MACROPOROUS TEXTILE AND MICROPOROUS NONWOVEN VASCULAR PROSTHESES: HISTOLOGICAL ASPECTS OF CELLULAR INGROWTH INTO THE STRUCTURE.

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SUMMARY.
The trellis concept of healing is suspended by the preclotting of the porous prosthetic fabric.

The absorption of the precoagulated blood and an occasional peri-prosthetic hematoma does not take place as rapidly as is usually surmised. Therefore, the presence of unorganized blood coagula can inhibit the stabilization of a fibrin layer which forms an early blood flow interface and can result in thrombotic complications.

Subsequently, the development of a cellular neointima which spreads exclusively from vascular tissues at the anastomotic site is impeded.

In contrast, the coated prosthesis (UNI-GRAFT {R} DV) can be used immediately without prior preclotting, thus also in patients being heparinized or suffering from coagulopathy.

The coating effectively prevents the imbibition of the prosthetic wall with blood as well as primary and secondary bleeding into the prosthetic bed. The coating smoothes the inner surface and immediately forms a highly hemocompatible (noncollagenous) contact interface to the blood flow and promotes the formation of a dense and coherent primary fibrin layer as the ‘guide-rail’ for a complete cellular neointima.

On the gelatine coating, the autologous fibrin film remains coherent and stable for long periods, probably indefinitely, when after clinical implantation the cellular healing of the graft remains poor or is absent.

In the absence of endothelium, a stable fibrin flow surface, the nature’s own means of covering a denuded region of the vascular wall, is superior to both the teflon/air flow surface of ePTFE, and the glutaraldehyde-fixed collagenous surface of the umbilical vein biograft.

The microporous flow surface of the experimental fPUR prosthesis allows the firm attachment of a very thin fibrin film. Even under haemorrhheologic disadvantageous conditions (loop-shaped conduit), this fibrin film forms both the athrombogenic interface to the streaming blood for many months and together the guide-rail with excellent anchoring possibilities for neointimal cells.

According to the present study, the patient’s (diseased) vessels in which a prosthesis was implanted, the flow surface consisted of fibrin rather than of endothelium.

In contrast to preclotted blood, the coating can be easily infil-
trated by cells which contribute to the healing of the graft.

As a result of improved cellular immigration and penetration the UNI-GRAFT (R) DV prosthesis is better attached to the surrounding tissue and the fibrin layer is better stabilized, thus allowing a more rapid spread of endothelium and neointimal smooth muscle cells.

INTRODUCTION.
Arterial grafting began in 1906/1908 when CARREL and GUTHRIE demonstrated that homologous and heterologous veins and arteries could serve as arterial substitutes experimentally and clinically. Nevertheless, 40 years elapsed until methods of preservation had been developed and stored arterial allografts could be used satisfactorily in humans (GROSS et al. 1948).

However, with increasing number of implanted preserved arterial allografts, complications such as allograft aneurysms, infections (probably also rejection phenomena), and inconstant durability, were reported with increasing frequency (SZILAGY et al. 1957).

The era of vascular prosthesiology proper started in 1952/1954 by the demonstration of VOORHEES et al. on the use of a synthetic Vinyon "N" cloth fashioned into a tubular configuration, as an arterial substitute.

The selection of Nylon as the fibre of choice was obviously a mistake (EDWARDS 1978), since HARRISON (1958) reported that Nylon loses 85% of its tensile strength already 3 months after experimental implantation. In contrast, Teflon and particularly Dacron, as inert fibres seemed more likely to last in the body for many years. The durability of the implant should be superior to the life expectancy of the recipient (GUIDOIN et al. 1988).

In 1955 the crimped configuration of the tubes was introduced (EDWARDS and TAPP). This crimping could largely reduce the kinking and bending of the strait tubes on the one hand, but on the other hand, the rugged flow surface is more thrombogenic and is more prone to bacteremic colonization, as demonstrated with the human umbilical vein graft (JULIEN et al. 1989).

Although more than 30 years of further intense research on vascular prostheses have passed, several main questions are still debated, that are:

1. The requirement of an endothelial lining within the scope of "complete healing" of the vascular graft.

2. The optimal texture of the prosthetic wall.

3. The porosity of the vascular wall. Tightly woven (filamentous), expanded polytetrafluorethylene (ePTFE), and fine-fibrillar polyurethane (ffPUR) grafts are microporous, permeable for water but impermeable for cells. The braided or knitted filamentous fabrics can be manufactured with large, medium sized or small pores.