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Review

The role of silver sulphadiazine in the conservative treatment of partial thickness burn wounds: A systematic review

A. Heyneman *, H. Hoeksema, D. Vandekerckhove, A. Pirayesh, S. Monstrey

Department of Plastic and Reconstructive Surgery, Ghent University Hospital, Ghent, Belgium

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ABSTRACT

Background: For more than 40 years, silver sulphadiazine 1% (SSD) is considered as standard therapy for the conservative treatment of burn wounds. However, in the last 10 years, substantial disadvantages of SSD have been reported in the literature and probably as a result of this, several new dressings for burn wounds have been developed and put on the market. The objective of this systematic review is to evaluate the available evidence on SSD in the conservative treatment of burns, specifically in comparison with the newer burn dressings that are increasingly being used nowadays.

Materials and methods: A search filter was composed to select randomized controlled trials (RCTs) from the MEDLINE database. Only RCTs studying the effect of conservative treatment on burns were selected. At least one of the two comparative groups was treated with SSD. Each included article was analysed and relevant data (baseline parameters, interventions, outcomes and methodological parameters) were registered using Microsoft Office Excel 2007.

Results: Many dressings showed superior healing properties compared to SSD, but no dressing was able to show a clear benefit over SSD regarding infection. The number of dressing changes, pain and patient's satisfaction are more favourable in the newer dressings, especially with solid and biological dressings.

Conclusions: The results of this systematic review clearly demonstrate that a faster wound healing is obtained with the newly developed burn dressings. Additionally, these new dressings tend to be more comfortable for the patients and easier to use for care givers. The minor differences in antibacterial activity between SSD and the new products did not seem to have any influence on the rate of wound healing.

Since rapid wound closure is essential to obtain an optimal functional and aesthetic outcome, it can be concluded from the results of this systemic review that the standard use of SSD in the conservative treatment of burn wounds can no longer be supported.

* *Corresponding author at*: Department of Plastic and Reconstructive Surgery, Ghent University Hospital, De Pintelaan 185, B-9000 Ghent, Belgium. Tel.: +32 09 332 28 10.
E-mail address: Alexander.Heyneman@uzgent.be (A. Heyneman).

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Contents

1. Introduction

Burn wounds have been present since the day mankind discovered fire, or maybe even earlier. These wounds were initially treated with natural remedies such as plants, oil and honey. The widespread use of silver started with the introduction of silver nitrate 0.2% and was first mentioned in the ''Chirurgische Bibliothek'' published by Richter between 1771 and 1797. Since then, several different concentrations have been used, ranging from 0.2% up to 10%. Silver nitrate 0.5% solution, introduced by Moyer in 1965, was found to be the minimal concentration with sufficient antibacterial properties and the application resulted in shorter hospitalization periods, less complications and a decreased mortality [1–4].

Silver sulphadiazine (SSD 1%), as we still know it today, was introduced by Charles Fox Jr. [5]. The new product had a strong antibacterial effect, improved the survival rate of severely burned patients and was reported to be less caustic in comparison to silver nitrate [1,2,6]. The widespread success of SSD lies in its mode of action. Silver binds with amino-acids, bacterial cell walls, DNA and interferes with the respiratory chain. These different target sites result in a broad antibacterial effect and low resistance rates [7–9]. Sulphadiazine is a sulphonamide antibiotic that does not really act here as an antibacterial agent, but in SSD has been reported to show a specific synergetic effect in combination with 'subinhibitory' levels of silver [2,10].

A decade after the introduction of SSD, cerium nitrate was added to the product [11]. It is used to improve outcome where early excision is not performed. Cerium binds and denatures the lipid protein complex liberated from burned skin that is responsible for the profound immunosuppression associated with major cutaneous burns. The reduction in mortality and morbidity of severely burned patients is due to its action on the burn eschar. The application of cerium nitrate SSD renders the eschar firm, impermeable and adherent to the wound bed. The hardened eschar is beneficial in nursing terms and facilitates later excision [12].

Even after more than 40 years of use, silver sulphadiazine still is frequently referred to as 'the gold standard' in the treatment of partial thickness burns because of its excellent antibacterial properties and its wide availability, especially in developed countries. However, in recent years, several reports have shown that this standard therapy also has a number of substantial disadvantages [1,2,13–16]. Application of SSD always results in the formation of a pseudoeschar layer on the burn wound which impairs evaluation of burn depth and healing status [12]. Daily dressing changes are labour intensive, expensive and induce fear and pain, especially in children [17]. A cytotoxic effect of SSD has also been demonstrated on epidermal cells with hair follicle death resulting in a slowing down of the healing rate and increased skin problems after healing [18–20].

Because of these disadvantages of SSD, the quest for the ideal burn dressing is still ongoing. Improvements in technology and the expansion of our knowledge regarding wound healing, bacterial burden and drug delivery have led to the development of a wide range of new dressing options. Factors such as fluid absorbing and releasing capacity (cfr 'moist' wound healing), number of dressing changes, ease of application and removal, pain and comfort for the patient, anti-bacterial properties, drug delivery as well as cost-effectiveness have all become increasingly important in the search of the ideal wound dressing [18,21–23].

An important factor in burn care research and daily practice is burn depth assessment. Theoretically, burn wounds are classified into four categories based on anatomic depth going from superficial burns over superficial partial thickness burns to deep partial thickness burns and finally full thickness burns [24]. In clinical practice it is more useful to link the burn depth to the time to healing which determines the optimal therapeutic approach.

The purpose of this systematic review was to evaluate the role of SSD in the conservative treatement of burn wounds. This evaluation is based on studies comparing SSD with the many newer dressings available. Outcome parameters such as wound healing, infection, pain, nurse-related characteristics and patient's satisfaction were identified and analyzed.

2. Materials and methods

A PubMed search was performed combining the MeSH terms 'burns', 'silver sulfadiazine' and 'randomized controlled trial'. The sensitive search filter was additionally limited to human studies and papers published in English, French, German or Dutch.

Search filter: (''burns'' [MeSH Terms] OR ''burns'' [All Fields]) OR (''burn units'' [MeSH Terms]) OR (''burn'' [All Fields] AND ''units'' [All Fields]) OR (''burn units'' [All Fields]) AND (''silver sulphadiazine'' [All Fields] OR ''silver sulfadiazine'' [MeSH Terms] OR (''silver'' [All Fields] AND ''sulfadiazine'' [All Fields]) OR ''silver sulfadiazine'' [All Fields] OR ''silver'' [MeSH Terms] OR ''silver'' [All Fields]) AND (''randomized controlled trial'' [Publication Type] OR ''randomized controlled trials as topic'' [MeSH Terms] OR ''randomized controlled trial'' [All Fields] OR ''randomized controlled trial''