A CHANGE OF TRADITIONAL METHOD OF TREATMENT
OF PARTIAL THICKNESS BURN WITH HYDROFIBRE DRESSINGS

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Nearly 1% of population is affected with burn trauma annually. Among patients seeking advanced medical care almost 8% require hospital stay. Most burns are superficial and do not cause full thickness damage to the skin. Standard topical treatment of burn wounds with creams and ointments requires frequent dressings' changes. The healing process is long and expensive. The technological revolution, as occurred in the last decade in the field of dressing care allows us to introduce the use of advanced material solutions. Modern materials allow to shorten the treatment time, reduce the expenses and diminish the patient discomfort leading to good outcome.

The study presented a case of four patients treated due to the partial thickness burn wound. Hydrofiber dressing with silver ions were introduced in the treatment. We observed good short and long term results.

Key words: skin burn wound, partial thickness burn, hydrofiber dressing, silver ions

Burns are the fourth most common cause of injuries, after car accidents, falls from heights and injuries inflicted during acts of violence. Every year, nearly 1% of the population are affected by burns, of which children account for 50-70% (1). Burns are usually superficial and not the whole skin thickness is damaged. However, a number of patients require hospitalisation due to the vast area of a burn and its location. Seventy percent of patients with burns appear at hospital emergency wards or outpatient clinics. Nearly 8% of them are admitted for hospitalisation and further treatment (2). As a result of a small number of highly specialised burns treatment centres, majority of such patients are treated in general surgery wards. The progress made in dressing materials during the past decade has resulted in a change of the traditional approach to healing partial thickness burns. Modern methods improve chances for quicker, cheaper and more effective healing of burns.

CASE REPORTS

Four patients with partial thickness burns were treated at our centre between August 2013 and February 2014; they were treated with the use of hydrofibre dressings with silver ions (Aquacel®Ag Burn, ConvaTec). All the patients were found to have II°A/B thermal skin burns (fig. 1a, 2a, 3a). Details regarding the patients are shown in tab. 1. Aquacel®Ag Burn dressing was applied in the first two patients within 72 hours of the thermal injury, after the vast wound was washed and cleaned with a gauze pad (fig. 1b). The dressing was applied in the other two patients within 24 hours of the burn. Adherence of the dressing to the wound was checked during the first four days. The dressing was found to adhere properly and a decision was taken to leave it unchanged for three weeks in ambulatory treatment. Subsequently, the patients were discharged between day 4 and 7 after the dress-
ings were applied. Patients came for follow-up visits every 7 days; during each such visit the proper position and adherence of the dressing was checked (fig. 3b). However, we noticed that the dressing was shrinking by approx. 2-3 cm on the perimeter in sheets with the size of 15-20 cm. The largest change in length was observed in the longitudinal direction relative to the weave of the hydrofibre material. The uncovered surfaces were secured with extra sheets of dressing. The patients denied any feeling of pain during the treatment, but they

Table 1. Clinical details of the patients under treatment

<table>
<thead>
<tr>
<th>Patient</th>
<th>Gender</th>
<th>Age (years)</th>
<th>Etiology</th>
<th>Area</th>
<th>TBSA (%)</th>
<th>Hospitalisation (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>48</td>
<td>boiling water</td>
<td>abdomen, face</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>48</td>
<td>boiling water</td>
<td>arms and forearms</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>17</td>
<td>boiling water</td>
<td>shanks</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>60</td>
<td>boiling water</td>
<td>forearms and hands</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
A change of traditional method of treatment of partial thickness burn with hydrofibre dressings

mentioned severe itching under the dressing. The dressings were removed in all the patients after 21 days; at this time, they were separated from the wound by a layer of healthy epidermis (fig. 1c, 2b, 3c). No signs of ingrowth of the dressing in the epidermis were observed. Skin graft was not found necessary in any of the patients. Only skin greasing was recommended as further treatment. In a long term (3-6 months), a properly healed elastic scar had formed with no signs of hypertrophy, properly vascularised and only slightly discoloured; this was better visible in patients in whom a delayed dressing was applied (fig. 1d). Burn scars were assessed at 1.7±0.6 points in the modified Vancouver scale, which proves a very good cosmetic effect (3).

Implementation of hydrofibre dressings in treatment has made it possible to give up using everyday topical healing agents, which, in consequence, reduced the cost of routinely used expensive preparations containing silver salt of sulfadiazine. Moreover, the duration of hospitalisation could also be shortened because the patients stayed in hospital only until full integration of the dressing with the wound. According to the producer’s recommendation, full integration should take place within the first 5 days, which was confirmed in our observations.

DISCUSSION

Traditional treatment based on use of superficially applied prescription greasy oint-
ments with gauze dressing ensures proper greasing of the burn wound. But drying out of the ointment results in a loss of moisture in the dressing and appearance of pain. Commonly applied treatments now include Koch’s ointment, made from balsam of Peru, paraffin and vaseline. The disinfecting and greasing effect are among the main advantages of the ointment (4). However, personnel find its application inconvenient because of its greasiness, and applying a dressing by this method is time-consuming. Patients who have this dressing must cope with clothes stained by the ointment permeating through the dressing. Moreover, resuming social activities may be hindered by the embarrassing intensive smell of the ointment.

