Hypodermoclysis or Subcutaneous Infusion Revisited

L K P Yap, S H Tan, W H Koo

ABSTRACT

Aim of study: To review the use of hypodermoclysis in a local Hospice.

Method: A review of all hypodermoclysis carried out over a six-month period was conducted. Special attention was paid to the reason for starting and stopping the drip, duration of the drip, complications, the type and amount of solution infused.

Results: Fifty-one (19%) out of 266 patients received hypodermoclysis during their stay. This constituted 5.9% of total patient-days in the study period. Vomiting and drowsiness were the main reasons for the use of drip. The commonest reason for stopping the drip was patient demise. Complications seen were drip site redness (16%), extravasation (15%) and bleeding (2.5%) There was no overt clinical sepsis in any of the patients.

Conclusion: Hypodermoclysis is an easy and convenient means of providing hydration. The availability of a standard protocol with clearer guidelines on its use will help to reduce procedure-related complications and promote wider adoption of the practice.

Keywords: hypodermoclysis, butterfly needle, hydration, hospice, standard protocol

Singapore Med J 2001 Vol 42(11):526-529

INTRODUCTION

Hypodermoclysis is defined as the infusion of fluid into the subcutaneous space[1]. It was first used in the 1940s in paediatric practice for dehydration[2], but became unpopular following anecdotal reports in the 1950s of shock caused by osmotic shifts[3]. The last decade saw increasing popularity of hypodermoclysis again, especially in non-emergency situations. The scope of its use includes acute stroke, geriatric and terminally ill patients where venous access can be difficult. A survey in 1994 found that this technique was used by a third of geriatricians in Holland[4]. Study among healthy volunteers showed that the absorption of fluid administered subcutaneously equals that given via intravenous route[5]. Both methods could achieve equivalent biochemical rehydration of the stroke patient[6]. Our local experience with hypodermoclysis is limited to the hospice setting although geriatric, stroke and terminally ill patients abound in the acute hospitals, community hospitals and nursing homes. An audit was carried out to review the use of hypodermoclysis in our hospice over a six-month period. By demonstrating that it is a safe, convenient and practical procedure, we hope to promote its use, given the appropriate indications.

METHODS

Material

The case records of patients admitted between January and June 2000 to our hospice were reviewed to identify subjects who had received subcutaneous hydration during their stay. Data collected included the diagnosis of the patient, reason for starting subcutaneous drip, duration of the drip, reason for stopping or changing the infusion, type of solution used, volume infused per day, drip insertion site and whether the patient was on concurrent oral intake.

Technique of subcutaneous needle insertion

The site of needle insertion is chosen based on patient comfort, skin integrity and other practical nursing procedure requirements. A winged "butterfly needle" size 23 - 25 G is inserted under aseptic conditions and covered by a transparent disposable dressing e.g. Opsite. The same drip set that is normally chosen for intravenous infusion is connected to the butterfly needle on one end and to the solution infused on the other.

RESULTS

Fifty-one (19%) out of 266 patients admitted over the six-month period had received subcutaneous hydration at some point in their stay. Approximately two-thirds (63%) of the patients suffered from gastrointestinal malignancies. These were stomach, small intestinal, colorectal, liver and pancreatic cancers. Together, these patients were on the drip for 290 days (56%) during their combined stay of 506 patient-days

Dover Park Hospice
10 Jalan Tan Tock Seng
Singapore 308436

L K P Yap,
MBBS (Singapore),
MRCP (UK)
Registrar

S H Tan,
MBBS (Singapore)
Resident

W H Koo,
MBBS (Singapore),
MRCP (UK)
Medical Director

Correspondence to:
Dr W H Koo
Tel: (65) 355 8200
Fax: (65) 258 9007
Email: whkoo@doverpark.org.sg

Fig. 1 Reason for starting drip.

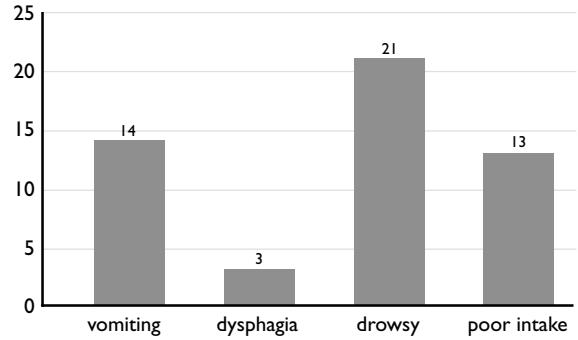


Fig. 2 Reason for stopping/changing drip.

