

Extravasation of Contrast Media

Frequency

The reported incidence of intravenous (IV) contrast media extravasation related to power injection for CT has ranged from 0.1% to 0.9% (1/1,000 patients to 1/106 patients). Extravasation can occur during hand or power injection. The frequency of extravasation is not related to the injection flow rate. Extravasation occurring with dynamic bolus CT may involve large volumes of contrast media.

Initial Signs and Symptoms

Although most patients complain of initial swelling or tightness, and/or stinging or burning pain at the site of extravasation, some experience little or no discomfort. On physical examination, the extravasation site may be edematous, erythematous, and tender.

Sequelae of Extravasations

Extravasated iodinated contrast media are toxic to the surrounding tissues, particularly to the skin, producing an acute local inflammatory response that sometimes peaks in 24 to 48 hours. The acute tissue injury resulting from extravasation of iodinated contrast media is possibly related primarily to the hyper-osmolality of the extravasated fluid. Despite this, the vast majority of patients in whom extravasations occur recover without significant sequelae. Only rarely will a low-osmolality contrast media (LOCM) extravasation injury proceed to a severe adverse event.

Most extravasations are limited to the immediately adjacent soft tissues (typically the skin and subcutaneous tissues). Usually there is no permanent injury.

The most commonly reported severe injuries after extravasation of LOCM are compartment syndromes. A compartment syndrome may be produced as a result of mechanical compression. A compartment syndrome is more likely to occur after extravasation of larger volumes of contrast media; however, it also has been observed after extravasation of relatively small volumes, especially when this occurs in less capacious areas (such as over the ventral or dorsal surfaces of the wrist).

Less commonly, skin ulceration and tissue necrosis can occur as severe manifestations and can be encountered as early as six hours after the extravasation has occurred.

A recent study has illustrated the infrequency of severe injuries after LOCM extravasation. In this report by Wang and colleagues, only one of 442 adult LOCM extravasations resulted in a severe injury (a compartment syndrome), although three other patients developed blisters or ulcerations that were successfully treated locally.

Evaluation

Because the severity and prognosis of a contrast medium extravasation injury are difficult to determine on initial evaluation of the affected site, close clinical follow-up for several hours is essential for all patients in whom extravasations occur.

Treatment

There is no clear consensus regarding effective treatment for contrast medium extravasation. Elevation of the affected extremity above the level of the heart to decrease capillary hydrostatic pressure and thereby promote resorption of extravasated fluid is recommended, but controlled studies demonstrating the efficacy of this treatment are lacking. There is no clear evidence favoring the use of either warm or cold compresses in cases of extravasation. As a result there are some radiologists who use warm compresses and some who use cold compresses. Those who have used cold have reported that it may be helpful for relieving pain at the injection site. Those who have used heat have found it helpful in improving absorption of the extravasation as well as in improving blood flow, particularly distal to the site.

There is no consistent evidence that the effects of an extravasation can be mitigated effectively by trying to aspirate the extravasated contrast medium through an inserted needle or angiocatheter, or by local injection of other agents such as corticosteroids or hyaluronidase.

Outpatients who have suffered contrast media extravasation should be released from the radiology department only after the radiologist is satisfied that any signs and symptoms that were present initially have improved or that new symptoms have not developed during the observation period. Clear instructions should be given to the patient to seek additional medical care, should there be any worsening of symptoms, skin ulceration, or the development of any neurologic or circulatory symptoms, including paresthesias.

Surgical Consultation

Surgical consultation prior to discharge should be obtained whenever there is concern for a severe extravasation injury. An immediate surgical consultation is indicated for any patient in whom one or more of the following signs or symptoms develops: progressive swelling or pain, altered tissue perfusion as evidenced by decreased capillary refill at any time after the extravasation has occurred, change in sensation in the affected limb, and skin ulceration or blistering. It is important to note that initial symptoms of a compartment syndrome may be relatively mild (such as limited to the development of focal paresthesia).

In a previous edition of this manual, it was recommended that surgical consultation should be obtained automatically for any large volume extravasations, particularly those estimated to be in excess of 100 ml; however, more recently it has been suggested that reliance on volume threshold is unreliable and that the need for surgical consultation should be based entirely on patient signs and symptoms. If the patient is totally asymptomatic, as is common with extravasations in the upper arm, careful evaluation and appropriate clinical follow-up are usually sufficient.

Patients at Increased Risk for Extravasations

Certain patients have been found to be at increased risk for extravasations, including those who cannot communicate adequately (e.g., the elderly, infants and children, and patients with altered consciousness), severely ill or debilitated patients, and patients with abnormal circulation in the limb to be injected. Patients with altered circulation include those with atherosclerotic peripheral vascular disease, diabetic vascular disease, Raynaud's disease, venous thrombosis or insufficiency, or prior radiation therapy or extensive surgery (e.g., axillary lymph node dissection or saphenous vein graft harvesting) in the limb to be injected. Certain intravenous access sites (e.g., hand, wrist, foot, and ankle) are more likely to result in extravasation and should be avoided if possible. In addition, injection through indwelling peripheral intravenous lines that have been in place for more than 24 hours and multiple punctures into the same vein are associated with an increased risk of extravasation.

Patients at Increased Risk for a Severe Extravasation Injury Once an Extravasation Occurs

A severe extravasation injury is more likely to result from an extravasation in patients with arterial insufficiency or compromised venous or lymphatic drainage in the affected extremity. In addition, extravasations involving larger volumes of contrast media and those occurring in the dorsum of the hand, foot, or ankle are more likely to result in severe tissue damage.

Documentation

All extravasation events and their treatment should be documented in the medical record, especially in the dictated imaging report of the obtained study, and the referring physician should be notified.

Suggested Reading (Articles that the Committee recommends for further reading on this topic are provided here.)

1. Bellin MF, Jakobsen JA, Tomassin I, et al. Contrast medium extravasation injury: guidelines for prevention and management. *Eur Radiol* 2002; 12:2807-2812.
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