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DECLARATION OF ACCURACY AND PRECISION

Re: Tranlation from Portuguese

Article by Cabral et al., "Biologic Dressing in the treatment of the severely burned patient" - Case Report

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This declaration certifies the accuracy and precision of the translation from Portuguese into English of the above material and is an accurate reflection of the text as it appeared in Portuguese.

For the translator:

Translator

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Date

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BIOLOGIC DRESSING IN THE TREATMENT OF THE SEVERELY BURNED PATIENT. CASE REPORT

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SUMMARY

It is described a case of severe burn treated with a temporary skin substitute (BIOFILL). The covering protected the epithelium until its recovery, shortened the healing period, reduced the pain, lessened protein losses and reduced contamination.

KEY WORDS: biologic dressing; skin substitute; cellulose graft

The elevated metabolic rate observed in victims of burns (over 50% of the body surface) is greater than any other form of trauma or severe septicemia.[1,2] Therefore, the severely burned patient has particular characteristics. His treatment is delayed, painful for the one who receives it, onerous for the one who pays for it and laborious for the one who performs it.

They constitute, therefore, a socioeconomic problem that is difficult to solve in whatever type of group where they occur.[3]

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The priority in the treatment of such extensive lesions is to seek to modify the accelerated rate of tissue destruction. This has been achieved by means of adequate nutritional support, prevention of infection in the burned area and other areas, and by means of rapid covering of the injured area.

These measures are responsible for the improvement in survival of burned patients in these last 15 years.[4,5]

Case report

Male patient, yellow, 63 years of age, smoker of three packs of cigarettes/day and not having other associated pathologies, was entered onto our service with a [clinical] picture of extensive burn, 24 hours after non-specialized treatment. Upon hospital admission, a central venous catheter in the left subclavian vein was installed by the Yoffa technique,[6] bladder probe, anti-tetanus immunization, prophylactic administration of ranitidine, local care and well-controlled fluid replacement, using the Parkland formula[7] for initiating the hydration, adjusting the volume needs according to clinical criteria such as level of consciousness, peripheral perfusion, signs of pulmonary congestion, frequency and amplitude of the pulse, and urinary rate (0.5-1 ml/kg/hour of urine).

The lesions were evaluated, with regard to depth, as superficial, deep and mixed (Sucena, 1973). With regard to extent, we use the rule of the threes (Kirschbaum, 1979) (Table 1). The evaluations were performed in the surgical center under general anesthesia, where we noted the extent and depth of the burned body surface in accordance with Table 2.