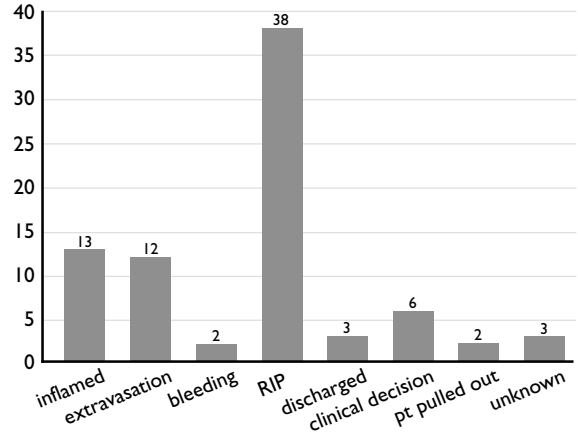
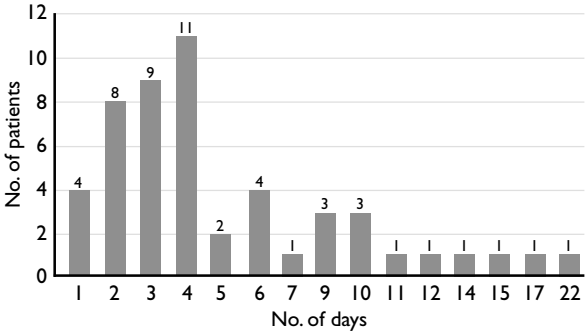


Fig. 3 Number of days on the drip.



in the hospice. The total drip-days constituted 5.9% of the overall patient-days in our hospice during the study period. As 19 patients had the drip site changed at least once, the subcutaneous needle was inserted a total of 79 times among the study population. The abdominal wall was chosen as the insertion site 78 times. Only one patient had the drip resited on his back after he repeatedly removed the needle on the abdominal wall in a state of confusion. Slightly more than half (57%) of the patients were not on oral feeding.

Reason for starting subcutaneous hydration (Fig. 1)

The most common reason for starting the drip was because the patients were too drowsy to receive oral intake. This occurred on 21 (41%) occasions. Fourteen (27.5%) patients required subcutaneous hydration as they had intractable vomiting, 13 (25.5%) had inadequate oral intake. The patients categorised under poor oral intake were not drowsy. Three (6%) patients needed the drip because they had difficulty swallowing.

Type and amount of drip

Only dextrose saline and dextrose 5% solutions were used. Dextrose saline was used 95% of the time. No additives like drugs or vitamin supplement was added. A vast majority of patients received 1.5 L of fluid per day. A few patients received 1 L and 0.5 L respectively.

Reason for stopping the drip/changing the drip site (Fig. 2)

The commonest reason for discontinuing the drip was patient demise. This occurred 38 (48%) times. On six (7.6%) occasions, the decision to stop the drip was based on clinical assessment of adequate rehydration or fluid overload. Complications around the drip site, such as redness, occurred 13 (16%) times, extravasation 12 (15%) times and bleeding twice (2.5%). In 18 (72%) out of the 25 occasions that drip site redness or extravasation developed, the patients had been been on the drip for three days or more. Patients with drip site complications had the drip site changed and continued to receive subcutaneous hydration. The drip was discontinued in only one patient who developed erythema at the drip site, and at the same time found to be well rehydrated. None of the patients developed overt clinical sepsis.

Duration of subcutaneous hydration (Fig. 3)

This varied from being on the drip for one day to 22 days. Thirty-two (63%) patients received infusion for four days or less. Thirteen (25%) were on the drip for more than six days.

DISCUSSION

In the terminally ill patient, the drip is used mainly to relieve distressing symptoms from dehydration, whatever the cause may be. Our audit shows that 19% of the patients admitted to our hospice received parenteral hydration. Of these, 25% of them were on the drip for more than six days. With such high number of patients on the drip for a prolonged period, it is imperative that the procedure be safe, comfortable for the patient and easy to manage. In acute care hospitals, the hydration is usually given via the intravenous route. However, the indwelling venous cannula is a potential source of severe infection, and insertion can be a traumatic experience, especially in the cachexic and frail patient. In a non-emergency setting when patient

Table I. Indications and contraindications of hypodermoclysis[13].

Indications

1. Prevention or treatment of mild dehydration in patient who has:
   - dysphagia
   - fluid loss due to vomiting, diarrhoea, diuretics etc.
   - poor peripheral venous access
   - drowsiness, confusion and poor oral intake
   - hyperthermia
   - difficulty to administer enteral or parenteral nutrition
2. During terminal phase of life:
   - infuse opioid analgesics/anxiolytics concomitantly with fluids
   - prevent symptoms due to dehydration e.g. dry mouth, constipation, confusion
   - request of relatives, patient
3. Infusion of amino acid solution to limit malnutriiton[12]

Contraindications

1. Emergency situations e.g. shock, circulatory failure, severe dehydration
2. Obvious coagulopathy
3. Fluid overloaded e.g. heart failure

Table II. Technique of hypodermoclysis[8,13].

