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Ways of Suture Material Perfection in Surgery

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Abstract

In high technologies time surgery makes certain demands to suture materials.A suture has to possess a number of properties besides the prevention of infectious complications [1, 2] in the wound, it must contribute to the rapid and traceless incisional wound healing [3, 4, 5, 6]. Moreover, an important aspect is adaptive and deformative characteristics of the suture that allows to minimize a number of negative factors in the course of healing and further scarring.

Nikelide titanic suture has such properties. It has both porous interfacial structure and superelastic and superplastic properties [7, 8, 9].We've carried out a serious of animal tests to study the behavior of nikelide titanic suture in living tissues.

1 Experimental

Part 30 animals took part in the trial. Studied animals were white laboratory rats Sprague Dawley of the same age (3months), weight (200-220 gr) and sex (females). We made 3 groups; there were 10 animals in each one.Suture material Monofil 5/0 was used in the first group, Uniflex 5/0 suture material was used in the second group, Nikelide titanic suture of the thickness 90 micrometer was used in the third one. The tissues with suture on the skin were studied in 14 days from the moment of saturation.The suture was made on the wound 3 cm in length and 1 cm in width up to bringing together the wound margins. Studied material was excised

within unchanged tissues. There was no control group in our study, only intergroup comparison was made. We obtained 5 sets of soft tissue specimens with suture material.

Arithmetical mean values (M) in absolute values and their errors (m) were calculated. The difference reliability probability of the compared mean values was determined by comparing the reliability criterion value (td) to the standard values of Student's test. In all the calculations reliable ones were thought to be the differences at p≤0,05 taking into account the character of sign distribution to be close to normal one. Furthermore we used the method of variation statistics for result processing namely that was the calculation of arithmetical mean value (M) and its error (m), mean-square deviation, paired t-test for mean values, Wilcoxon-Mann-Whitney's distribution-free test. In all the calculations reliable ones were thought to be the differences at p≤0,05 taking into account the character of sign distribution to be close to normal one.

Skin sections were dehydrated in alcohol, clarified in xylene, colored by hematoxylin and eosin and put into the balm.

Histological characteristics of ski flap after saturation did not differ according to structural cellular characteristics in studied groups but the intensity degree was different.

2 Results and discussion

Overall morphological picture on the 14th day of our study was the following. Active tissue reaction with granulation proliferation, fibrosing developments of mosaic type (granulations of different maturity degree) withtransformation from few-celled to high-celled areas were determined; fibroblasts, fibrocytes, histiocytic elements, lymphocytes, macrophage elements, hemosiderophages prevailed among the stromal elements; giant multinuclear cells of foreign body type retained.Numerous fibroblasts ingrew into loose connective tissue the substantial part of which was proliferative with transformation into more mature forms with high differentiation that could be the evidence of current regenerative process. These cells prevailed over other elements taking part in the regenerative process;macrophages, lymphocytes, plasmjcytes, the number of which is indicated in the table, should be marked out among the latters

Vessels were of different size having round, oval form with swollen endothelium with the number decrease from the center to the peripherals, in remote from the suture tissues the vessels were multidirectional with different extent of plethora

and extravasates from erythrocytes. On the whole the formed arteriolovenular bridge can be characterized as small-looped one.

Comparative analysis showed other conditions being equal, a lower inflammation degree in the group with Nikelide titanic suture; the numerical density of reactive inflammatory elements, multinuclear cells, macrophages proved to be reliably lower that can be the evidence of slighter tissue traumatizing (Fig. 1, 2, 3), more marked reactive changes turned out to be in the group with Uniflex, the tissues with Monofil took up an intermediate position according to the reparation degree. Less marked traumatic impact of Nikelide titanic suture contributed to the normalization of collagenous potencies and bloodstream that resulted in the forming of more mature scarry tissue with perifocal reaction of low activity.Sinophilicgranulocytes took a small area in tissues of all groups that can be the evidence of hypoallergenicity of suture material.

