

Research Article

Hypodermoclysis: The Modern Use in Care of an Ancient Therapeutic Technic

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Abstract

In geriatric and palliative care, hypodermoclysis is proving to be a valuable support to the therapeutic choices. In these years the subcutaneous infusion has been the topic of extensive studies, trial and systematic reviews, though these are still limited in number. Some fields of application of hypodermoclysis are hydration, deficiency states and pain therapy. These fields point out the versatility of the technic with regard to its management by the health personnel and the domiciliary use by the caregivers, assuring levels of functional autonomy and quality of life for the patient.

Considering the above-mentioned points, this bibliographic review aims to explain the use of hypodermoclysis and highlight the necessity of a major research on the argument.

Keywords: Geriatric; Hypodermoclysis; Infusion subcutaneous infusion therapy; Palliative care

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Introduction

In an Italian hospital, some time ago, a patient having a subcutaneous infusion pump with an analgic solution was hospitalized. The needle, a butterfly of G21, was inserted and appropriately secured in the external quadrant of the third superior of his arm (deltoid area). The medical condition of the patient was fairly impaired, notwithstanding the subcutaneous infused analgesic therapy was sorting its effect. This episode was reported by some nurses working in that ward and stimulated the interest, but mostly the need, to look further into hypodermoclysis. The point in question was simple: Does retrieving a way and technique of drug administration that was abandoned almost thirty years ago represent a worsening of the territorial healthcare that, unlike the hospital setting, can't guarantee standards and therapies? Or does the retrieval suggest that with the appropriate arrangements this technique can be valid (of quality) in terms of care and be efficient and well-functioning in terms of treatment?

These questions must be contextualized in a wider perspective. A perspective where it would be possible to evaluate the relation between the therapeutic tool of hypodermoclysis and the development of hospital care setting in over a period of at least a century, during which prejudices, hopes, innovations and experiments characterized the use of this procedure. Towards the end of the nineteenth century, hypodermoclysis was even recommended for the subcutaneous infusion of pregnant women urine as a cure for menopausal disorders; meanwhile it was already being used for several decades for hydration and pain therapy [1-3]. After all it's not new: Before hypodermoclysis, other therapeutic techniques have been recovered after being abandoned for some periods. It is the case of phlebotomy which was very used in medicine for centuries and never completely abandoned (especially in cardiology): It has turned up mainly in the treatment of some blood disorders (e.g. hemochromatosis) with high values of altered hematocrit. Therefore, the reappearance of hypodermoclysis in nursing practice should not be a surprise but should rather stimulate questions about care and therapeutic and care settings.

Hypodermoclysis is mentioned for the first time in Italy, in 1865, in the writings of the physician Arnaldo Catani, as a remedy to the serious state of dehydration caused by cholera: For this purpose, injections can be best of benefit served by a thin trocar whose cannula was left hanging under the skin, fits an elastic tube equipped with a stopcock, receiving the liquid from a little bowl placed at 1-2 meters of height, - a very simple device that I had built under the name of "Hypodermoclysm" [1]. Catani, however, was not the first to speak of this route of administration; Already in 1853, the Scottish doctor Alexander Wood illustrated the technique of hypodermic medication for the injection of narcotics into neuralgia painful points [4].

In more recent times, it has appeared in the Presidential Decree 225 of 1974 [2] (known as the Mansionario dell' Infermiere) as part of the list of diagnostic and curative treatments the professional nurse could perform under the order of the doctor [5]. However, from the 70's in Italy and around the 50's in the US, where some serious adverse reactions occurred¹, its use began to be less frequent. It was soon replaced by the diffusion of intravenous therapy, a route that was

1. Subsequently, it was established that these were caused not by the subcutaneous route of administration, but by the wrong time of infusion (too brief), the use of hypertonic solutions and the infusion of large volumes of liquids.

further favoured by the arrival of new drugs, therapeutic protocols, medical instruments and enhanced training of professionals, especially nurses.

