

Morphological study of luminal surface of dacron and umbilical vein arterial grafts by means of SEM

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KEY WORDS.—SEM examination - Arterial prostheses - Umbilical vein.

Vascular reconstructive surgery using non-autogenous material is common. The thrombogenicity of various types of prostheses has been investigated by various Authors with different methods:^{1,2} SEM examination appears invaluable in evaluating interaction between host and prostheses.^{3,4} Usually, Authors⁵ have studied "short-term" material in which luminal surfaces of prostheses appear covered at first by blood cells and fibrin and, later, by cells looking similar to fibroblasts.

We have studied by means of SEM and in semithick sections 12 non-autogenous arterial grafts removed during operation for clinical failure up to 12 years from implantation. We have also studied a "Dardik Biograft" (composed of human umbilical vein in a dacron cradle) after 10 days of implantation.

MATERIALS AND METHODS

13 arterial by-pass prostheses (aorto-iliac, aorto-femoral, aorto-popliteal) were examined by means of SEM and in semithick sections. The technical methods for SEM examination have been reported in a previous paper.⁶ Samples for semithick sections were obtained from segments adjacent to the ones used for SEM examination: they were fixed in 2.5% buffered glutaraldehyde, post-fixed in 1% buffered Os O₄, and embedded in araldite.

RESULTS

At SEM examination, the luminal surface of dacron prostheses appears largely covered by

thrombus; in some areas the fibrils of prostheses appear at luminal surface, but never an endothelial layer is observed.

The "Dardik Biograft" has completely lost the endothelial layer and appears covered by a thin fibrin layer that is present also in the dacron cradle.

In semithick sections the dacron prostheses show an inflammatory reaction around the prosthetic fibrils with granulomatous giant cell reaction and neo-angiogenesis. The semithick sections of "Dardik Biograft" confirm the presence of a thin fibrin layer on the luminal surface; the vein wall does not disclose relevant modifications, excepting notes of oedema among the smooth muscle cells.



Fig. 1.—Luminal aspect of thrombus in a dacron prostheses (SEM, 500 \times).

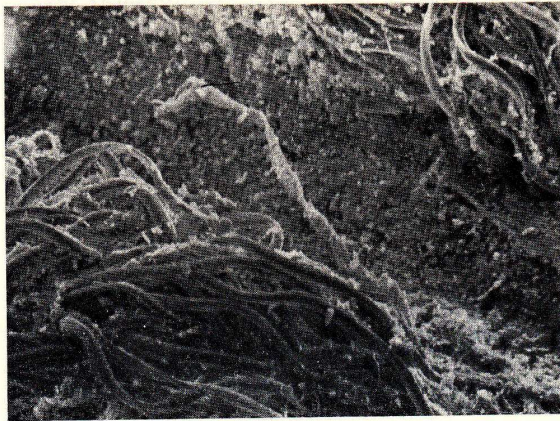


Fig. 2.—Fibrin layer in the dacron craddle of "Dardik Biograft" (SEM, 100 \times).

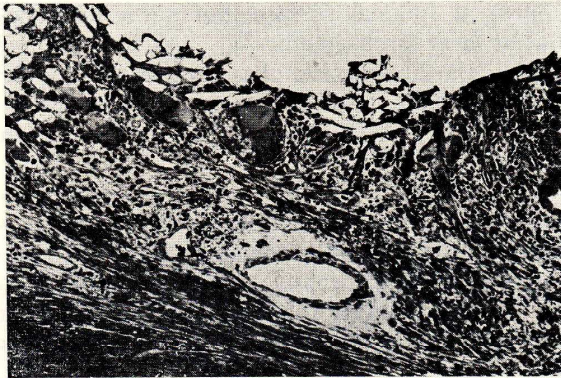


Fig. 3.—Giant cell granulomatous reaction and neovascularization in the dacron prostheses wall (Semithick section, 80 \times).

DISCUSSION

In all dacron samples examined we have never observed an endothelial layer at luminal surface. In non-autogenous prostheses, the "neointima" appears formed more or less largely by throm-

bus. We do not know if these aspects are due to "long-term" implantation, nor we may evaluate in this material the role of angiogenesis and of inflammatory reaction in the pathogenesis of thrombus formation. The examination of "Dardik Biograft", that shows a fibrin layer on the luminal surface already deprived of endothelial cells after "short-term" implantation, may emphasize the possible role of the endothelial layer in thrombus formation on prostheses.

SUMMARY

12 non autogenous and 1 "Dardik Biograft" prostheses removed from patients were examined by means of SEM and in semithick sections.

None of the grafts presented with an endothelial layer at examination of luminal surface either after a long or a short term implantation.

The role of the endothelial cells in thrombus formation on grafts is discussed.

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