

## Treatment for Infiltration and Extravasation

### Question:

Many references provide confusing information about treating infiltration and extravasation. Should we apply cold or heat to the site?

### Answer:

First and foremost is to recognize that prevention is the ultimate goal. Methods of prevention must be applied to peripheral and central venous catheters as the problems occur with all types of catheters. This includes proper securing and dressing for all catheters and port access needles, choosing smaller gauge sizes for peripheral catheters, and always obtaining a blood return from a central venous catheter prior to infusion of fluids or medication.

Infiltration is defined as the escape of non-vesicant fluids or medications from the vein into the subcutaneous tissue. Extravasation is the escape of vesicant medications from the vein into the subcutaneous tissue. 1 Vesicant medication include antineoplastic agents, contrast media, electrolytes such as potassium and calcium, antibiotics such as Nafcillin and Vancomycin, promethazine (Phenergan), diazepam (Valium), and phenytoin (Dilantin).2, 3

The problem occurs with peripheral catheters due to mechanical punctures or tears in the vein wall, enlarged lymph nodes or thrombus obstructing flow through the vein leading to fluid spilling from the insertion site, and the inflammatory process leading to fluid escaping through gap junctions in the capillary walls.

Many advocate the use of central venous catheters in order to prevent infiltration and extravasation into peripheral sites. However, fluid escapes from central venous catheters in several ways. For example, needles used to access implanted ports may become dislodged during any physical activity, or a fibrin sheath may form on the central venous catheter so that infused fluids flow retrograde between the catheter and the fibrin sheath and leak from the vein entry site. 4, 5

Numerous questions are unanswered about the issues surrounding infiltration and extravasation. Clinical research cannot answer these questions because of ethical concerns surrounding human trials; therefore, we must rely on case reports and animal studies to gain insight into this condition. Clear interventions to prevent tissue damage are not known, although several approaches have been tried. These include manipulation of the skin surface temperature and injecting antidotes.

Dorr reports numerous animal studies where heat application caused more skin ulceration with extravasation of doxorubicin and daunorubicin. Yet topical cooling increases skin ulceration with vinca alkaloids. Neither heating nor cooling produces benefits in extravasations of alkalyting agents such as mechlorethamine or mitomycin C. 6 Boyle and Engelking support the immediate topical application of cold for extravasations of all vesicants, except vinca alkaloids. 2

Another study injected 5 mL of test solution through an infiltrated scalp vein needle placed in the forearm of 22 subjects. Solutions injected were 0.45% sodium chloride and 3% sodium chloride. Heat application to the sites had no effect on pain compared with the control group. In the 0.45% sodium chloride group, heat had no effect on induration or the volume of subcutaneous fluid measured by MRI. In the subjects with 3% sodium chloride, heat increased the amount of induration and slowed the reabsorption of the infiltrated fluid. 7

It is difficult to apply this information to all medications that could escape into the subcutaneous tissue. However research indicates that the solution osmolality leads to differing clinical pictures. Hypertonic solutions produce more pain and cause more fluid to accumulate in the tissue due to osmosis of fluid from the plasma and surrounding cells. 8

Controversy surrounds this issue of skin temperature manipulation to treat infiltration and extravasation. Each facility must create a protocol for management. Data should be collected on each infiltration and extravasation including the types of catheters, fluid and medications involved and the outcomes for the protocol. This data can be used to identify trends and alter the protocol accordingly.

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