Basically, on the threshold of the 80's, the use of the subcutaneous administration of liquids was completely supplanted by the intravenous way, thus decreeing the disappearance of a centuries-old technique, for at least an entire generation of nurses.

Lately, hypodermoclysis is being once again used as a therapeutic administration, particularly due to the territorial spread of social and health services in the area, the development of homecare and the introduction of Hospice and palliative care. The same happened in Canada and the United States. Now more hospitals or local health personnel do commonly encounter patients who are treated with this technique to correct a state of dehydration, nutritional deficiency or for the infusion of analgesic solutions through a volumetric pump.

The Italian decentralization of care and the advancement of palliative care have hence recovered this therapeutic tool. Moreover, in the history of medicine, the retrieval of hypodermoclysis is not the first case of a technique previously abandoned or forgotten and then reused. Phlebotomy is an example. For centuries it has been a focal operation in medical care and in many cases was abused and improperly used, but after a short period in the "limbo" of therapeutic interventions it has found new forms of application, like in the treatment of hemochromatosis [6]. Therefore, the return of hypodermoclysis should not be dazzling if not for the question that it poses on why we should recover this type of route of administration when, nowadays, the nursing know-how, techniques and mostly the present equipments guarantee excellent levels of performance. And again, what are the outcomes, the consequences, in terms of quality of care and of life for the assisted person and his family?

The choice of hypodermic infusion instead of the intravenous way can be a fallback solution to the difficulty of professionals to find venous access or does it express the possibility of meeting the needs of patients? To the many points raised it could be sufficient to set the aim of finding an answer to the simple question of whether hypodermoclysis is an appropriate therapeutic practice in terms of quality of care and whether it represents a technic of effectiveness and efficiency of care, and not least of equity.

Materials and Methods

It is not easy to answer the questions posed by the reintroduction of a practice abandoned few decades ago. The bibliographic review has provided a baseline by using scientific material obtained through the PubMed search engine. The search was made via the keyword hypodermoclysis and all its possible matches: Hydration, subcutaneous infusion therapy, palliative care, elderly, manage dehydration, caregiver, temperature. The terms listed were not randomly chosen, but they embody specific conceptual references that allow us to understand the field of therapeutic and assistive application of hypodermoclysis.

The research on PubMed was carried out over a period of time that compared the first six months of 2013 with those of 2018. The search with the keyword hypodermoclysis initially gave 155 results which rose to 210 results, of which reviews increased from 31 to 50 results, while the clinical trials from 16 got to 28 results. These results are definitely limited in numbers. These further reduced if the keyword is sought in the title with just an increase of two articles: 5 in

2013 and 7 in 2018. The number of results decreased when the principal keyword was matched with other keywords: Hypodermoclysis an alternative infusion technique (3 results, unchanged in 5 years), palliative care (from 36 to 44 results), elderly (from 64 to 83 results), manage dehydration (from 5 to 6 results), temperature (from 5 to 8 results), caregivers (from 3 to 5 results). Furthermore, by combining hypodermoclysis (with the Boolean and operator) with the word nurs* for 2018 the result is 53; with the title filter there are no results.

All the articles taken into consideration for this study have described exhaustively the use of the hypodermic infusion technique, the associated critical issues and the advantages, and also the significant outcomes on the care plans both in protected structures during hospitalization and at home.

Results

The overview given by the number of results is rather limited, mostly if compared to the thousands of articles that come up when searching on PubMed for other therapeutic techniques or routes of administration. However, this means that we are at an early stage of a scientific work on hypodermoclysis, where the present literature is still limited, and current knowledge must be further validated by studies aimed at quantifying and evaluating the usefulness of this therapeutic practice. Despite the results, three specific fields of intervention can be traced to the quantitative dimension of the scientific panorama which refers to the specific contents expressed by the articles dealing with the topic. These fields are hydration, reduction of deficiency states and pain therapy [7-9].