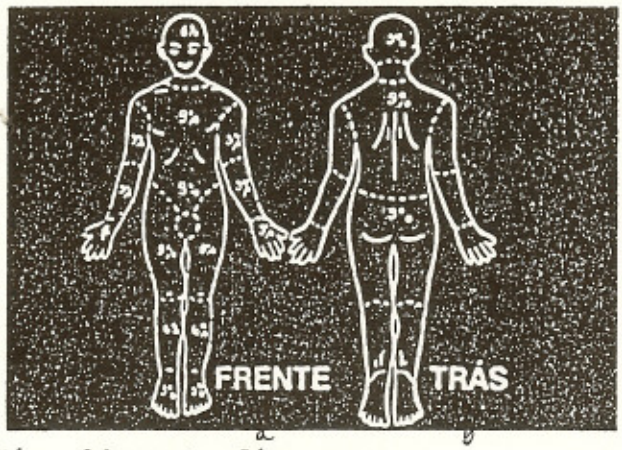


Fig. 1 - *Kirschbaum's diagram*
Key: a) front; b) back

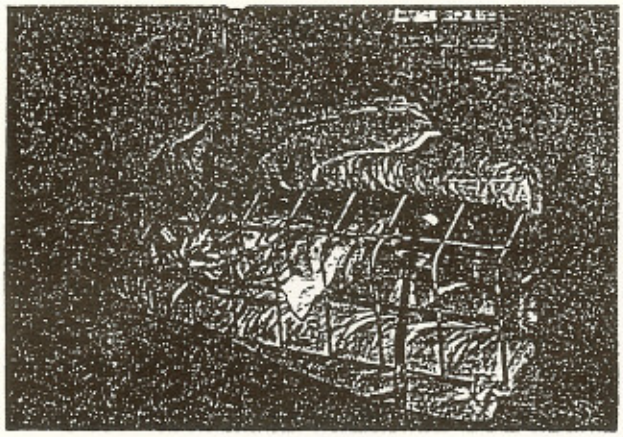


Fig. 2 - *Beginning of treatment with occlusive dressing. Protection arch. Nutritional support already established.*

Patient with 74% burned area, in the body surface, having approximately 15% superficial burns and 59% deep and mixed burns.

The choice of dressing was by the occlusion method (Lesars, 1909), since the patient had circular burns in UL, LL and anterior and posterior thorax.

The initial dressings were performed by the classic methods, local cleaning with 0.9% physiologic serum and topical povidone,[8] morin bandage,[9] cheesecloth, hydrophilic cotton, crepon strip on the lower limbs, upper limbs and thorax; the face and gluteal region were left exposed (Fig. 2).

The antibiotic begun on the other service (cephalothin) was continued until evaluation of possible infectious foci in effect was done; in the absence of such evidence, the antibiotic was discontinued on the 4th day because we do not use prophylactic antibiotics, in accordance with various segments of the literature.[10,11]

During the first days of hospitalization, it was verified that the anorexia and the impossibility of an adequate caloric supply would make administration of nutrients solely by oral route impractical, opting at that time for enteral as well as parenteral nutritional support.[12,13,14]

Nutritional supply was begun on the 3rd day after the accident.[15]

The calculation of the basal energy expenditure (B.E.E.) corrected for activity and the lesion was obtained by means of the Harris Benedict formula[16] modified by Long[17] and determined at about 3,890 kcal in 24 hours.

Table 1 - Extent of the lesions

Head	9	Scalp	3
		Face	6
Neck	1		
Anterior trunk	18	Thorax	9
		Abdomen	9
Posterior trunk	18	Back	9
		Lumbar-gluteal	9
Upper limb	9	Arm	3
		Forearm	3
		Hand	3
Lower limb	18	Thigh	9
		Leg	6
		Foot	3

Table 2 - Extent and depth of the lesions

Head	7	Scalp	1 (S)
		Face	6 (S,I)
Neck	0.5		(S)
Anterior trunk	13.5	Thorax	9 (S)
		Abdomen	4,5 (M)
Posterior trunk	9	Back	4,5 (I)
		Lumbar-gluteal	4,5 (I)
Rt. upper limb	7	Arm	2 (M)
		Forearm	3 (M)
		Hand	2 (M)
Lt. upper limb	8	Arm	3 (M)
		Forearm	3 (M)
		Hand	2 (M)
Rt. lower limb	14	Thigh	7 (I)
		Leg	5 (I)
		Foot	2 (I)
Lt. lower limb	15	Thigh	8 (I)
		Leg	5 (I)
		Foot	2 (I)

S = superficial; I = intermediate; M = mixed

During the first four days of nutritional support, we sought to increase gradually the caloric value until reaching 3,800 kcal in 24 hours.

In the first two days, 2,150 kcal with 64 g of proteins, 322 g of carbohydrates and 68 g of fat were infused. On the third and fourth days of treatment, we increased the caloric value to 3,400 in 24 hours, maintaining the same proportion of ingredients (15% proteins, 55% carbohydrates and 30% fat).

Due to the fact that the patient had a disproportionality between the donor area and the recipient area, and in order for us to decrease the loss of proteins and electrolytes,[18] we opted for

a biologic substitute for human skin, derived from a microfibrillar cellulose film obtained by means of biosynthesis of bacteria in a favorable culture medium. This cellulose film is semitransparent, homogeneous, has selective permeability, preventing the passage of microorganisms, and has an average thickness of 0.05 mm.

