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Mini Review

Wounds in Pediatric Age: Practical Approach of Extravasation, Surgical Wound, Pressure Ulcer and Burns

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Abstract

Wounds in pediatric age are cause by injury due to extravasation, surgical wounds, pressure ulcers, burns - chemical and thermal injuries, among others causes.

The objective of the treatment is clean the wound with reduction of microbial load, removal of organic/inorganic waste and facilitation of healing.

We can use antiseptics but they all have side effects and usage must be with very careful.

Polyhexanide and Betaine association is a product that cause fibrin reduction, is safe, reduce pain, can control infection, don't interference with the growth of the granulation tissue and reduce the time of treatment.

When we use a wound dressing, we remove excess moisture, be impervious to bacteria, maintain temperature, allow gas exchanges, no toxic particulates or contaminants and when we remove the dressing need to be not traumatic.

Keywords: *Wounds; Pediatric Age; Practical Approach*

When we are talking about wounds, pediatric population is a very sensitive group. At this age the skin is susceptible to get more scars and secondary complications.

Common etiologies of pediatric wounds are: injury due to extravasation, surgical wounds, pressure ulcers, burns - chemical and thermal injuries, among others causes [1].

Extravasation: Extravasation is secondary of inadvertent leakage of vesicle/cytotoxic fluid from a vein/catheter into the surrounding tissue. Most of the lesions are in premature babies less than 26 week of gestational age. This skin necrosis happened in 40 - 60% of cases. The most frequent side is back of the hand, lateral side of the foot and head. The risk factors are thinner veins, venous fragility, thin epidermis and reduced subcutaneous tissue. Extravasation may result in severe injury: necrosis, flictena and severe damage to surrounding structures (compartment syndrome). There are some drugs that can cause extravasation: hyperosmolar solutions like Total Parenteral Nutrition (TPN), hypertonic glucose, hypertonic saline solution; calcium, potassium; vasopressors (dopamine, dobutamine, norepinephrine, epinephrine); mannitol; digoxin; aminophylline; phenytoin; vancomycin; thiopental. The treatment consist of stop the infusion and give a flush of normal saline [1].

Surgical wound: Surgical wound is important to check if the wound is closed by 1st or 2nd intention, the presence of drains and complications. If is a 1st intention wound, edges close very quickly and after 48 hours don't let bacteria to enter. If is a 2nd intention wound, edges are separate, the wound is left open to heal. Most of the complications are: bleeding, infection, dehiscence, formation of fistulas. Regular monitoring of surgical wounds is essential for early detection of complications and early treatment [1,2].

Pressure ulcer: This problem is less in pediatric age, around 5% in children in intensive care unit. The lesions are more frequent in the occipital region, in the sacrum region and in the feet. There are 4 categories of pressure ulcer (Table 1). The risks factors are: prematurity, change of perfusion, mechanical ventilation, change in nutritional stage, loss of mobility, motor problems, drugs that may change blood flow to the skin, urinary and fecal incontinence, internal care admission. Patients in wheelchairs should use a mirror to inspect areas they cannot see or have someone inspect them. Pressure relief, especially in bony prominences, is the main measure in preventing the onset of pressure ulcer. Efforts should focus on redistributing pressure to the skin either by repositioning or by using pressure relief devices. Do not use adult mattresses in pediatric patients, cushions or donuts, since they concentrate the pressure in the surrounding areas and avoid massaging flushed skin because may increase the damage to the already damaged tissue [3,4].