Discussion

For many nurses, especially those who have graduated from the 80's, the term hypodermoclysis is strongly linked to the past. A past when there was a very different practice of the profession that embraces a period of time that goes from the post-war period to the threshold of the 70's, during which the nursing profession was still caged in rigid and overdetermined tasks and interventions, and very often blood samples (and phlebotomy) were still performed by doctors. Many of the professionals in service have never done hypodermoclysis and have never seen a hypodermoclysis needle. The needle is described as quite long (about 15-20 cm) and equipped with several outlet holes that are parallel to its length in order homogeneously diffuse the administered solution into the subcutaneous tissue. Some aged nurses remember the need to apply a moist warm compress that promoted vasodilatation, useful for a more functional reabsorption of the subcutaneous liquid.

Hypodermoclysis is nothing but the infusion of isotonic solutions through the subcutaneous tissue [8,10]. A therapeutic practice abandoned for a long time and that today is slowly returning on the scene for various motivations substantially linked to particular conditions of the patient and to the context of assistance itself. In the first case, hypodermoclysis is recommended in elderly patients or in those who are more easily subjected to palliative care, in a situation where the infusion can be functional both for antalgic therapy and for rehydration. The context is set on a territorial and/or residential care level where the management of the infusion is easier not only at home, in Hospice or in the RSA, but also when the assistance is provided by the nursing staff alone supported by the active participation of family members. In this case the family can be a better care resource rather than when dealing with the greater complexity of continuous intravenous infusions.

The subcutaneous route is seen as an alternative to the intravenous route when it is not possible to find a peripheral venous access, or to functionally manage central venous accesses or in order to avoid IV complications. This alternative is also useful when oral administration is impossible and is made problematic by the presence of specific symptoms (nausea, vomiting, etc.) or pathologies of the upper tracts of the alimentary canal.

Antalgic therapy and rehydration are the areas in which hypodermoclysis is more widely used, for instance in patients which clinical conditions are really compromised by the advanced state of chronic-degenerative or neoplastic poli-pathologies. Numerous studies about antalgic therapy have shown that the plasma concentration of opioids administered subcutaneously is comparable to that administered by intravenous route. To be precise, the most important studies on this are represented by a systematic review, two RCTs and six cohort studies. To reduce the presence of deficiency states and dehydration, protein solutions, 5% glucose or 0.9%-0.45% saline [8,9,11-13] can be infused via the hypodermic route.

In the medium or long term, inasmuch as adopting these strategies, the possible onset of dehydration could be prevented when it can be easily predicted in the presence of fever, diarrhoea and vomiting [14]. As opposed to the previous case, hypodermoclysis should not be considered when dealing with renal failure, heart failure, and severe dehydration and with all clinical situations where quantification and a direct control of the hydro-electrolyte balance are imposed as a consequence of serious acute clinical episodes. Furthermore, it is essential to bear in mind the importance of evaluating the low dosage of the solutes that have to be infused because, the presence of hypertonic solutions in the extra-cellular space attracts liquids from the circulatory stream, consequently increasing the haematocrit and altering the hemodynamic equilibrium. Nonetheless, the possibility of using the subcutaneous way for rehydration or antalgic therapy is still a great opportunity in terms of care.

From a purely technical point of view, hypodermoclysis can be infused at any point of the subcutaneous tissue characterized by a good presence of panniculus adiposus, in suitable areas that can collect the liquid. The areas of the body that are most frequently selected are the axillary, the abdominal, and the thoracic or sub clavicular [15]. In regard to this, it should be remembered that as a consequence of aging, there is a reduction of the subcutaneous tissue in the peripheral areas of the body while the central ones (thigh, scapula and abdomen) remain the elective sites for hypodermic infusion [16]. Medium-small sized butterfly needles (21-23 gauge) are generally used. Some texts refer that it should remain inserted a maximum of 72 hours [11,12,17], though a prolonged presence of the needle poorly combines with the ease of finding subcutaneous insertion points.

