

Studies on manufacturing of pajamas for patients with extensive burn surfaces

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Abstract. Paper carries out the manufacturing of pajamas made of different knitting structures. One emphasized on criteria necessary to fulfill the medical requirements according with patient critical condition. Considering burns wounds of 3rd degree one has in view the need of thermal insulation (the remaining skin surface does not cover up the ability of thermal insulation and patient is confronted with hypothermia), keeping sepsis condition liquid feeding and a specific pharmacodynamics therapy. The paper has in view two lines one is to obtain a pajamas based on high comfort for hyper sensitized and damaged skin made by means of specific knitting systems and secondly to promote on inner surface of pajamas a specific biomaterial able to speed up healing and fast recovery of burn wound. There presented detailed on progress research obtained on a specific biomaterial and on main lines to obtaining a clothing system able to promote a medical therapy.

1. General background

The state of a patient with deep burns is critical and there is enough room in the therapy field for improvement and innovation. Clinicians consider that the main elements to influence the patient evolution are the depth and surface of the lesions, the sepsis and the promptness of medical intervention. The ideal textile cloth specific for a patient with burns, has to meet the following requirements:

- i) the main biological systems of the body are severely damaged;
- ii) the pain associated with burn injuries is so high that an optimal function of the nervous sistem cannot be maintained;
- iii) the absence of skin barrier allows continuous heat loss leading to an unbalanced methabolysme caused by hypothermia;
- iv) the body loses a significant volume of liquids and proteins (electrolytes, enzymes, blood, lymph, etc) whith a marked effect the cells methabolysme, on the circulatory and excretory systems;
- v) the protective function of skin against patogen agents is damaged, the wound becoming a large gate for bacterias; on the other hand, the excretory function of the teguments is altered and body toxins are not anymore neutralised; there is a huge pathogenic agresion towards the whole body and the patient is not able to fight against it;
- vi) because of the severe changes, the functions of the nervous sistem are near colapse.

Under these circumstances the clinician needs to form a strategy that covers all the demands of the patient.



2. Principles of treatment for burn injuries

The treatment of patients with burns is complex, with two main complementary aspects: general and local. The burn injury is defined by a continuous evolution, mainly during the first 72 hours after the incident, with a high risk of extension, in both surface and depth. A correct fluid resuscitation is decisive in the further evolution of the wounds.

The surgical treatment of a burn injury depends on the general status of the patient and the local aspect of the wound.

For the superficial lesions, with good resources for spontaneous regeneration, conservative treatment is indicated. Clinical studies stated that a correct fluid resuscitation and the maintenance of a moist medium around the wound, can limit the aggravation of the local injury. The use of ointments on the burned surface has the following purposes: to calm the continuous pain, to hydrate the tissues, to stimulate the desquamation and to optimally control the bacterial colonisation (density and composition). The most painful moment of the day for a burned patient is the bandage replacement. Any applicable solution that can minimize the pain (special gauzes with lipids or oils to avoid the adherence to the wounds, not painful ointments) are useful. On the same note, any substance that stimulates the skin regeneration is welcome (skin growth factor, vitamins). Chemical substances with antiseptic properties, but not aggressive towards the fragile newly formed skin layer, are very useful in the fight against bacteria (silver, iodine)[1-4]. The pH of the wound is very important, too and can be influenced by substances added to the bandage.



Figure 1. Second degree burn on the thigh (first day)



Figure 2. Conservative local treatment

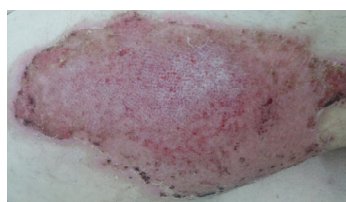


Figure 3. Same injury ,complete healing (day 20)

The ideal approach for the deep wounds is: early excision and grafting. This option is not always available, mainly when the burned area occupies more than 20% of the body surface. There are many advantages of early excision of the damaged skin layers in deep burns (within the first 3 to 5 days after burn injury): less bacterial contamination of the tissues, functional dermal vascular network, less bleeding after excision. For circumferential deep burns with limbs localisation, this technique manages to avoid the compartment syndrome. Early excision and grafting will always guarantee the rapid wound healing and will avoid general complications and death.



Figure 4. Deep burn injury (day 1)



Figure 5. Early excision



Figure 6. Early grafting

The grafted area and the donor zones (surfaces where grafts are harvested from) have particular bandage requirements. Within the first 5 postoperative days, the grafts need to be covered with nonadherent gauzes (grasolind) and moist, compressive bandages. The donor zones, with active, dermal bleeding, need special haemostatic gauzes. The mobile segments of the body (as hand and fingers) need bandages that allow all the active movements, in order to avoid complications like muscular atrophy and joints blockage [5-8]. The burned patient usually presents areas with different types of injuries, so a special bandage or „pajamas” destined to cover the body surface has to meet the varied requirements corresponding to each lesion and to offer thermal protection.

3. Textile solutions to improve the condition of a patient with burn wounds

To build up a garment able to be worn on wound is a sensible task but in the near future textile garment will provide a solution for some acutely requirements necessary to accomplish in the therapy of skin damaged by burn. Our research still in progress has to solve obtaining of a garment in the shape of pajamas made by a blouse and trousers in a new concept.

According with our design the blouse and trousers has to be performed under the following general shape illustrated in figure 7 shown below.

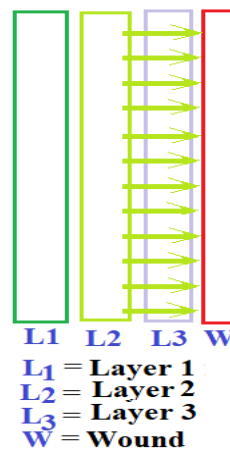


Figure 7. Principle outline of a pajamas fabric

The general concept of a pajamas is made by three layers: L1, L2, and L3. The pajamas fabric covers the whole surface of body skin and on the wound location the structure is shown in the figure 1 from above. The pajamas is customised according with disposal the wound location. The garments has to be ready in a proper period of time to assist the skin damaged. The three layers are ready before the patient entrance in clinic. The clinician provides information on the map and surface of wound skin in an electronic shape to textile company. By using a specific software the company already knows the dimensions and the way of linked different parts in the structure shown in figure 7.

Type of fabric inserted in each layer is the result of the research still in progress. But layer 1 is an polyester woven structure; the layer 2 is a knitted structure and layer 3 is a nonwoven fabric.

4. Conclusions

The goal of research is to help the work of surgery tasks and to ameliorate the patient comfort. The main lines exposed have to be obtaining by some reasonable textile solutions. On the other hand a tendency consider the need of customisation the main parameters according with specific aspects of each patient and if the cost of such pajamas. Up to now we have to determine the criteria which have much influence on obtaining an even diffusion of both drug and solution which need more accuracy. The research is in progress.

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