Comparative Evaluation of Different Dressings for Applications on Transplanted Splitting Perforated Autodermotransplants

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ABSTRACT

Objective: Comparative study of effectiveness of different dressings for application on transplanted split perforated autodermotransplants.

Material and methods: Clinical and laboratory evaluation of autodermoplasty made in 108 patients with deep lesions.

Results: It was revealed that good engraftment and epithelialization of autodermotransplants largely depended on the preparation of recipient bed and creation of optimal conditions for healing through use of dressings, rather than on any additional manipulations. Complications in the form of festering wounds with lysis of the transplanted autodermotransplants most often occurred in application of dressings containing no antibiotics.

Conclusion: Rational treatment tactic of burn wounds after autodermoplasty is proposed.

Keywords: burn wound, dressing, autodermotransplant.

INTRODUCTION

In treatment of full-thickness burns, closure of the wound through surgical intervention remains the only effective way. Here the main method is grafting with free split meshed autodermotransplants. After autodermoplasty, the primary goal of wound treatment is to create optimal conditions for engraftment without any complications.

For protecting grafted autodermotransplants, dressing application is the most suitable way. The dressing should protect them from drying and infection, ensure uniform pressure, optimize regeneration, possess anti-adhesive activity, be easily and painlessly removed. In addition, such dressings should be easy to use and access.

For application on autodermotransplants, clinicians use wet-to-dry dressings with antiseptic solutions, waterborne and fat-based ointments, as well as various synthetic and biological wound dressings (4-6, 8, 9, 11, 13, 16-19, 21-23, 25).

The **aim** of the study was to compare the effectiveness of different group dressings when applying them on grafted split meshed autodermotransplants.

MATERIAL AND METHODS

The study is based on the analysis of treatment results for 118 patients (26 women and 92 men) with thermal injuries, aged 18-65 (with the average age at 41.4±0.8 years), treated at Department of thermal injuries, wound and wound infection, Burns Centers at A.V.Vishnevsky Institute of Surgery and State Hospital 36, Moscow. Most observed injuries (70.3%) were caused

by flame. The total affected area made from 5 to 50% of the body surface (in average 25.3±1.1%), with full-thickness burns covering from 1 to 40% of the body surface (in average 11.4±0.7%). All the patients with full-thickness burns underwent tangential escharotomy of pathological granulations followed by autodermoplasty of the wounds on 1-15% of the body surface (in average 6.4±0.7%). Dissection of 0.3-0.4 mm thick split transplants was performed with electrodermatomes. They were processed through the skin mesher with 1:4 expansion ratios. Various dressings were applied to the transplanted skin grafts (Tab. 1).

Table 1

Distribution of the treated patients by groups of dressings used

Group	Dressing	Number of patients
Textile dressings	Gauze dressings with Furacilin solution	25
	Activetex-CHA (with chlorhexidine and hydroxyapatit)	5
Atraumatic dressings	Voskopran	5
	Branolind	5
	Jelonet	5
	Parapran	10
	Urgotul	10
Films	Biodespol-1 (without drugs)	8
	Biodespol-LB (with lidocaine and clorehexidine)	10
Hydrogels	Supresorb X+PHMB (with chlorehexidine and polyhexamethylenbiguanede)	5
Hydrocolloids	Hitoskin-call with epidermial growth factor (EGF)	5
	Hitoskin-call with vascular-endothelial growth factor (VEGF)	5
	Hitoskin-call without medicinal substance(WMS)	5
Synthetic foams (hydrocellular)	Mepilex Transfer	10
Biological dressings from pigskin	Xenoderm	5
Total		118

The contrasted group consisted of the patients treated with Furacilin gauze dressings for the same purpose. The first dressing was applied on the 3^{d}-5^{th} day after the surgery. During the study, all the patients kept on receiving the standard general therapy, including treatment of accompanying pathologies.

The comparative clinical and laboratory evaluation of the dressing effectiveness involved clinical criteria, with the main one being how fast the grafted autodermotransplants healed. We also conducted

a laboratory evaluation, consisting of cytological and microbiological studies. In addition, we studied functional properties of the used dressings, evaluated their safety, acceptability, and patient-friendliness.

The data obtained was processed with the use of standard Excel statistical tools; we calculated the arithmetic average and its standard error. All the data, obtained during the analysis, were systemized in tables.

