Disposable Capillary Film Artificial Kidney

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In order to construct efficient dialysers the blood film must be thin, short and wide. This requires stacking many blood films. In practice this has been extremely difficult because of the problems with manifolds.

We have developed a novel concept of manifolding which allows stacking of any desired number of blood films in a simple manner. The dialyser consists essentially of a stack of dialysing elements mounted alternately upside-down. Each dialysing element comprises a supporting plate and a membrane covering. The supporting plates have an extremely fine patterned surface on the front side and are smooth on the back. The front sides, covered with Cuprophan, touch each other, thus forming a blood film between the membranes. Dialysate flows countercurrent to the blood stream on either side through the patterned spaces of the supporting plates.

The experimental model shown has 50 blood films of 6 cm length and 10 cm width, the thickness of the blood film being about 100 microns. The active surface area is approximately 0.5 m^2. The filling volume for blood is 25 to 30 ml, exclusive of blood tubing. Overall size is 12 by 12 by 7.5 cm, and weight is 800 g approximately.

At a dialysate single-pass flow of about 600 ml/min the in vitro chloride clearance for a 'blood' flow of 100 ml/min is 80 ml/min. Other respective values are: 200/120, 300/140 and 400/150 ml/min (Figure 1). Blood flow resistance is low, so pumpless operation is possible and has been confirmed in very preliminary clinical tests (Figure 2).

At the moment, assembly of the kidney is done by a semi-automatic machine which can, however, be fully automated. We believe that this new dialyser is capable of being mass produced in order to make available a high efficiency, low cost and disposable dialyser.

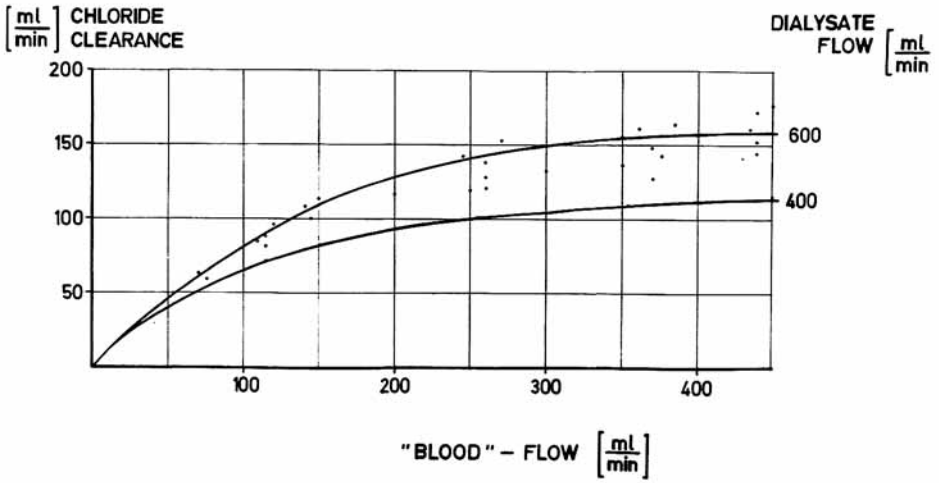

Figure 1. In vitro chloride clearance of capillary film artificial kidney

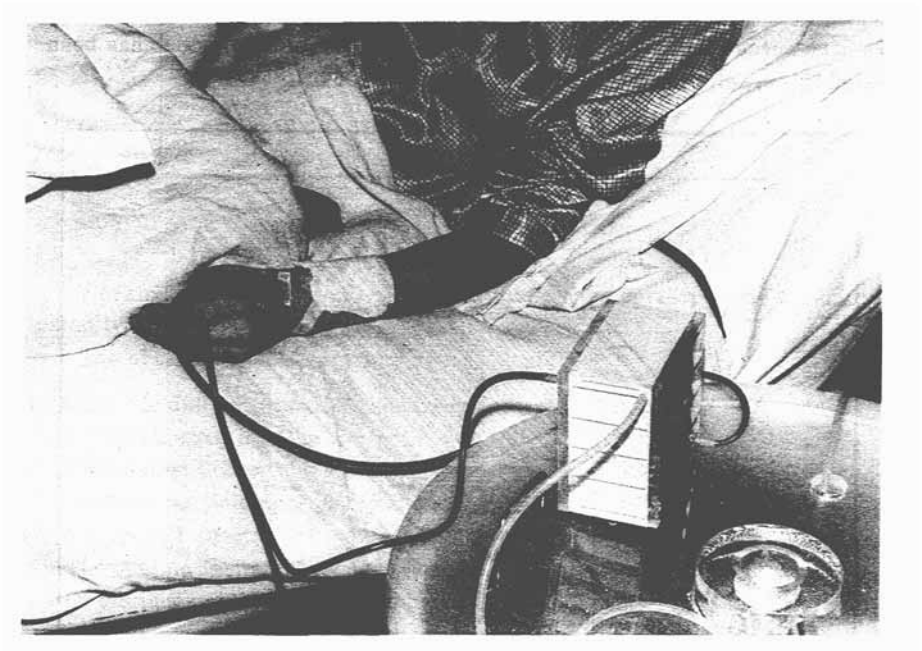

Figure 2. Capillary film artificial kidney