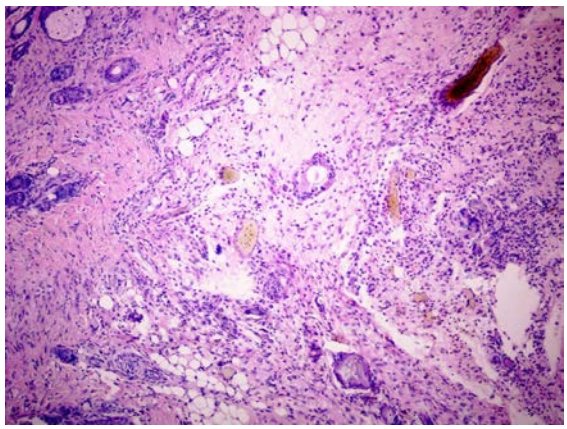

Fig. 1. Reactive changes with multinuclear cells of foreign body type. Group with Uniflex.Coloration by hematoxylin and eosin. X150

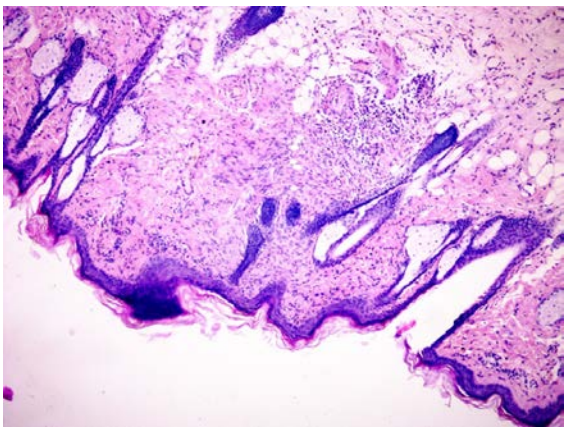

Fig. 2. Tissue changes in the group with Monofil. Less marked cellular inflammatory reaction and edema, multinuclear cells as singular clusters, lively fibroplastic reaction. Coloration by hematoxylin and eosin. X150

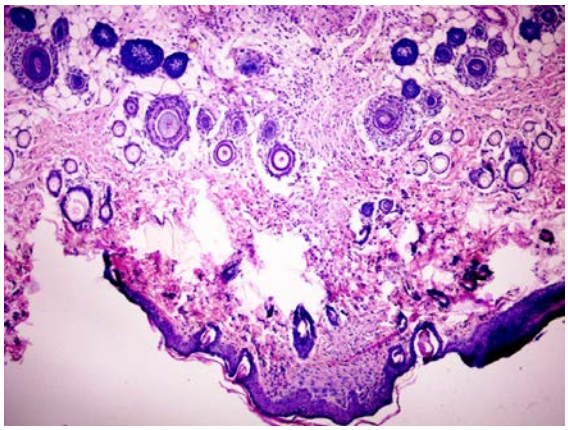

Fig. 3. Group with Nikelide titani csuture. Low activity of cellular inflammatory reactions, edema is slight and localized only in subepithelial area, connective tissue is mature. Coloration by hematoxylin and eosin. X150

Table 1. Morphometric indices of vascular structures in the groups on the 14th day. Specific density of bloodstream vessels (mm2)

Monofil (the 14th day)	Uniflex (the 14th day)	Nikelide titanic suture(the 14th day)
16,9,5±1,28	13,5±0,18	17,6±0,15

Table 2. Morphometric indices of tissular structures in the groups on the 14th day (M±m)

Studied parameters	Monofil (the 14th day)	Uniflex (the 14th day)	Nikelide titanic suture (the 14th day)
Thickness of collagenous fiber	10,2±0,27	9,5±0,17	13,42±0,74

fasciculi			
Elements of fibroplastic set	38,6±0,08	30,4±1,8	42,4±0,8
Lymphocytes	25,8±1,3	34,3±0,9	21,3±0,9
Plasmatic cells	14,3±0,7	18,9±1,0	13,9±0,9
Macrophages	16,9±0,09	19,8±1,2	14,6±1,4

Morphofunctional study showed that suture material from Titannikelide caused less marked inflammatory reaction that indirectly resulted in less marked edema, destructive development decrease, lymphostasis reduction that stimulated the regional angiogenesis, the mature capillary formation, the repair process improving.

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