Site of infusion

- lateral abdominal wall (most common)
- anterior or lateral aspects of thighs
- subclavicular region
- back, usually inter or subscapular regions (useful in confused patients who try to pull out the drip)

Equipment

- 23-25G winged butterfly needle (metal, Teflon or Vialon)
- drip set (as for intravenous infusion)
- transparent disposable dressing e.g. Opsite

Method

- meticulous local asepsis
- butterfly needle is connected to the drip set
- needle and drip set are primed with the solution infused
- skin is gathered up between index finger and thumb, the butterfly needle is inserted into the subcutaneous space with its bevelled end facing down at 45 degrees
- transparent disposable dressing is applied on the butterfly needle
- patient comfort is checked
- infusion site is checked each nursing shift to look for complications such as redness, tenderness, oedema and bleeding
- it is suggested that the site of infusion and the drip set be changed every 24 hours and 72 hours respectively[15] although the evidence for such practice is not well established

Solutions used

- isotonic saline (0.9% NaCl), dextrose saline, dextrose 2.5% or 5%
- up to 2g of potassium chloride can be added per litre of solution

Infusion rate

- 1.5 L/day/injection site and up to 3L/day via 2 sites
- 1 L/8hours during a nocturnal infusion

is haemodynamically stable and does not require large amount of fluids (<3 L) per day[7], subcutaneous hydration can be a more practical alternative to the intravenous route.

In a study by Lipschitz et al in 1991[5], 500 ml of normal saline labelled with technetium pertechnetate were infused over three hours into the anterior chest wall of volunteers. After 60 - 75 minutes, all radioactivity had cleared from the site indicating total absorption into the intravascular space. Hypodermoclysis does not involve placing a needle into a vein and hence does not predispose to intravascular infection or thrombosis with their attendant complications[8]. Insertion is less painful and resiting can be done with ease. It does not block and replacement by doctor in the middle of the night is never needed. The drip can be set up by nurses in almost any setting including at home, does not require close medical supervision and even if dislodged does not cause serious problems. It provides greater ease of patient mobility and nursing as it does not immobilise a limb. In the confused and agitated patient, the infusion site can be placed beyond the reach of the patient and is less likely to become dislodged. It may be safer in the elderly patients as the risk of pulmonary oedema is low[1]. In addition, drugs like opioids[9], clodronate[10] and electrolytes, including up to 2 g of KCl per litre of fluid[11], can be added safely to the infusion. This route can also be employed to administer amino acid solution for a few days to prevent malnutrition[12]. Cost-wise, significant savings are possible as the needle costs less at $0.20 for a 23 gauge, compared to $0.50 for an intravenous canula of the same size.

The risks of hypodermoclysis are minimal when the indications and guidelines are respected. The side effects, which are rare and easily avoided, depend mainly on the choice of solution, volume and infusion rate[13]. Cardiovascular collapse, reported in the 1950s in paediatric patients, was always related to administration of large quantities of hypertonic or isotonic solution without electrolytes[3]. Current practice recommends the use of normal saline or dextrose saline in volumes not exceeding 1.5 L per infusion site and up to a maximum of 3 L per day[13]. Without cannulation of the vein, even if infection were to occur, it is likely to be limited to the insertion site with a low risk of systemic dissemination. A recent study comparing hypodermoclysis with intravenous hydration showed significantly fewer local reactions at the catheter site in the hypodermoclysis group[14]. By changing the needle daily and adhering to the same aseptic technique used for intravenous infusion, the risk of infection can be further minimised. The use of Teflon or Vialon needles instead of metal needles further reduces insertion site complications and the

need for frequent needle change[15]. Berger claimed no episodes of infection during 25 years of practice[16]. Schen reported adverse effects in 12 of 634 patients given a total of 4,500 subcutaneous infusions, comprising oedema (9), ecchymoses (2) and infection (1)[17]. Jain et al observed three cases of subcutaneous abscess on the anterior abdominal wall of elderly patients during a two-month period. These resolved with antibiotic treatment and local toilet. A subsequent audit revealed lack of protocol standardisation for subcutaneous fluid administration and led to the establishment of locally agreed guidelines[8]. Our study results at first glance may suggest a high incidence of adverse events. However most of these were not complications per se but signs that the medical staff were actively looking out for, to avert more serious problems later. There was no complication of abscess or serious haemorrhage in our study. It is noteworthy that in none of the patients was the drip discontinued because of drip site complications. A closer look at the data revealed that the complications of drip site redness and extravasation occurred mostly in patients who had been on the drip for three days or more. It has been suggested that the site of infusion and drip set be changed every 24 hours and 72 hours respectively[15] to reduce local inflammation and extravasation. Extravasation can also occur if the needle is placed too superficially or the infusion rate is too rapid. Mild bleeding was reported in two subjects with liver cirrhosis and abdominal varices. It is possible that the veins on the abdominal wall were inadvertently punctured during needle insertion. In addition, these patients probably had underlying coagulopathy as a result of liver dysfunction. Another reason which could account for the higher complication rate observed in our study could lie in the type of needle used. Metallic winged "butterfly" needles used in our hospice have been shown to have a higher complication rate compared to Teflon or Vialon needles[15]. There has yet to be a standard protocol formulated for subcutaneous hydration locally. This paper should prompt the adoption of a standard protocol for delivery of subcutaneous fluids as exemplified in Tables I and II with the aim of reducing drip-related complications.

