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OBJECTIVE: *To test the usefulness of silver dressings in patients with skin ulcers in the healing phase after debridement.*
MATERIALS AND METHODS: After randomly selected a group of 30 patients and divided them into three groups (A, B and C) according to the type and severity of the ulcer, we used respectively for each group antiseptics-free dressings, hydrofiber dressings with a low or a high content of silver. Then we performed samples by aspiration from the bottom of the wound three times (zero time, after two weeks, after a month) to prepare bacterial cultures.
RESULTS: *In group A, 5 ulcers showed signs of critical colonization after two weeks and 2 of these showed evidence of infection without progression to healing after a month. In groups B and C, no ulcer showed signs of infection with negative cultures. In these two groups, wounds evolved towards healing.*
CONCLUSIONS: *Silver dressings seem to be the best option for the prevention of reinfection of skin ulcers; silver concentration should vary according to the degree of ulcer contamination. Dressings with hydrofibers avoid the accumulation of secretions for bacterial growth which would compromise tissue repair.*

KEY WORDS: Skin ulcers, Silver dressings, Wound infections.

Future Prospects

Possibility of using the filtering system not only during debridement with hydrosurgery but also appropriately adapted to an aspiration system; to verify its use by washing-aspiration technique which, as opposed to the traditional one, would have the advantage both to take a bigger quantity of material for culture purpose and to separate the tissue debris in a simple and immediate way. Such a method, made in this way more reliable, will give quali-quantitative information not only about the superficial bacterial load but, somehow, also of the deeper layers one.
This system is proving suitable to check over time the state of an ulcer infection also in the phases following surgical debridement when a reinfection might compromise the tissue repair again.
The removal of the tissue debris and the killing of bacteria probably restart the tissue repair mechanism. In this phase, though, a new rise in bacteria load might impair healing again, so careful management of the ulcer to preserve it from a likely infection is essential. As most antiseptics are known to have cytotoxic action, their use pre-

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sents insurmountable difficulties, so silver dressings seem to be the most appropriate. In literature, although there are still disagreements about use of silver nitrate in wound management, there are a number of case studies advocating its use. In this regard, in a study of three cases with extensive co-morbidities associated, silver nitrate applications reduced the size of large wounds avoiding the patients to undergo surgery. For this reason we wanted to verify their effective usefulness in the healing phase following debridement.

TABLE I

N° of Patients	30
Male	12
Female	18
Average age (range 35-85)	58
Types of ulcers:	
Phlebostatic	21
Phlebostatic in diabetic patients	3
Mixed	6
Sizes of wounds in cm^2 (range 8-15)	11

Materials and methods

We initially enrolled for the study 34 patients showing a well-deterged wound with no signs of infection and with a well represented granulation tissue. On the basis of this selection we randomized 30 patients divided into three groups of 10 patients each, homogeneous for pathology and ulcer size, who had undergone debridement and received appropriate antibiotic therapy until steady control of the infection and clear signs of the renewal of the cicatrization process were obtained.
The patients were classified according to the type and severity of the ulcerative wound (Table I). Also a photographic documentation and measurement on a transparent millimitred film were carried out obtaining in this way objective references for future evaluations.
In group A (control group), after local detersion and disinfection, we covered the wound with antiseptic-free dressings.
In group B we used hydrofiber dressings containing silver which was not released at the bottom of the wound.
In group C we used dressings with a high content of silver which was released at the bottom of the wound.
For culture purpose we performed three samples at three consecutive times.
Zero time: three days after the debridement and at the end of the antibiotic therapy. The sample was taken before cleansing and antisepsis manoeuvres. From 34 patients we took a sample from the bottom of their wounds by aspiration. This may be a useful alternative to biopsy even though it will give a quali-quantitative evaluation with no information on deep pathogens. We chose this method because it was clearly impossible to use either biopsy, as it is too invasive, or the technique we have developed because a new debridement was not advisable in this phase. We selected for our study only the 30 patients with an infection-free wound, without any tissue debris and with a well represented granulation tissue. The patients were checked every three days and each time dressing changes were performed.
A new sample was performed after two weeks. The sample was taken from 25 patients with the method previously described. The remaining 5 patients showed clinical signs of critical colonization, so we performed also a saline perilesional infiltration which was then aspired from the bottom of the ulcer. This allowed the culture selection also of the deep germs.
A culture test was repeated after a month. A new debridement and a culture test using the technique we have developed were done to 2 patients with clinical signs of full-blown infection and presence of biofilm.