RESULTS AND DISCUSSION

For application on meshed autodermotransplants, it proved to be the most effective, as well as easiest and cheapest, to use standard **wet-to-dry dressings with Furacilin solution**, with waterborne ointment Levomecol dressings on top to reduce drying. This technique made it possible to leave the dressings on autodermotransplants for five and more days (Fig. 1).

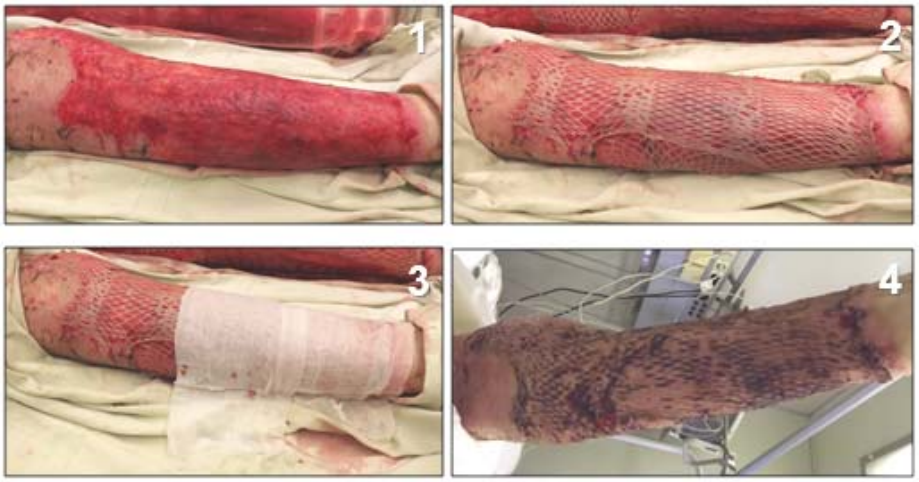

Fig. 1. Use of wet-to-dry dressings with antiseptic solution on autodermotransplants with 1:4 expansion ratio (1- granulating would after surgical treatment, 2- autodermoplasty, 3 - application of dressing, 4- in 9 days after the surgery).

Earlier rebandaging could have led to displacement of non-integrated autodermotransplants, traumatization of newly formed capillaries, capillary trophic insufficiency and formation of hematoma underneath. Festering with areas of partial lysis of transplanted autografts developed in 16% of cases, only. At the same time, in most patients the gauze dressings dried. Removal of such fixed dressings at rebandaging often resulted in traumatizing of the grafted autodermotransplants in the slits. Thus, if there were no fluids, lower layers of the dressings were left on the wound, with only upper ones being changed. The complete epithelialization in the autodermotransplants slits took 10.3±0.4 days, in average, after the surgery.

The use of **atraumatic dressings** for application on autodermotransplants with 1:4 expansion ratio protected the wounds from drying, so rebandaging went without traumatizing. We observed good additional adherence of autodermotransplants on the wound surface when using Branolind, Jelonet,

Urgotul and Parapran dressings. In contrast, Voskopran dressings sometimes failed to adhere and slid over the wound, which caused displacement of autodermotransplants. With all the atraumatic dressings, most patients showed good integration of autodermotransplants and epithelialization in the graft slits in 3-5 days after the surgery (Fig. 2).

Fig. 2. Use of atraumatic 'netlike' dressings on split autodermotransplants (1 – autodermoplasty, 2- application of Urgotul dressings, 3 – in 5 days after the surgery).

However, despite the meshing in atraumatic dressings, we observed local accumulation of traumatic discharge and its festering. All cases of autodermotransplants festering under atraumatic dressings were caused by persistence of hospital strains *S.aureus* and *P.aeruginosa*, as well as the superinfection *Ent.faecalis*. During subsequent bandaging, the use of atraumatic dressings in those patients led to partial autodermotransplants lysis, especially with Voskopran and Parapran dressings (Table 2).

