

# Hydrotherapy in burn care: Pros, cons and suggestions

Mirela Tiglis<sup>1,2</sup>, Ileana Peride<sup>3</sup>, Tiberiu Paul Neagu<sup>4,5</sup>, Laura Raducu<sup>4,6</sup>, Ioan Lascar<sup>4,5</sup>

<sup>1</sup> Clinical Department No. 14, "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

<sup>2</sup> Department of Anesthesiology and Intensive Care, Emergency Clinical Hospital of Bucharest, Romania

<sup>3</sup> Clinical Department No. 3, "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

<sup>4</sup> Clinical Department No. 11, "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

<sup>5</sup> Department of Plastic, Aesthetic and Reconstructive Microsurgery, Emergency Clinical Hospital of Bucharest, Romania

<sup>6</sup> Department of Plastic and Reconstructive Surgery, "Prof. Dr. Agrippa Ionescu" Emergency Clinical Hospital, Bucharest, Romania

## ABSTRACT

Hydrotherapy represents the use of water for medical purpose, being involved in burn wound care since the 17th century. Burn wound cleansing, performed daily, twice a day, or as needed, as part of standard care, should be scheduled by a burn surgeon and supervised by proper specialists. It can be performed by various methods, like shower, immersion, bedside irrigation or wiping. Due to the high risk of cross-contamination, immersion is no longer recommended. Tap water seems to be superior to saline solution in burn wound care, and adjuvants can be added, especially chlorhexidine, povidone-iodine, or special detergents. Disposable plastic sheets use during showering and the following of cleaning protocols for washing areas have decreased the risk of infection. Apart from the wound-cleansing role, hydrotherapy reduces itching and pain, improves wound healing, favours early mobilization and increases patients' comfort. Controversy persists around the optimal method and appropriate solutions for cleaning burn injuries and clinical studies are further required to solve this matter. In the absence of standardized recommendations, most burn centers are guided by experience.

**Keywords:** hydrotherapy, burn care, burn wound, cross-contamination, wound healing

## BACKGROUND

Despite advances in burn care that have been made in the last fifty years, infections continue to be the main complication and leading cause of death in these patients and retractile scars impair the life quality, being associated with persistent pain [1, 2]. In addition to the fact that infected post-burn wounds are very difficult to heal, they can also cause systemic infections, which have a negative impact on the outcome of patients with severe burns [3,4]. In order to limit these impediments, over the years, hydrotherapy has been proposed for the management of burn patients. There are various opinions for and against this practice, which will be discussed in the present article.

Hydrotherapy represents the use of water for medical purpose, being involved in burn wound

care since the 17<sup>th</sup> century [5,6]. In Burn Units, there are designated rooms for this procedure. Every burn center has its own routine regarding wound cleansing, which can be performed daily, twice a day or, as needed, depending on the association with other topical treatments [7,8].

Burn wound cleansing is part of standard care and can be performed using various methods, like shower, immersion in bathtubs, immersion followed by a shower, bedside irrigation or bedside wiping [9]. It is mainly realized using tap or sterile water, in association with cleaning solutions like regular soap, special detergents, chlorhexidine or povidone-iodine [10]. These solutions can be harmful to the healing process and should be carefully chosen depending on the type, grade and localization of burns [7].

Fernandez et al. emphasized in a systematic review that tap water is more effective than a saline solution in reducing the infection rate in adult patients with burns. At the same time, if potable tap water is unavailable, boiled and cooled water or distilled water can be safely used to clean burn wounds [11]. Regarding the use of Chlorhexidine, Abdel-Sayed et al. showed its role in the topical management of infections with resistant organisms due to a large spectrum of action, such as preventing or treating infected burn wounds. The effects on burn injury healing and reepithelization promotion are still controversial and need further studies [12].

### Pros – The purpose of hydrotherapy

As we emphasized before, the first role of hydrotherapy is burn wound cleansing, through lesions decontamination (reduces microbial burden), especially as showers (specialized shower systems) during normal patient care [9, 13]. It improves the burn wound surface through cleaning, pus drainage and separation of healthy skin from eschars [14].

Over time, hydrotherapy was associated with wound healing promotion, softening of the burn wound and new tissue formation through removing dead cells. It can minimize scar development and create a proper moist environment for wound healing [15, 16]. As adjuvant therapy, it promotes early mobilization and increases patients' comfort and quality of life [14].

Recent guidelines showed the important role of hydrotherapy in standard burn care. It can relieve itching, ameliorate persistent pain, and appears to improve patients' cardiopulmonary function and range of motion, favouring rehabilitation [17].

