Use of Polyhexanidine in Treating Chronic Wounds

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Chronic wounds have a long period of healing, being impeded by numerous factors, as infections. Polyhexanidine is a new broad spectrum antiseptic with non-toxic action which is used lately in wound cleaning solutions. A case control study was realized with two groups of patients treated with silver sulfadiazine and with polyhexanidine, the last group having an accelerated healing evolution. Besides the bactericidal action, polyhexanidine has also no cytotoxicity, good tolerability and anti-inflammatory properties.

Keywords: polihexanidine, sulfodiazine, cytotoxicity, anti-inflammatory

Experimental part

A case control series of ten patients with chronic wounds were treated in the Plastic Surgery Department of Emergency Clinical Hospital Prof. Dr. Agrippa Ionescu over a six month period. Inclusion criteria were chronic wounds of diabetic or vascular etiology older than 3 months. Exclusion criteria were uncontrolled glycemia, pregnant women and hemoglobin value less than 12mg/dL.

The patients were divided in two groups, of five patients each. In one group the patients' wounds were treated with polihexanidine and in the other group, considered a control group, with usual local therapies.

At admission usual blood tests and bacterial wound cultures were realized. In the polyhexanidine group, patient's wounds were cleaned daily with 0.1% polyhexanidine and in the other group, with usual local therapies.

Results and discussions

At admission all wound cultures were positive, the most common bacteria being Staphylococcus aureus in 6 out of 10 cases, in 3 of the cases being meticillin resistant (MRSA). Other encountered bacteria were: Escherichia coli, Enterococcus faecalis, Enterococcus faecium, Proteus mirabilis and Pseudomonas aeruginosa. After one week of cleaning and dressing with polihexanidine, in 4 out of 5...
patients the wound cultures become sterile and no systemic antibiotic was necessary compared with the control group where antibiogram was still positive in all patients and systemic antifungal treatment was started.

The polyhexanidine dressing provided also a moist environment promoting wound healing. Wounds started to epithelise from the periphery after one week, and a pink granulation appeared after 10 days. The patients have been skin grafted one week earlier comparing with the control group.

Polyhexanidine dressing also treated with Polyhexanidine

Polyhexanidine is a commonly used antiseptic and bactericidal, and can be used in wound cleansing solutions at concentrations of 0.1, 0.02 and 0.04 % [12]. Another application form is the 0.04% concentration gel that is used in wound dressings. This polymer has a lot of properties: broad antibacterial spectrum, sustained antiseptic effect, no effect in lipids from the human cell membrane with no cytotoxicity, biofilm reduction, good tolerability with no known toxic risks and anti-inflammatory properties [12].

Regarding its chemical properties polyhexanidine has hydrophilic biguanide residues and hydrophobic hexamethylene spacers, being soluble in water and poor soluble in lipids [13]. The antibacterial actions have been studied; polyhexanide disorganizes the microbes’ cytoplasmic membrane, increases its permeability and is absorbed in the bacterial cell, finally causing cell death [5]. This antimicrobial property increases by combing small oligomers (n=4) that start the cell wall disintegration and permit a more easily passing into the cell of large oligomers (n=35) [13].

Polyhexanide acts also on gram negative and gram positive bacteria having a natural affinity for their envelopes by replacing the cations that stabilize their membrane [14].

Apart from the local colonization, bacteria create also a natural habitat with a matrix made of biopolymers and polysaccharides that realize a shield from biocides and host defense mechanisms [15]. One of the main opportunistic pathogens that create this biofilm are staphylococcus aureus and pseudomonas aeruginosa, being also responsible for transition in a chronic wound [16]. Polyhexanidine has been demonstrated that reduces this biofilm by binding of the matrix polysaccharides, accumulating in the matrix and making it toxic for the resident bacteria [13].

This biocide has been considered one of the strongest antiseptic, being effective on gram negative bacteria, gram positive bacteria, fungi (Candida albicans, Aspergillus niger), protozoa pathogens (acanthamoeba spp) and even HIV virus [13].

Polyhexanidine has also a non-toxic profile, superior to other antiseptics and also a safety margin greater than the used antibiotics. Also, until present there is no known development of bacterial resistance, probably due to its heterogeneity [12].

Conclusions

Polyhexanidine is a broad spectrum antimicrobial substance used in treating colonized or infected chronic wound having a good impact on multidrug resistant bacteria. Having the ability to act on bacterial membrane and biofilm matrix prevents the development of bacteria resistance.

Contrast to other antiseptic agents that have poor tissue tolerability and decrease healing, polyhexanidine has a low risk profile, a good tissue tolerability creating a moist environment that promotes wound healing.

Today, polyhexanidine is an accepted substance for reducing bacterial load in infected acute and chronic wounds, but is not the only therapy option. Surgical debridement and treatment of the underlying disease remains still the first priority.

References

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