this policy.

Five cases of skin injuries were reported in the ADRAC database, although anecdotal evidence suggests this is a marked underestimate. In the twelve months following the implementation of our CME policy, eight cases of CME were reported in our department, all of whom attended CT exams. All of these patients sustained mild erythema and oedema at the injection site. Treatment was commenced immediately (within 5 minutes) on recognition of CME, using the policy guidelines. In all cases, manifestations had subsided with no adverse outcomes, within 24 hours.

Key Points

Epidemiology

Traditionally, extravasation of radiographic contrast material is most frequently seen during lower limb venography, particularly when contrast agents are injected into oedematous extremities (and with the tourniquet still in place). However, with the widespread use of automated power injectors, CME occurs predominantly during CT examinations. The reported frequency of CME in radiology practices vary from 0.04-1.3%.

Risk Factors for Extravasation

CME occurs mostly as a result of incorrectly positioned intravenous access or venous rupture. Various factors increase the likelihood of CME, including:

• Infants, small children, elderly and unconscious patients

• Use of small peripheral veins, i.e., over the dorsum of the hand and foot

• Use of indwelling intravenous catheters inserted over 20 hours prior to use (due to thrombophlebitis that may have developed in the cannulated veins)

• Use of fragile or damaged veins, particularly those with multiple punctures

• Use of metal needles (as compared with plastic cannulas)

• Patients with arterial or venous insufficiency, as well as those with lymphatic obstruction, e.g., diabetics, venous thrombosis and those following radiation or regional lymph node dissection

• Use of automated power injectors, although no correlation has been demonstrated between injection rate and extravasation frequency

• Use of high osmolar media. The osmolality threshold for significant tissue injury is estimated at 1.025-1.420mOsm/kg water.

Clinical Presentation

Subclinical CME occurs when no soft tissue injury is discernible, usually when the extravasated volume is less than 20ml. Some patients may complain of stinging or burning pain but the majority are asymptomatic. With larger volumes of CME, the affected area appears erythematous, oedematous and tender. Whilst the majority of cases resolve spontaneously in 2 - 4 days, a few may progress to skin blistering, ulceration, necrosis and soft tissue injury. Severe skin ulceration, although rare, has also been reported in a few cases of low volume (less than 10ml) extravasation. Often, the severity of CME injury cannot be ascertained at the initial examination; scarring around nerves, tendons or joints may occur even if the skin is intact initially. Compartment syndrome, one of the most serious CME complications, pres ents with a dense, dusky and oedematous extremity with reduced or absent arterial pulses.

Recognition and Prevention

CME should be suspected if there is either absence of contrast on images, pain during and following contrast administration or skin oedema and erythema. Preventative measures include:

• Venous access into large calibre veins when ever possible e.g. cubital fossa

• Replacement of cannula if it has been inserted over 20 hours in duration

• Flushing the cannula with normal saline to ensure patency

• Use of plastic cannulas instead of butterfly needles

• Avoiding multiple puncture of the same vein

• Use of non-ionic contrast agents

• Use of central venous catheters (if present), although use of such devices is not without risk

• Monitoring the patient/injection site whilst the contrast is being administered. Whilst direct observation of the whole injection is often not possible, such as during CT angiography, it is usually possible to observe the commencement of the injection.

An extravasation detection accessory has been described in the literature aimed at reducing significant CME. It consists of a small, pliable, adhesive- backed electrode patch measuring 8x5cm which is attached over the patient's arm directly above the cannula tip. In the authors' knowledge, this device has not been readily available for use in clinical practice in Australia until recently (previous devices were available but anecdotal evidence from the vendors did not support their use).

CME Management

Most CME resolves with the following methods of conservative treatment:

• Aspiration of fluid via the needle/cannula – generally of limited value as only a small amount of fluid (if any) can be removed

• Elevation of affected limb above the level of the heart to allow for resorption of extravasated fluid into the capillaries and, more importantly, the lymphatics

• Topical application of ice packs for 15 – 60 minutes, three to four times a day. This has been shown to reduce the size of potential skin ulcers that may develop following extravasation. Documentation of the incident and subsequent progress is essential for quality assurance. Follow-up phone calls not only allow monitoring of any delayed complications but also serve to reassure the patient. A surgical consultation is warranted if the following clinical findings occur; skin blistering; altered tissue perfusion; paraesthesia, or persistent or increasing pain after 2 - 4 hours.

An emergency fasciotomy is required in these circumstances to decompress the neurovascular structures involved. Other, somewhat controversial, treatment options recommended in the literature include:

• Silver sulfadiazine to prevent secondary infection if skin blistering is present

• Local dilution (by injecting normal saline or water) to reduce the concentration of extravasated agent in the subcutaneous tissue. However, the amount of injection required to obtain adequate dilution is substantial – this may cause further mechanical damage to the soft tissues

• Hyaluronidase for rapid dissipation of oedema – although conflicting results have been published concerning its efficacy.

• Dimethylsulfoxide, a free-radical scavenger with anti-bacterial, anti-inflammatory and vasodilatory effects. Its efficacy has not yet been proven.

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