Table 2

Comparative evaluation of dressing's effectiveness for application on autodermotransplants

Parameters	Branolind	Jelonet	Voskopran	Parap[ran	Urgotul
Number of patients in the group	5	5	5	10	10
Effluent accumulation, %	20	20	40	30	30
Frequency of festering with partial lysis of grafted autodermotransplants, %	20	20	40	30	20
Traumatization of autodermotransplants	-	-	-	+/-	-
Period of epithelialization of autodermotransplants with skin cover 1:4 without lysis areas, days	8.6±1.1	9±0.7	9.2±0.8	9.1±0.6	8.3±1

In average, the periods of epithelialization of autodermotransplants with the use of atraumatic dressings were 1-2 days shorter that with gauze dressings with Furacilin solution, and Urgotul and Branolind dressings proved to be particularly effective.

The application of **film dressings** (Biodespol and Biodespol-MS) on autodermotransplants protected the latter from drying and promoted epithelialization, thus resulting in reliably shorter periods of wound healing in comparison with gauze dressings with Furacilin solution (Table 3). However, the frequency of festering and wound autolysis under the films limited their use. At the same time, festering was less frequent under the use of dressings with chlorehexidine (Biodespol-MS).

Table 3

Comparative evaluation of dressings for application on autodermotransplants

Parameter	Biodespol-1	Biodespol-MS
Frequency of festering with partial lysis of grafted autodermotransplants, %	25	20
Period of epithelialization of autodermotransplants with skin cover 1:4, days	7±0.5	7.1±0.9

Hydrogel dressings Suprasorb X+PHMB was also placed right at the surgery on grafted split autodermotransplants with 1:4 expansion ratio, which provided their additional fixation on the wound surface. No festering cases of grafted ADT were revealed. Most observations showed drying and firm fixation of the dressings on the wound. Dry covers provided good engraftment of autodermotransplants and extensive epithelialization in the slits. However, endeavors to remove them, even after soaking, resulted in the graft traumatization, so the dressings were left on the wound until the complete epitelialization, when they detached from the wound on their own. The period of full epitelialization of grafted autodermotransplants with 1:4 expansion ratio averaged to 8.2±0.4 days after the surgery.

In some patients, the use of Hitoskin-call **hydrocolloid dressings** on split autodermotransplants was accompanied by their drying and firm fixation on the wound. Under dry covers, there was good healing of autodermotransplants and their extensive epitelialization in the slits, especially with the use of EGF (epidermal growth factor) dressings (Table 4). However, endeavors to remove the fixed dressings, even after soaking, resulted in the graft traumatization, so the dressings were left on the wound until the complete epitelialization, when they detached from the wound on their own.

Table 4

Comparative evaluation of different Hitoskin-call dressings effectiveness for application on autodermotransplants

Parameter	VEGF	EGF	WMS
Frequency of festering with partial lysis of grafted autodermotransplants, %	60	20	20
Period of epithelialization of meshed autodermotransplants with skin cover 1:4, days after surgery	12.2±1.2	9±1.2	11.6±1.4

At the same time, some patients, treated with the use of Hitoskin-call dressings on the grafted meshed autodermotransplants, developed hypergranulations, increase of traumatic discharge under the dressings, which was of festering nature and resulted in the autodermotransplants lysis. The occurrence of complications was the highest with the use of Hitoskin-call dressings with VEGF, which took the healing more time.

It should be noted that when hydrogel and hydrocolloid dressings were used for application on autodermotransplants located at side and lower surfaces of the body, we observed 'sliding' of the dressings put, which required their additional fixation with gauze bandages. In addition, they were uncomfortable to use in the complex-configuration areas (fingers and toes, joints), also due to the problems with fixing.

With the use of **Mepilex Transfer foam dressings** for application on meshed autodermotransplants, the period of epithelialization was shorter than that in the group treated with gauze dressings. However, in some patients, endeavors to remove the fixed dressings, even after soaking, resulted in the graft traumatization; in 20% of the cases, certain body areas developed festering and lysis of the grafted autodermotransplants (Table 5).

With the use of **textile dressings Activetex-CHA**, containing hydroxyapatit as a reparation promoter, we observed accumulation of traumatic discharge under the dressings and traumatization of the integrated autodermotransplants at rebandaging. At the same time, the period of epithelialization was not shorter than that in the group treated with wet-to-dry dressings with antiseptic solutions (Table 5).

The use of **Xenoderm biological covers** for application on split autodermotransplants was also accompanied by accumulation of traumatic discharge underneath. In 40% of the cases, at the first rebandaging, we found festering and partial lysis of the autodermotransplants under Xenoderm, which was not observed in the contrasted group (Table 5). However, the wound epitelialization period after engraftment was approximately the same.