The temporary substitute for human skin called BIOFILL was applied in a surgical environment under general anesthesia. After rigorous local asepsis of the entire burned area, placement of BIOFILL over the bloody area similar to laminar-type skin graft was done. In order for us to obtain perfect adherence, we went over it with gauze soaked in physiologic serum, removing in this manner not only air bubbles but also excess exudate and blood (Figs. 3 a-k).

We opted to leave the entire area exposed (Fig. 4), since its adherence is almost immediate, being able to move the patient satisfactorily without the BIOFILL leaving its original position.

Due to the handling of the patient in bed (transport from the surgical center to the room), the BIOFILL ran along the posterior region of the right and left legs (Fig. 5); leaving the patient with the lower limbs exposed, we re-placed the film until it showed satisfactory drying and adherence (Figs. 6 a-b).

On the 10th day of development, the patient had sudden dyspnea, tachycardia, chest x-ray without evidence of pulmonary congestion or infection, but with elevation in the right phrenic eminence; ECG with sinus tachycardia and diffuse alterations in ventricular repolarization, and arterial gas measurement with hypoxia and hyperventilation. A clinical diagnosis of pulmonary embolism was made that, due to technical difficulties, was not confirmed with pulmonary mapping or arteriography.

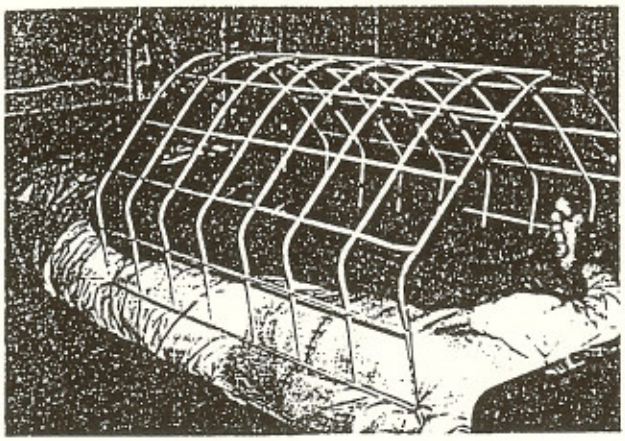


Fig. 4 - *In the room, the dressing is kept exposed under the protection arch.*

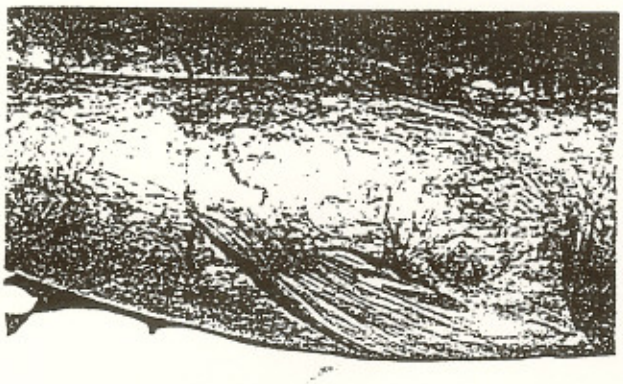
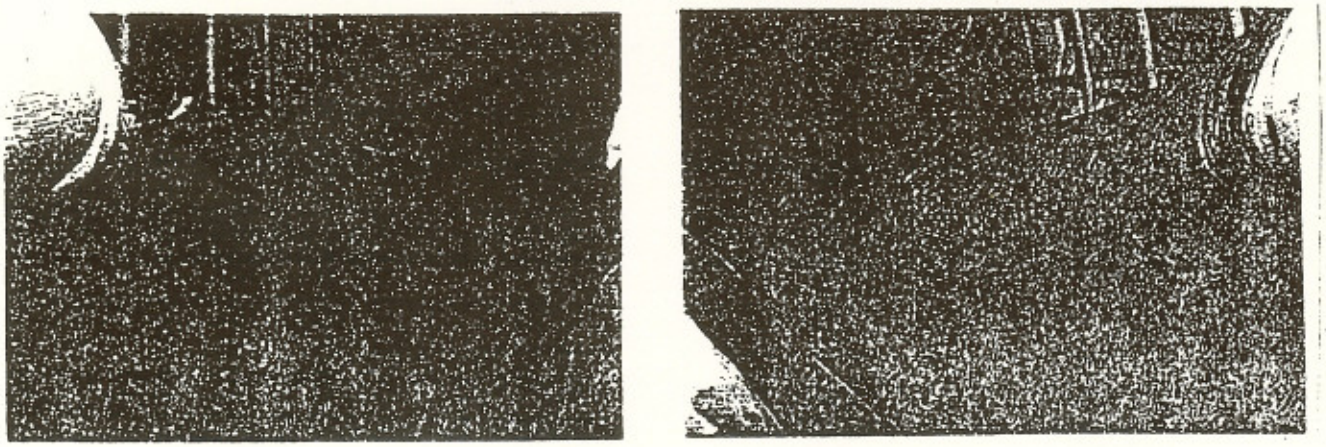