Another type of ointments used in treatment of partial thickness burns are collagenase preparations. Necrotic tissues are removed by enzymes, which results in cleaning the wound surface and preparing the base for epithelialisation. However the process of wound cleaning is long and it requires frequent changes of dressings, especially during the initial period. Keeping the wound properly moisturised is another necessary condition to ensure the effectiveness of the method. Moreover, collagenase does not have the bactericidal effect (5).

Creams with silver salt of sulfadiazine – SSD (Dermazin®, Sandoz; Argosulfan®, Jelfa) – remain the most common agents used in treatment of partial thickness burns. The antibacterial effect of silver is an advantage of these products and it reduces the risk of delayed healing of a wound, caused by a developing infection, usually with Pseudomonas aeruginosa (6). Using silver creams requires frequent changes of dressings and applying large amounts of the compound, so that the whole wound should be covered by a 2-3 mm layer. As the price of the product is relatively high, this method of treatment is quite expensive, which is a considerable financial burden for the healthcare facility in cases of long-term therapy. Miller and co-worker reviewed the available literature and pointed out that currently there is no evidence of effectiveness of using SSD formulations in treatment of burn wounds, therefore their routine application cannot be recommended (7).

Common treatment methods as described above involve using traditional gauze dressing. However, according to the TIME wound healing strategy, it is recommended that such dressing types should be used which help to remove damaged tissues (tissue management), with bactericidal and anti-inflammatory action (infection), which help to maintain proper moisture level in the wound (moisture) and which promote epidermis growth from the wound edges (epithelialization). Using gauze dressings does not meet any of these criteria, which opens the way for modern specialist types of dressing with special properties. Hydrofibre dressings enable absorption of wound exudate with the harmful substances in it. Their application reduces the amount of exudate, reduces skin maceration and stimulates granulation processes. Adding silver ions to the preparation makes the dressing antibacterial, like dressings with silver salt of sulfadiazine (8). The main advantages of using hydrofibre with silver ions result from the fact that one dressing can remain on the wound for a number of days, which reduces the inconvenience and the cost of treatment, while maintaining the antibacterial effectiveness (6, 9, 10).

Maintaining the moisture level which favours epithelialisation in the wound considerably reduces pain during the treatment of burn wounds compared to the treatment with creams containing silver compounds (10, 11). Muangman et al. showed on a group of 35 patients with partial thickness burns that application of hydrofibre dressings with silver considerably reduces the time of full epithelialisation of the wound compared to 1% silver salt of sulfadiazine (10+3 vs 13.7±4 days; p<0.02) (10). Mabrouk et al. pointed to a better appearance of a burn scar a long time after the injury when hydrofibre dressings with silver ions are used, which is of considerable importance in superficial burns of face skin, in the treatment of which traditional creams with silver ions should not be used (12). Wasiak et al. reviewed in 2013 the latest randomised trials in which superficial and partial thickness burns were treated and found the outcome achieved with traditional dressings, including creams with silver ions, worse than when modern, biosynthetic, silicone and hydrogel dressings with silver were applied (13).

Carboxymethyl cellulose in hydrofibre dressings binds a considerable amount of wound exudate, without excess fluid being moved horizontally. This makes it adhere to
95A change of traditional method of treatment of partial thickness burn with hydrofibre dressings

The base and reduces the voids. It creates perfect conditions for epithelialisation along the scaffolding created by the elastic dressing. A similar phenomenon occurs when acellular or extracellular dermal matrices are used in treatment of deep burns (Alloderm™, Xeno-Derm™ LifeCell; Integra™ Integra Life Science Co.). Porosity of the materials facilitates vascularisation of the surface and growth of keratinocytes (14, 15). However, the cost of allogenic materials is too high for the solution to be commonly applied. Therefore, application of hydrofibre dressings is economically justified in treatment of the most common superficial and partial thickness burns. The epidermis formed under a dressing gradually separates the tightly adhering dressing from the damaged skin. As a result, the dressing can be easily removed from the wound without the risk of epidermis damage after the healing process is completed (16, 17). Dokter et al. pointed out that using hydrofibre dressings considerably reduces the need for surgical treatment of burns with skin drafts compared with a group of patients treated with silver salt of sulfadiazine (11.6 vs 30.5%; p<0.01) (18).

The aim of treatment of recent, uninfected burn wounds is to reduce the risk of bacterial infections of the wound and to retain the remaining epidermis which is the base for further treatment (19). Early application of hydrofibre dressings in treatment of partial thickness burns helps to achieve those objectives. The required characteristics of such a dressing are listed in tab. 2 (20). According to the guidelines issued by the European working group for treatment of partial thickness skin burns, every surgeon should be familiarised with the action and properties of modern dressings applied in treatment of burns.

### CONCLUSIONS

Application of hydrofibre dressings with silver ions is a cheap and convenient method of treatment of recent partial thickness burns. It reduces the duration of hospitalisation and wound healing process, it does not require frequent and time-consuming dressing changes compared to traditional wound treatment with creams with silver salts of sulfadiazine. It reduces pain during treatment and helps to achieve a good long-term outcome of the process. When using hydrofibre dressings, one should take into account partial shrinking of the dressing and use a larger sheet than the wound size during its first application.

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