CONCLUSION

Hypodermoclysis has been practised with considerable success in our hospice. Numerous other studies have also shown that it is safe, reliable and can be easily administered with minimal patient discomfort. It is most suitable for hydration of the elderly and terminally ill where patient comfort is prime. Its use can even be extended to the home setting. The only limitations are a slight delay in transfer of fluids into the vascular compartment and that only 1.5 L/day of fluid should be administered at each site. Nonetheless, two infusion sites can run concurrently, making it possible to deliver 3 L/day when necessary. Hypodermoclysis is not meant to replace the intravenous route in resuscitation of shock or severe dehydration. The availability of a standard protocol should encourage more widespread adoption of this approach and minimise complications. This paper can hopefully provide the platform for future intervention studies locally to demonstrate objectively the efficacy and safety of the procedure. It is hoped that hypodermoclysis will catch on in our local practice in the years to come.

REFERENCES

1. Ashby M, Fleming BG, Keam E, Lewis S. Subcutaneous fluid infusion (hypodermoclysis) in palliative care: new role for an old trick. Med J Aust 1992; 156(9):669.
2. Gasford W, Evans DG. Hyaluronidase in paediatric therapy. Lancet 1949; 2:505.
3. Abbott WE, Levey S, Foreman RC et al. The dangers of administering fluids by hypodermoclysis. Surgery 1952; 32:305-15.
4. Olde Rikkert MG, Bogaers MA, Bruijns E. Hypodermoclysis, an undervalued rehydration method in geriatrics. Tijdschr Gerontol Geriatr 1994; 25:197-204.
5. Lipschitz S, Campbell AJ, Roberts MS, et al. Subcutaneous fluid administration in elderly subject: validation of an under-used technique. J Amer Geriatr Soc 1991; 39:6-9.
6. Challiner YC, Jarret D, Haywood MJ, Al-Jubouri MA, Julious SA. A comparision of intravenous and subcutaneous hydration in elderly acute stroke patients. Postgrad Med J 1994; 70:195-7.
7. Farrand S, Campbell AJ. Safe, simple subcutaneous fluid administration. Br J Hosp Med. 1996; 55(11):690-2.
8. Jain S, Mansfield B, Wilcox MH. Subcutaneous fluid administration-better than intravenous approach? J Hosp Infection. 1999; 41(4):269-72
9. Bruera E, Legris MA, Kuehn N, Miller MJ. Hypodermoclysis for the administration of fluid and narcotic analgesics in patients with advanced cancer. J Pain Symptom Manage. 1990; 5:218-20.
10. Walker P, Watanabe S, Lawlor P, Hanson J, Pereira J, Bruera E. Subcutaneous clodronate: a study of evaluating efficacy in hypercalcemia of malignancy and local toxicity. Ann Oncol 1997; 8(9):915-6.
11. Schen RJ, Arieli S. Administration of potassium by subcutaneous infusion in the elderly patient. BMJ 1982; 285:1167-8.
12. Ferry M, Leverve C, Constans T. Comparison of subcutaneous and intravenous administration of a solution of amino acids in older patients. J Amer Geriatr Soc 1997; 45:857-60.
13. Ferry M, Dardaine V, Constas T. Subcutaneous infusion or hypodermoclysis: a practical approach. J Amer Geriatr Soc 1999; 47:93-5.
14. Dasgupta M, Binns MA, Rochon PA. Subcutaneous fluid infusion in a long-term care setting. J Amer Geriatr Soc 2000; 48:795-9.
15. Dawkins L, Britton D, Johnson I, Higgins B, Dean T. A randomised trial of winged Vialon cannulae and metal butterfly needles. Int J of Palliat Nurs 2000; 6(3):110-6.
16. Berger EY. Nutrition by hypodermoclysis. J Amer Geriatr Soc 1984; 32:199-203.
17. Schen R J, Singer-Edelstein M. Subcutaneous infusions in the elderly. J Amer Geriatr Soc 1981; 24:583-5.