

FAST FACTS AND CONCEPTS #220 HYPODERMOCLYSIS

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Background This *Fast Fact* discusses subcutaneous fluid infusions, also known as hypodermoclysis (HDC). The use of parenteral hydration in dying patients is controversial and is discussed in *Fast Fact* #133. While this *Fast Fact* discusses subcutaneous fluid infusions for purposes of hydration, similar techniques can also be used to deliver medications (see *Fast Fact* #28).

Historical and Current Practice Hypodermoclysis was a widely accepted route for parenteral hydration in the 1940s and 1950s before falling out of favor after several reports of adverse reactions, likely related to the use of hypertonic and electrolyte-free solutions. Due to its ease of use, and subsequent research demonstrating its safety and efficacy, HDC has become more widely used. In the US, HDC is mostly used in geriatric and palliative care settings, although it is used more widely elsewhere in the world.

HDC vs. Intravenous Hydration Decisions for parenteral hydration in dying patients are complex and individual decision making is paramount. When parenteral hydration is indicated, clinicians are generally faced with a decision to use HDC or intravenous (IV) hydration (see *Fast Fact* #134).

- **Advantages of HDC over IV:** Starting and maintaining a subcutaneous infusion catheter is relatively pain-free. It can be done by trained patients or family caregivers, preventing the need for frequent skilled nursing visits or trips to medical centers to maintain a working IV. HDC provides greater potential sites for needle placement (arm, back, abdomen, thighs), and equipment costs are generally lower than with IVs. Subcutaneous catheters can be easily disconnected from IV tubing and re-used later, allowing a patient to receive intermittent fluid treatments. Portable infusion devices are not needed with HDC. HDC infusions may also cause less agitation in patients with dementia versus IV (1).
- **Disadvantages:** HDC is limited by a continuous infusion rate of 1-2 ml/min or 1.5-3 L/day (2). This is adequate for most clinical situations, and additional catheters can be added if needed. Bolus infusions (up to 500 ml/hour) are possible with HDC, but often require hyaluronidase (see below). Both HDC and IV infusions have similar rates of local adverse events (e.g. erythema, cellulitis) and lifespan of infusion site (3). HDC can be technically difficult in patients with substantial peripheral edema, as well as in cachectic patients with little subcutaneous tissue. Patients and families may have pre-conceived attitudes about greater benefits with IV routes even while acknowledging increased burden (4).

Technique

- **Equipment needed:** Small butterfly needle (usually 22 gauge) or angiocatheter, skin preparation (alcohol or iodine), sterile occlusive dressing, solution bag (saline or saline-dextrose combination), tubing with drip chamber. The use of an electrolyte free solution like 5% dextrose is discouraged due to third-spacing risks which can cause tissue sloughing or rarely circulatory collapse.
- **Procedure:** After cleaning the local site, insert the needle bevel up into the subcutaneous tissue. Attach to fluid and tubing and cover with occlusive dressing. Select an infusion fluid and set drip rate or fluid bolus. Normal saline (NS) is typically used although half-normal saline or 2/3 D5W in 1/3 NS have been used in clinical practice. Drip rates can be set to 20-125 ml/hour with gravity (no pump required) or 1-2 ml/minute. Some patients may prefer drips set to gravity 24 hours per day at a low rate (e.g. 50 ml/hour), overnight hydration (e.g. 100 ml/hour), or intermittent fluid boluses (e.g. 500 ml). The volume of infusion needed to keep acceptable levels of hydration in many palliative care patients is lower than healthy patients and postulated to be ~1 L/day (5). No evidence exists for the frequency of site change. Some change only when there are symptoms or needle displacement while others choose a fixed time (e.g. every 3 or 7 days) or fluid volume (e.g. every 1.5 L). Teflon cannulas, although expensive, can be used for a week and are helpful for patients who have trouble maintaining a catheter site (6). Local anesthetic creams may be helpful during catheter placement to reduce discomfort, especially in children.
- **Recombinant human hyaluronidase:** RHH is an enzyme that temporarily lyses the subcutaneous interstitial space to promote diffusion of fluid. It can be used for site discomfort or if a faster rate of

absorption is desired. Previous preparations were of bovine origin and were associated with local allergic reactions, anaphylaxis, and pain, making its role controversial. RHH has shown no human allergenicity (7). Recent studies have investigated RHH versus placebo in a randomized trial with gravity-driven infusion. The RHH group showed higher obtainable fluid rates, decreased discomfort, and similar local reactions. Doses of 150 U to 750 U given as steady push prior to the infusion can yield fluid rates of 380 to 520 ml/hour (8).

Cautions Uncommon local reactions include edema, local pain, or erythema. Interventions include slowing the rate, changing the site, or using RHH. Rare complications include cellulitis and vascular puncture. Systemic complications such as pulmonary edema can occur with all types of artificial hydration.

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