Apart from the cleansing role of hydrotherapy, it can be used in the rehabilitation phase after important burns, leading to the improvement of retractile scars by obtaining a uniform wound structure, skin color, viscoelastic properties, decreasing the pruritus and pains intensity [18].

### Cons – The risks associated with hydrotherapy

Hydrotherapy through immersion is responsible for cross-contamination and bacterial resistance development, due to equipment contamination [19, 20]. Therefore, this practice has been replaced by showering and bedside irrigation or wiping. At the same time, the use of disposable plastic sheets and the establishment of cleaning protocols for washing areas have resulted in a decreased risk of infection [21]. The movement of patients up to the hydrotherapy room can be associated with cross-contamination [22].

A recent study published by Ziwa et al. showed that the use of hydrotherapy (traditional bathtubs,

without shower trolley or disposable materials) increases the wound bacterial load, promotes infection (and cross-infection), and sepsis development, which leads to the development of resistant microorganisms (mainly *Staphylococcus aureus* and *Klebsiella pneumoniae*). It confirms previous findings that only decontamination of regular bathtubs is not enough [16].

Hydrotherapy may be associated with other risks, apart from an infection, such as plasma electrolyte disturbances, especially hyponatremia [6]. Due to the lack of skin barrier, reports show that burn patients may absorb water and can further develop tissue edema [23, 24].

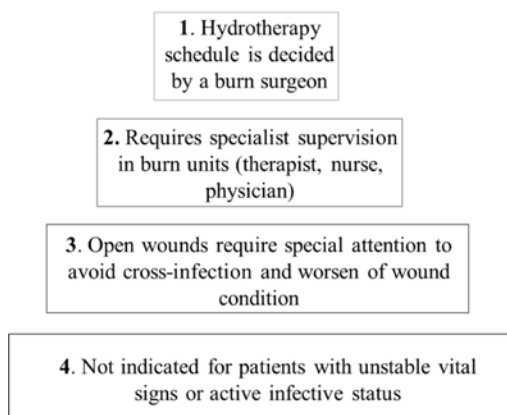
### Suggestions – Current recommendations

There is no current standard recommendation regarding the use of daily hydrotherapy in burn patients. Due to the previously mentioned risks, namely infection transmission, there are authors that do not consider it as part of normal routine care [25].

The use of disposable plastic sheets for the shower trolley decreases the potential risk of bacterial transmission through surfaces, as shown in a study by Akin S. and Özcan M. [21]. Immersion hydrotherapy in bathtubs is no further considered a proper option [9]. The use of simple equipment, easy to clean, with removable stretchers, plastic-covered chairs and shower nozzle for water delivery are of vital importance in infection prevention. The bathtub has only the role of water drainage [23].

In a recent report, McKew et al. showed the efficacy of using aerosolized hydrogen peroxide in cleaning high-risk devices and rooms (bathrooms, shower trolleys, shower chairs etc.) in Burn Units, after normal detergent cleaning, reduces, but do not neutralizes, the contaminated surfaces [26].

According to a guideline for burn rehabilitation, hydrotherapy must follow some specific steps as presented in Figure 1, in order to avoid the risk of complications [17].



**FIGURE 1.** Guideline recommendation for proper hydrotherapy use

As presented by Langschmidt et al. in a survey regarding hydrotherapy practice among specialists in UK and Ireland, although it is used nationwide and plays an important role in burn patients' management, there is variation among practices due to the lack of structured guidelines [27].

## CONCLUSION

Controversy persists around the optimal method and appropriate solutions for cleaning burn injuries, and clinical studies are further required to