Results and Conclusions

In group A 5 wounds showed signs of critical colonization after two weeks; after a month, 2 of them showed clear signs of infection with highly exuding ulcers without any progression to healing whose bottoms were covered with biofilm. For these two cases we found it appropriate to start an antibiotic therapy by general route because in 1 case the culture test showed presence of polimicrobic infection (Pseudomonas aeruginosa, Proteus mirabilis, Staphylococcus aureus, Bacteroides fragilis, Candida albicans, Streptococus epidermidis, Eschericha coli) in a significant number of colonies. On the basis of the antibiogram, the antibiotic therapy consisted in administrating Amoxicillin + Clavunalic Acid or Teicoplanin associated with Levofloxacin. In another case the bacteriological test showed also a Methicillin-resistant Staphylococcus (M.R.S.A.) infection which made it necessary to use Tigeclina. We did not believe it necessary to add an antifungal at the same time because the development of fungus colonies was not significant.
In another case our choice of the antibiotic was not made on the basis of the number of colonies but on the results of the bacteriological test which selected the beta-haemolitic Streptococcus. In such cases, in fact, the wound is to be considered infected regardless of the number of isolated colonies.
In groups B and C no wound showed clinical signs of infection, this evidence being confirmed also by the culture test. The wounds kept showing progression towards healing. In five cases there was complete healing in ulcers of about 10 cm^2 after 50 days. We did not notice any difference between the two groups even using dressings with different silver contents.

Conclusions: Silver dressings have proved able to avoid the development of new infections, also with different concentrations of silver in group B as opposed to group C. This may be accounted for by the fact that a high silver content is suitable for wounds showing evidence of infection, whereas it is sufficient to use dressings with lower silver content for wounds which are contaminated only. Moreover, hydrofiber dressings, by increasing their volumes when in contact with exudate, take a shape that fits to the bottom perfectly and totally remove the dead spaces which might be the seat of accumulation of discharge and of pabulum for bacterial growth. We believe that during the healing process, reactivated by debridement and by the control of the infection, a new rise in bacterial load might compromise the tissue repair again. Careful management of the ulcerative wound is therefore necessary in order to prevent a likely infection.

Riassunto

Lo scopo del nostro studio è stato quello di valutare l'utilità delle medicazioni a base di Ag nella fase di guarigione delle ulcere dopo debridement chirurgico, momento in cui una reinfezione potrebbe compromettere nuovamente il processo di riparazione tessutale.
A tale scopo sono stati arruolati 34 pz e inseriti nello studio solo i 30 pz che mostravano una ferita senza segni di infezione, con assenza di detriti tissutali e con tessuto di granulazione ben rappresentato; i pazienti sono stati poi divisi in 3 gruppi da 10, omogenei per patologia e dimensione dell'ulcera, sottoposti a debridement chirurgico e terapia antibiotica fino ad ottenere un controllo stabile dell'infezione e la ripresa dei processi di cicatrizzazione.
In 10 pz (gruppo A - gruppo di controllo) sono state adoperate medicazioni di copertura della ferita, gli altri due gruppi sono stati trattati rispettivamente con medicazioni a base di idrofibra a basso contenuto di Ag che non veniva rilasciato sul fondo della ferita (gruppo B) e medicazioni ad alto contenuto di Ag rilasciato sul fondo dell'ulcera (gruppo C).
Sono stati effettuati prelievi con agoaspirato per l'esame colturale in tre momenti successivi: un primo prelievo al tempo zero, ovvero dopo 3 giorni dal debridement chirurgico, al termine dell'antibioticoterapia prima di eseguire manovre di detersione e antisepsi; un secondo prelievo dopo due settimane e un terzo prelievo dopo 1 mese.
Nel "gruppo A" cinque ferite hanno mostrato segni di colonizzazione critica dopo 2 settimane e due di queste dopo 1 mese hanno mostrato segni evidenti di infezione senza progressione verso la guarigione, pertanto è stata iniziata una terapia antibiotica mirata. Nel "gruppo B" e nel "gruppo C" nessuna ferita ha mostrato segni di infezione e in tutte sono stati riscontrati segni di progressione verso la guarigione senza evidenti differenze tra i due gruppi pur essendo state utilizzate medicazioni con differente contenuto di Ag.
Il nostro studio ha portato alla luce la capacità delle medicazioni all'Ag di prevenire reinfezioni delle ferite dopo debridement chirurgico ed è stato dimostrato che in presenza di ferite contaminate, ma senza evidenti segni di infezione, è sufficiente l'uso di medicazioni a basso contenuto di Ag.

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