Three cases of recalcitrant wounds, treated with an iodophor foam dressing

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Introduction

Chronicity of a wound is caused by a series of linked intrinsic and extrinsic factors. Among the extrinsic factors, contamination, infection and the presence of a biofilm play a major role. Biofilm consists of a topical microbial community that makes itself "difficult to reach" and more resistant to the host immune system by the creation of its own protective exopolymeric matrix. By some, biofilm is considered as extrinsically contributing to the poor healing trends, while other consider the development and presence of a biofilm to be among the primary reasons for chronicity.[1, 2]

Biofilms have been shown to contribute to both the infection and (hyper) inflammation[3] represented in the DIME acronym,[4] and are difficult to prevent and treat. Among topical treatment options are iodine-containing compounds.

Biological mode of action

Iodine is a broad spectrum antimicrobial agent. It targets microorganisms, including: amoebic cysts, bacteria, fungi, spores, several viruses, and pro-tozoa.[5-8] It interferes and acts on number of structures and cellular mechanisms of these organisms[5, 7, 9-11] and has a certain amount of anti-inflammatory effects as well,[7, 9, 12-15] while the toxicity for human cells was shown to be very low when compared to a number of other topical agents.[16,17] Adverse effects (including those on functions of the thyroid) are rare.[18]

Formulations

Iodine tincture, by definition a alcohol-based solution, is a very effective antimicrobial agent but has a number side effects.[8, 9, 18-21] An iodophor, a preparation containing iodine in complex with a solubilizing agent, largely does away with these side effects. An iodophor releases free iodine within the dressing from a state of equilibrium with the wound fluid present in the dressing: iodine is released from the iodophor as iodine is being "consumed" by microorganisms[5, 22] within the dressing. This results in less dumping and a prolonged availability of the active compound, significantly improving tolera-bility and safety with regard to side effects.

Biofilms and iodine

In vitro data indicate iodophors can penetrate and "kill" biofilms.[23-26] A new iodophor is based on a polyvinyl alcohol foam dressing from which iodine release is controlled and slow. Similar to other iodophors, the compound has a relatively low level of toxicity to mammalian cells[27] *In vitro* data indicate that this dressing is effective at killing clinical strains of *Pseudomonas aeruginosa* and *Staphylococcus aureus*.[27] The dressing's color changes from black (Figure 3c) to white upon the depletion of iodine supply (Figure 2b).

Clinical implications

The presence of a biofilm has a major negative impact on the healing of skin ulcers.[28, 29] Therefore, early intervention, aimed at prevention and treatment/removal/destruction of the biofilm is an essential step in the healing trajectory.[28] This is best achieved through combination therapy incorporating mechanical debridement together with topical antibiofilm agents.[30] The ideal antiseptic to be used for this purpose should combine a series of properties, including being active against a broad series of microorganisms, having a low potential for (acquired) resistance and being able to penetrate into eschar/necrosis and biofilm.[8-14, 31]

It should also support aspects of wound healing (including suppression or correction of hyper inflammation), have a low toxicity level, be tolerable (i.e. not painful) and being of low cost.[8-14]

Iodophors were shown to have among the highest success rates in attacking/preventing biofilm (re)formation and were also shown to assist in lowering the hyperinflammatory wound environment.[14-32]

Case 1

67-year-old obese male with recurrent venous ulcers. Ulcers were very painful and previously treated for a month with calcium alginate and Unna boots. Patient refused any debridement. He was treated with weekly dressing changes using and iodophor-foam and Unna boots. Ulcers almost healed in 6 weeks time **(1c)** and healing was complete at 10 weeks **(1f)**.

Medial aspect

1a

1b

1c

Lateral aspect

1d

1e

1f

Case 2

32-year-old morbidly obese male with a history of bilateral venous insufficiency and lymphedema. Status post traumatic non-healing ulcer to the left anterior leg, 8 months ago, failed skin graft and 5 applications of a dermal matrix with continued compression therapy and negative pressure wound therapy.

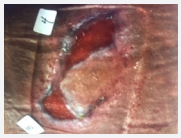
Also status post two periods of wound infections, treated with oral antibiotics. Iodophor-foam dressings, combined an Unna boot, were changed twice a week. Photos show the results two months after the initiation of treatment **(2a-2c)**. Thereafter, treatment was changed to a silver-foam dressing with compression, with complete healing at 2 months later **(2e)**.

2a

2b

2c

2d



2e

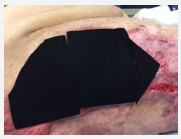
Case 3

55-year-old obese male with a self inflicted, non-healing wound on the right thigh, existing > 12 months. A biopsy was negative for malignancy and vasculitis. Status post failed skin graft with wound recurrence. Thick slough present **(3a)**. Patient was treated with periodic debridement and application of an iodophor-foam dressing 3 times (fresh application in situ **(3c)** per week and as needed. The wound is healing well **(3d)**.

3a

3b

3c



3d

Conclusion

Prevention and treatment of biofilm is essential for healing of hard-to-heal, chronic lesions. A combination therapy of debridement, if and when possible, topical antimicrobial therapy and, depending on the type of lesion, adjunct therapies, seems to offer the highest level of success. Iodophors, with their wide antibacterial spectrum, long-lasting efficacy, limited number of side effects, and suppressive effect on (hyper) inflammation, seem to be among the most appropriate agents for aggressively “attacking” biofilms and redirecting wounds to a more normal healing pathway. Here we present three cases where an iodophor foam dressing, along with other therapies, positively impacted the healing trajectory of chronic wounds.

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