Therefore, the study did not show additional impact of using different dressings on epitelialization of grafted autodermotransplants. Most often, the complications in the form of wound festering with lysis of the grafted autofermotransplants occurred with the dressings not containing antibacterial medications. This confirmed the published data that during first days skin grafts themselves fail to protect from infection (10, 24), whereas the use of local antiseptics considerably minimizes the number of lyses of grafted autodermotransplants in burn patients (26). This justified the prescription of local antibacterial medications for treatment and prevention. Taking into consideration our previous research data (2), which showed that poly-resistant strains *S.aureus* (37.93% of the cases) and *P.aeruginosa* (27.59%) were the dominant microorganisms responsible for local infectious complications after surgery in burn patients, with others affecting significantly rarer - *S.epidermidis* (10.34%), Gram-positive rods (8.05%), *Acinetobacter spp*. (4.6%), *Candida* gender fungi (4.6%) and other microorganisms (6.85%), as well as the data of studying the microbiological activity of locally applied antimicrobal preparations (3), it is recommended, for application on meshed autodermotransplants, to use dressings with antiseptic solutions, which eliminate the majority of potential infectious agents (for example, Prontosan), unlike Furacilin solution, which is effective against Gram-positive microorganisms, only. At the same time, it is not recommended to use iodium pyron, chlorehexidine and dioxidine solutions for the same purpose, since, according to the published data (2, 20), they are cytotoxic and may affect regeneration negatively.

The analysis of the evaluation results for different dressing effectiveness for application on grafted meshed autodermotransplants showed that all of them are almost identical clinically (Table 5). The epitelialization period was the shortest with the use of dressings creating moist wound environment. However, their effectiveness was neutralized by accumulation of effluent under dressings, and the risk of festering and partial lysis of autodermotransplants (in 20 to 40% of the cases).

Table 5

Comparative evaluation of clinical effectiveness of dressings for application on meshed autodermotransplants

Parameters	Atraumatic 'netlike' dressings	Biodespol films	Hydrogel dressings	Hydrocolloid dressings	Synthetic foams (Mepilex)	Biological cover Xenoderm	Activetex textile dressings	Gauze dressings with Furacilin solution
Effluent accumulation	28.6%	33.3%	20%	35%	30%	40%	20%	20%
Frequency of festering with partial lysis of grafted autodermotransplants	25.7%	22.2%	20%	25%	20%	40%	20%	16%
Traumatization of autodermotransplants	-	-	++	-	+/-	-	+	+
Period of epithelialization of autodermotransplants with skin cover 1:4 (without lysis areas), days	9±0.4	7±0.3*	8.2±0.4*	10.8±0.8	8.7±0.4*	9.8±1	11.8±0.6	10.3±0.4

* $p<0.05$ — in contrast with gauze dressings with Levomecol ointment.

It is obvious that after grafting of split meshed autodermotransplants, the wounds in their slits are still in the 2nd stage of the wound process; given those conditions, it is effective to use the moist method of local treatment, which creates the wound environment optimal for healing. However, in 3-5 days after surgery, i.e. transfer to the 3d stage of the wound process, it is recommended to continue treatment with the dry method, which protects the wound from infections and supports the newly-formed epithelium. Otherwise, the continuing moist environment promotes inflammation, results in excessive wound effluent discharge, secondary infection and autolysis of the healed wound surface.

Taking into consideration the above mentioned, the following tactics of the wound care after autodermoplasty is recommended: after a single use of dressings creating moist wound environment, at the first rebandaging in 3-5 days they should be replaced by gauze wet-to-dry dressings with antiseptic solutions, creating dry wound environment, which, in most cases, prevents development of local festering complications and promotes epitelialization of autodermotransplants in the shortest period possible.

CONCLUSION

The effectiveness of autodermoplasty is closely connected with primary treatment of wounds, as well as thorough surgical processing and hemostasis. Good engraftment and epithelialization of autodermotransplants largely depends on the preparation of recipient bed and creation of optimal conditions for healing through use of dressings, rather than on any additional manipulations. Yet, further search for more efficient dressings to take care after burn wounds in the post-surgery period, especially in patients with vast full-thickness burns, remains one of the promising academic research areas.

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