*Conflict of interest:* none declared

*Financial support:* none declared

## REFERENCES

- Torres MJ, Peterson JM, Wolf SE. Detection of infection and sepsis in burns. *Surgical Infections*. 2021 Feb 1;22(1):20-7.
- Chowdhury RS, Islam MD, Akter K. Therapeutic Aspects of Hydrotherapy: A Review. *Bangladesh Journal of Medicine*. 2021 Jun 5;32(2):138-41.
- Cazander G, den Ottelander BK, Kamga S et al. Importance of Debriding and Wound Cleansing Agents in Wound Healing. *Therapeutic Dressings and Wound Healing Applications*. 2020 Mar 2:59-89.
- Palmieri TL, Greenhalgh DG. Topical treatment of pediatric patients with burns. *American journal of clinical dermatology*. 2002 Dec;3(8):529-34.
- Almassmoum SM, Balahmar EA, Almutairi ST et al. Current clinical status of hydrotherapy; an evidence based retrospective six-years (2012–2017) systematic review. *Bali Med. J*. 2018 Sep 1;7:578-86.
- Thomsen M. It all began with Aristotle--the history of the treatment of burns. *Burns, including thermal injury*. 1988:S1-46.
- Atiyeh BS, Dibo SA, Hayek SN. Wound cleansing, topical antiseptics and wound healing. *International wound journal*. 2009 Dec;6(6):420-30.
- Blunt J. Wound cleansing: ritualistic or research-based practice? *Nursing Standard* (through 2013). 2001 Sep 19;16(1):33.
- Hayek S, El Khatib A, Atiyeh B. Burn wound cleansing-a myth or a scientific practice. *Annals of Burns and Fire Disasters*. 2010 Mar 31;23(1):19.
- Khan MN, Naqvi AH. Antiseptics, iodine, povidone iodine and traumatic wound cleansing. *Journal of tissue viability*. 2006 Nov 1;16(4):6-10.
- Fernandez R, Griffiths R. Water for wound cleansing. *Cochrane database of systematic reviews*. 2008(1).
- Abdel-Sayed P, Tornay D, Hirt-Burri N et al. Implications of chlorhexidine use in burn units for wound healing. *Burns*. 2020 Aug 1;46(5):1150-6.
- Thomson PD, Bowden ML, McDonald K et al. A survey of burn hydrotherapy in the United States. *The Journal of Burn Care & Rehabilitation*. 1990 Mar 1;11(2):151-5.
- Lochaitis A, Chalikitis S, Tzortzis C. Hydrotherapy (bath therapy) as a treatment option in burns. *Annals of the MBC*. 1992;5(2):1-4.
- Shankowsky HA, Callioux LS, Tredget EE. North American survey of hydrotherapy in modern burn care. *The Journal of burn care & rehabilitation*. 1994 Mar 1;15(2):143-6.
- Ziwa M, Jovic G, Ngwisha CL et al. Common hydrotherapy practices and the prevalence of burn wound bacterial colonisation at the University Teaching Hospital in Lusaka, Zambia. *Burns*. 2019 Jun 1;45(4):983-9.
- Cen Y, Chai J, Chen H et al. Guidelines for burn rehabilitation in China. *Burns & trauma*. 2015 Dec 1;3.
- Moufarrij S, Deghayli L, Raffoul W et al. Applegate LA. How important is hydrotherapy? Effects of dynamic action of hot spring water as a rehabilitative treatment for burn patients in Switzerland. *Annals of burns and fire disasters*. 2014 Dec 31;27(4):184.
- Simor AE, Lee M, Vearncombe M et al. An outbreak due to multiresistant *Acinetobacter baumannii* in a burn unit: risk factors for acquisition and management. *Infection Control & Hospital Epidemiology*. 2002 May;23(5):261-7.
- Embil JM, McLeod JA, Al-Barrak AM et al. An outbreak of methicillin resistant *Staphylococcus aureus* on a burn unit: potential role of contaminated hydrotherapy equipment. *Burns*. 2001 Nov 1;27(7):681-8.
- Akin S, Özcan M. Using a plastic sheet to prevent the risk of contamination of the burn wound during the shower. *Burns*. 2003 May 1;29(3):280-3.
- Palmieri TL. Infection prevention: unique aspects of burn units. *Surgical Infections*. 2019 Feb 1;20(2):111-4.
- Chertow G, Brady H. Hyponatraemia from tap-water enema. *The Lancet*. 1994 Sep 10;344(8924):748.
- Abrams RS, Nichter LS, Sloan GM, Holdrege S. Electrolyte changes caused by hydrotherapy in purpura fulminans. *The Journal of burn care & rehabilitation*. 1988 Sep 1;9(5):488-9.
- Merchant N, Smith K, Jeschke MG. An ounce of prevention saves tons of lives: infection in burns. *Surgical Infections*. 2015 Aug 1;16(4):380-7.
- McKew G, Phan T, Cai T et al. Efficacy of aerosolized hydrogen peroxide (Deprox) cleaning compared to physical cleaning in a Burns Unit. *Infection, Disease & Health*. 2021 Aug 1;26(3):161-5.
- Langschmidt J, Caine PL, Wearn CM et al. Hydrotherapy in burn care: a survey of hydrotherapy practices in the UK and Ireland and literature review. *Burns*. 2014 Aug 1;40(5):860-4.