A New Modification of a Monitoring Unit with a Single Pass System for Simultaneous Haemodialysis

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A six-bed haemodialysis centre (Figure 1) using recirculation dialyzers (Figure 2) for Cuprohane twin coil kidney has been used since April, 1968. 1463 haemodialyses have been successfully performed in RDT during the first year.

A monitoring system (Figure 3) was developed which incorporates safety of the patient and control features necessary for simultaneous management. The automatic control includes the following functions: the blood roller pump stops automatically if (1) membrane ruptures, (2) recirculating dialysate temperature rises beyond a preset limit, and (3) bubble catcher pressure rises. A separate small monitor interrupts the effluent blood flow to the patient if one cm of air passes through the effluent cannula left in this monitor.

Figure 1. Central control panel
The ensuing rise in effluent blood pressure stops the blood pump. The bath fluid flows by gravity through a gauging chamber which contains a single-pass heater, a temperature sensor and an electro-conductivity meter. The dialysate fluid path to the patients is interrupted automatically if its composition (electroconductivity) changes. In addition to these devices the nurse-operator is informed about the ultrafiltration rate changes, dialysate flow rate and the function of the central dialysate single-pass heater. The front panel of the central operating table and all six bedside monitors (Figure 5) are designed to present information to the nurse-operator in an audible or visual (or both) fashion.

Two nurses in a shift are sufficient for the 6 simultaneous dialyses because of simplicity of operation. No adverse reactions of patients attributable to the use of commercial uniform dialysate concentrate have been observed.

By the use of Cuprophane twin coil kidneys (dialysis area 0.72 sq m, priming volume 350 ml, urea dialysance 120-138 ml/min with blood flow rate 200-250 ml/min, ultrafiltration rate 100-450 ml/hr), made by our nurses by means of a special winding machine, the NPN of our patients has been reduced to less than 50 mg/100 ml in 50% of all dialyses. The irradiation
Figure 3. Performance diagram of monitoring system
Figure 4. Air-in-blood line monitor

Figure 5. Dialyzer and bedside monitor
of recirculating dialysate by ultraviolet light has significantly reduced the incidence of high counts of gram-negative bacteria (Escherichia coli and Aerobacter) in the bath fluid at the end of dialysis; over $10^7$ germs per ml after 8 hours: $x^2 = 9.14$, $p<0.01$ and over $10^8$ germs per ml after 8 hours: $x^2 = 8.65$, $p<0.01$.

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