Fig. 5 - *Latero-posterior region of the left leg, where we see the wrinkled appearance.*



Figs. 6A and 6B - *Site of changing of BIOFILL in the posterior region of the leg.*

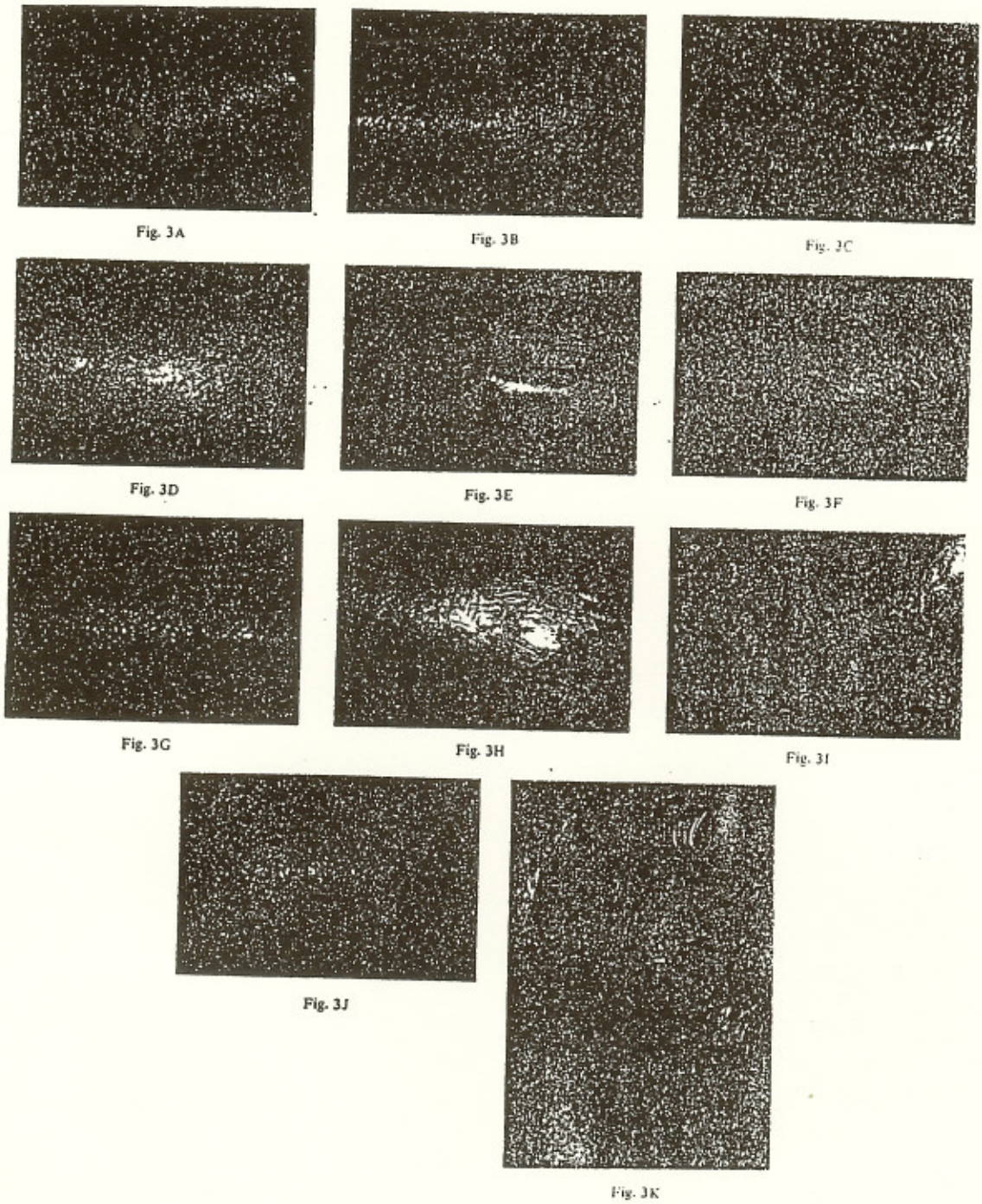


Fig. 3 - *Appearances of the various regions after immediate placement of BIOFILL over the burned areas. 3A - Left and right thigh; 3B - Left leg; 3C - Right thigh; 3D - Right leg; 3E - view of the lower limbs; 3F - Left arm; 3G - Left forearm; 3H - Left hand; 3I - View of the left upper limb; 3J - Right flank; 3K - Area of posterior thorax.*

Heparin 30,000 U IV/day was begun, with APTT control (1.5 - 2 times normal).

On this occasion we chose to change the source of proteins to branched chain amino acids (Fisher's solution).

On the 11th day, the patient began a febrile picture. Material collected for culture of blood, urine, skin and new chest x-ray done, without infectious evidence. On the following day, significant abdominal pain, which evolved on the 13th day with abdominal distension, absent hydro-aerial sounds, fine [thready] and tachycardiac pulse, febrile, depression of the level of consciousness with mental confusion; x-ray of the abdomen showed distended loops, hemogram with leukocytosis and deviated to the left, normal serum amylase and without hydroelectric disturbances. In view of the great technical difficulty of diagnostic investigation due to the extensive burned areas, we chose to change the enteral Dobbhoff probe to a nasogastric probe for efficient gastric drainage, which led to the removal of a large quantity of fluid of stasis; an antibiotic regimen was also begun covering probable abdominal infectious focus (chloramphenicol and amikacin). On the 14th day, the patient had gastric bleeding through the nasogastric probe. Anticoagulation was discontinued, the bleeding stopped in 12 hours, with 500 ml of whole blood being necessary. Anticoagulation attempt made with 30,000 U of subcutaneous heparin per day (divided into three doses), bleeding occurred again. Subcutaneous heparin in prophylactic doses was opted for, until the end of the treatment. The patient developed satisfactorily, with improvements in the abdominal distension, returning in 72 hours to a normal intestinal transit, hemodynamic improvement, complete recovery of consciousness, remaining, however, febrile and with leukocytosis and deviation to the left. Echocardiogram was performed, which did not show vegetation (the change in central venous catheter was performed every 10 days, using guide wire).