Like wise the IV pathway, even in hypodermoclysis is the possible to connect a stopcock that enables to use the pathway for multiple simultaneous infusions. Moreover, compared to the intravenous drip, the monitoring of infusions is optimized for caregivers or healthcare staff as it does not require a particular knowledge or skill. Once the infusion is over, the circuit is safely closed and prevents blood from flowing out (situation that would be difficult for the family to manage). There is no need of washing to maintain the patency; the needle displacement, differently from the IV infusion, is not a cause of worry for those assisting nor a disturbance, discomfort or pain for patients (unlike in the case of extravasation and/or thrombophlebitis caused by phleboclysis) for the patient himself.

Hypodermal infusion can be facilitated by increasing the permeability of tissues through the action of the enzyme of hyaluronic acid, hyaluronidase. The enzyme is recommended to be used in its pharmacological preparation form; it should then be mixed to the solution infusions [9,18-20] at a dose of 450 U/I. This dosage is functional to support the absorption of solutions that are infused between 80 and 200 ml/h. Indeed, the infusion rate should be carefully controlled as it affects the ability to absorb liquids in an inversely proportional way, increasing the risk of stagnation, oedema, tension, pain and a possible insurgence of ischemic suffering. The use of hyaluronidase has been known for at least half a century [21]. Despite to the ease of use of hypodermoclysis, side effects must be taken into consideration. The side effects are qualitatively and quantitatively inferior to those of phleboclysis (important electrolyte abnormalities and the appearance of pulmonary oedema are quite rare): Localized oedema and local inflammation. The mentioned side effects can be reduced with hyaluronidase, massaging the affected area and reducing the rate of infusion when there is a clear evidence of difficult absorption [19,22]. More serious complications such as necrotic tissue damage and gaseous gangrene can be prevented through the rotation of the infusion sites and by applying the same asepsis measures adopted for phleboclysis.

Having done this excursus, it is now possible to begin to outline the background of the validity of hypodermoclysis; a technique that, due to its ease of use (simple insertion and disconnection) and the reduced local reactions, has been undoubtedly an advantage to nursing staff, health support personnel (OSS-Social-Healthcare Workers) and for the caregivers. Safety and practicality guarantee a good cost/effectiveness ratio [10,13], especially in a domiciliary setting. Hypodermoclysis can turn out to be a more versatile technic that assures good quality of life levels for patients and their families in economic and management terms, thus reducing hospitalization requests for chronic patients [3,9,23,24]. However, it there are limits on the administration of certain hypertonic and nutritional infusion solutions: Quantity, composition and infusion times.

Conclusion

What is written in this article is only a broad and generic picture of the elements used for the reevaluation of hypodermoclysis. The collected data supports the validity of this technique in terms of cost containment and versatility.

The current epidemiological results show that there will be a rise in the elderly population and the associated multiple pathologies will tend to grow. The trend would necessarily lead to a displacement in the territory of care assistance, and in particular to domiciliary care, in order to sustain the health system and respond appropriately to the health demands of the population.

The possibility of using therapeutic techniques that allow the active involvement of family members and caregiver figures is undoubtedly a resource both in terms of management and education. If hypodermoclysis was inserted from this view, it would be surely an optimal choice.

Also, this fundamental fact has to be considered: The patient care outcome. Does the person with the needle inserted in the subcutis have greater mobility and autonomy of movement, mostly of the upper and lower limbs, than he who carries a peripheral venous catheter? Infective complications are minor or major compared to those of

central venous access? These questions need more structured answers in terms of recommendations, guidelines and protocols. In addition, the type of patient has to be kept in view: A chronically ill person, in a complicated or terminal phase of the illness where the palliative therapy and assistance becomes more useful. If keeping into account pain control, especially in the terminal phases of some diseases, the hypodermic pathway is a functional alternative to oral or intravenous administration of analgesic therapy.

In conclusion there remains a final consideration to make concerning the specific nature of the nursing profession. The retrieval of an old therapeutic technique gives some thoughts to it. Once the efficacy and efficiency (and the qualitative level of care) have been proved, obsolete assistance techniques of the past could be used again. This suggests that the professional, the experimenter and the researcher have a broad vision. They question themselves and they are not satisfied with appearances; they try to improve techniques and approaches, aiming to give answer to the needs expressed by the person and the families to whom they offer their services as nurses.

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