Burns: Burns scald injuries represent 40 - 50% of burns, with a higher incidence in young children (0 - 2 years). Burns resulting from contact with flame, matches, gasoline, fireworks and aerosols continue to occur in the age group from 6 to 14 years. It mainly damages the skin (tissue destruction and coagulation of blood vessels). Burn can be classified in 3 types: 1- Surface Burns/1st Degree upper layers of the affected epithelium; intact basal layer (typical of sunburn, dry, hot, painful and hypersensitive). 2A- Superficial burns of the dermis/2nd Degree superficial extend beyond the epidermis to the upper layers of the dermis; usually very flushed, painful and associated with blistering. 2B - Deep Burn of the Dermis/Deep 2nd Degree extends to the deeper layers of the dermis and may involve hair follicles or sweat glands; dry, white and with reduced sensitivity. 3- Full thickness/3rd degree burns, complete destruction of the epidermis and dermis; the lesion extends to the subcuticular layer; may involve muscle and bone; absence of sensitivity (not painful), appearance of "leather". Water reposition and monitoring is of extreme importance!! Surveillance of the injury in the following 24 hours in case of discharge after an accident!!! The use of splints to prevent contractures are useful accessories in burned children; are usually placed at the 1st sign of contraction of the skin. In the acute phase, the head should be positioned in hyperextension (be careful not to allow the mouth to be open) and do not use cushions. For treatment we can use hydrogel, silicone dressings, biosynthetic dressings or antimicrobial dressings. The results are better than sulfadiazine [5].

Local treatment: The goal is clean the wound with reduction of microbial load, removal of organic/inorganic waste and facilitation of healing. We can use debridement of the wound and remove necrotic tissues. Can be autolytic using hydrogel, maltodextrin or polyacrylate with Ringer's solution. Can be enzymatic or by surgery. Can be chemical using Dakin solution. The debridement can be biological with the use of larvae, with special appetite for devitalized tissue.

We can use antiseptics but they all have side effects and usage must be with very careful: Hypochlorite (Table 2), hydrogen peroxide (H_2O_2) (Table 3), iodopovidone (Table 4), chlorhexidine (Table 5) and cetrimide (Table 6).

Categories	Description
I	Non-bleachable erythema on intact skin
II	Partial loss of skin or flictena
III	Total loss of skin thickness (visible subcutaneous tissue)
IV	Total loss of tissue thickness (visible muscles and bones)

Table 1: Classification of pressures ulcers.

Action	Side effect
Gram + and Gram -	Cellular toxicity
Some spores and viruses	Reduction of capillary perfusion
	Toxic to granulation tissue
	Prolongs the inflammatory response
	Skin irritation, pain and discomfort
	Localized edema

Table 2: Hypochlorite.

Action	Side effect
Cleaning Mechanics	Fibroblasts Toxicity
Effective on anaerobic bacteria	Embolisms in irrigations in cavities
Removal of contaminating substances	Short half-life
	Contact pain
	Irritation of surrounding skin

Table 3: Hydrogen peroxide (H_2O_2).

Action	Side effect
Effective in Gram + and Gram -	Inhibits healing
Fungus	Iodine reabsorption
Some virus	May increase the likelihood of infection in contaminated wounds

Table 4: Iodopovidone.

Action	Side effect
Gram + and Gram -	Cell toxicity
	Skin irritation, pain and discomfort
	Cumulative effect
	Mutagenic effect

Table 5: Chlorhexidine.

Action	Side effect
Detergent	Fibroblasts toxicity
	Skin irritation and tenderness
	Easy contamination with bacteria

Table 6: Cetrimide.

Nowadays, we have a product with Polyhexanide and Betaine. This association cause fibrin reduction, is safe, reduce pain, can control infection, don't interference with the growth of the granulation tissue and reduce the time of treatment.

We use this combination in 50 patients with different kind of wounds and we found they inhibited bacterial colonization and reduced the need for antimicrobial usage in 90% of cases.

We have also other treatments like compression therapy, hyperbaric oxygen therapy, ultra sounds, low intensity laser therapy, ultra violet, growth factors, skin replacements, honey among some of the new technologies applications.

The important thing is to always use common sense based on scientific knowledge when we choose the treatment. One treatment that is good for one patient, doesn't mean that is indicate or enough for other patient.

When we use a wound dressing, we remove excess moisture, be impervious to bacteria, maintain temperature, allow gas exchanges, no toxic particulates or contaminants and when we remove the dressing need to be not traumatic [6-8].

Conclusion

Wounds in pediatric age are cause by injury due to extravasation, surgical wounds, pressure ulcers, burns - chemical and thermal injuries, among others causes. Antiseptics are not a good treatment choice. Polyhexanide and Betaine association, in our experience reduced the need for antimicrobial usage in 90% of cases.

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