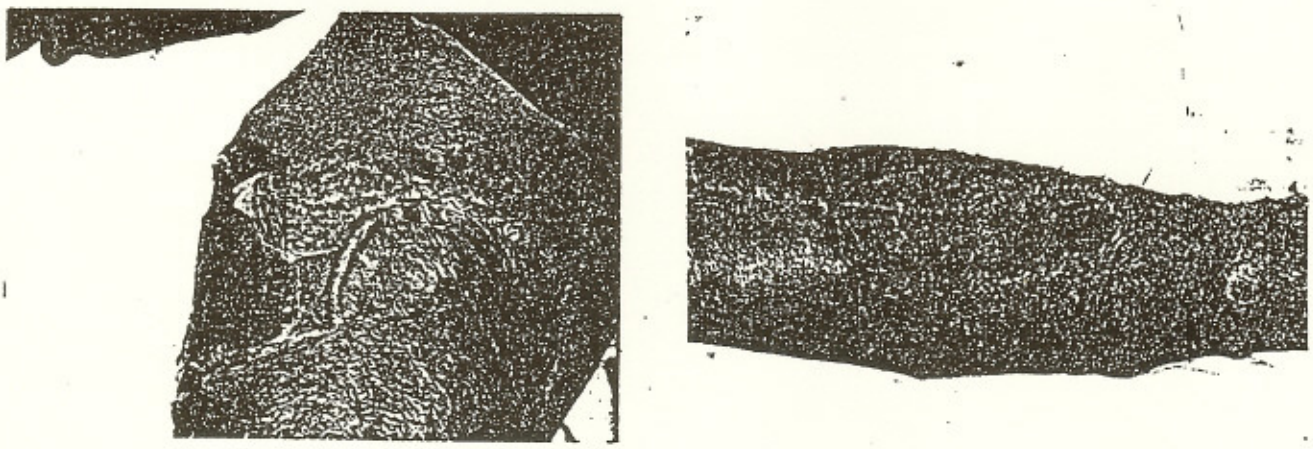
The patient was afebrile only five days later, when carbenicillin was administered to cover *Pseudomonas sp* that,

although not isolated, in our case, is a bacterium commonly implicated in burn.[19]

We noted that BIOFILL underwent drying, causing the film to develop into a thick crust with chestnut brown coloration, as Figs. 7 a-b show.

While evolution into improvement occurred, due to spontaneous re-epithelization (superficial burn) as well as to spontaneous healing (deep burn),[11] BIOFILL loosened from its bed and showed us an epidermis with pink coloring, smooth and brilliant (Fig. 8).

In some areas of the deep burn, BIOFILL was attached until the 25th day, its epithelization being of great fragility in some deeper areas, where we observed small ulcerations in the region of the left forearm due to mechanical trauma (Fig. 9). The subsequent days were accompanied by obvious improvement in the general condition and laboratory normalization; on the 25th day, the patient already had the entire area epithelized (Fig. 10) and on the 26th day, nutritional support was discontinued. Discharged from the hospital on the 37th day of hospitalization.



Figs. 7A and 7B - *Drying of the cellulose film, which developed into a thick crust with chestnut brown coloring.*

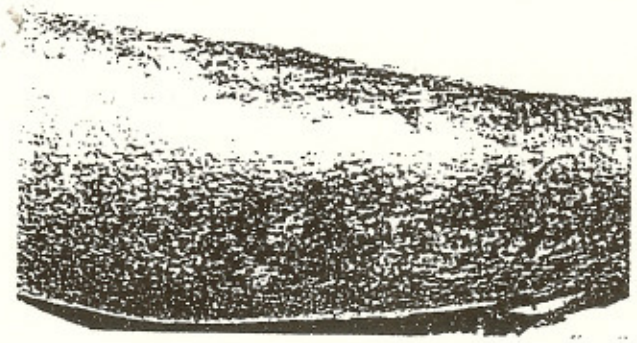


Fig. 8 - *Re-epithelization of pink coloring, smooth and brilliant.*

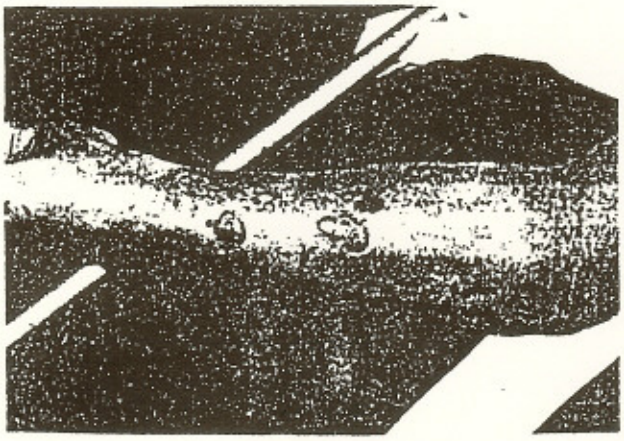


Fig. 9 - *Epithelial fragility in deeper areas.*

Fig. 10A

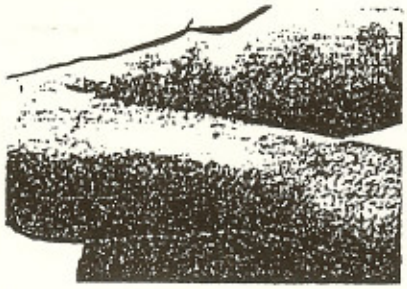


Fig. 10B

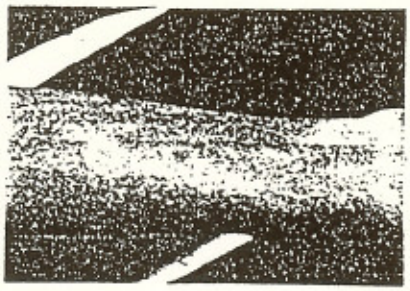


Fig. 10C

Fig. 10D

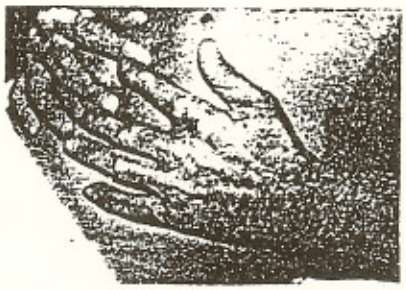


Fig. 10E

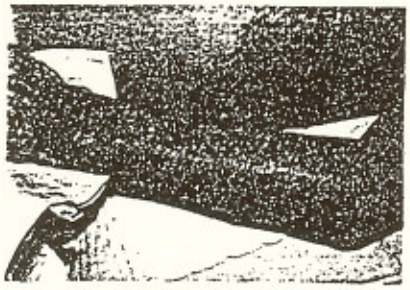


Fig. 10F

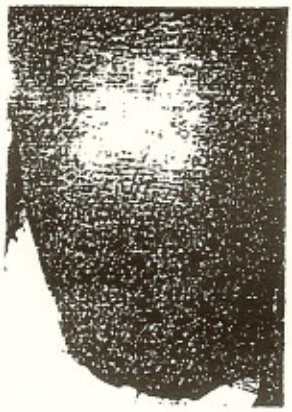


Fig. 10G

Fig. 10 - *A, B C, D. E, F. G - Final appearance of the burned areas after the use of BIOFILL.*

COMMENTARIES AND CONCLUSIONS

It is estimated that 6,000 cm² of skin are necessary to cover 50% of burned body area of an adult; skin grafts remain as primary methods used for coverage of skin losses. In cases in which we do not have donor areas available for satisfactory coverage, where the disproportionality between the donor area and the recipient area is

great, we remain limited to patch or stamp-type grafts and waiting for re-epithelization of these donor areas as sources of skin. Research looking for agents and materials capable of giving definitive coverage for a large burned area continues. The various temporary substitutes for human skin are found to render an extremely useful function, which is to give temporary coverage to the de-epithelized tissue. In our case, we use a temporary substitute for human skin called BIOFILL, with which we obtained good results.

Its first advance is in the conversion of an open and contaminated wound into a closed and clean wound, with the advantage of our being able to observe the burned areas without doing dressing changes.

BIOFILL provided us with very satisfactory temporary coverage. Adherence to the de-epithelized surface made the pain in large part absent, not permitting secondary bacterial invasion and reducing the losses of proteins and electrolytes. The film aids the preparation of the recipient bed, is easy to apply and remove, and re-epithelization is done in less time, shortening in this way the hospitalization time.

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