A NEW MACHINE FOR PERITONEAL DIALYSIS

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The performance of peritoneal dialysis by the usual technique with one or two litre containers is complicated and there is always the danger of bacterial contamination. Up to now there are only a few descriptions of machines to be handled in a simpler way or even automatically (Boen, 1964; McDonald, 1965; Bosch et al., 1966; Quellhorst, 1967; Sieberth and Heller, 1967).

Fig. 1. Manually operated cycling machine.  
Fig. 2. Automatic cycling machine.
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We would like to present a machine for peritoneal dialysis that can be managed very easily by hand and that works automatically as well.

Construction of the machine for peritoneal dialysis

The machine can be moved by hand. Its arm can be lifted and let down around an axis. At the end of it two or four 10-litre containers can be hung up in low position and brought up into a higher one by hydrostatic pressure (Fig. 1). The two containers are connected with a 2-litre disposable container by way of an infusion-system coupled like a Y. A tube leads directly into the abdomen, and by way of another piece formed like a Y the outflow of dialysate is achieved.

Cycle of events during peritoneal dialysis

1st operation. The cold dialysate solution is pumped from the 10-litre containers into the 2-litre plastic bag within 15 minutes and is there surrounded by water of 40°C.

Fig. 3. Diagram of automatic cycling machine (for explanation see text).
2nd operation. A double-clamp prevents further outflow from the 10-litre containers and simultaneously the warmed dialysis solution descends into the abdomen; the outflow of the solution into the measuring box is closed by another clamp.

3rd operation. While the dialysate runs out from the abdomen into the measuring box after the changing of the clamp, the solution from the 10-litre containers runs down into the disposable container again (1st operation).

In consequence only two operations are necessary for the subsequent dialysis cycles. The outflowing quantity of the dialysate is collected in a measuring box and then runs into a 60-litre movable container that is easy to clean.

Automatic machine for the peritoneal dialysis (Figs. 2, 3, 4)

We shall now discuss the developed form of the machine we have just described. Instead of all operations being manual, the dialysis cycles are now automatically controlled. The main object is to make the machine completely safe and trouble-free.

Construction of the machine. By a solid frame construction all functional units needed for peritoneal dialysis are connected. On this frame six 10-litre containers with sterile dialysis solution are hung up and coupled by a special infusion-system (13). By way of a tube-pump (not shown in the picture) the dialysis solution is pumped into a disposable container (5) and controlled by a thermostat (6) at a temperature of 40°C. A sterile tube which is regulated by a special tube-valve (8) is led from the disposable container to the abdomen. Another valve (11) regulates the outflow of the dialysate from the abdomen into the measuring box. Finally the whole quantity of the dialysate runs by way of another valve (14) into a plastic container.

The way the machine works automatically. The sterile dialysis solution is pumped by the tube-pump out of the 10-litre containers (1) into the thermostatically controlled disposable container (5), until it is filled with the determined quantity up to the level; this lasts about 2

Fig. 4. Close-up of control panel on the automatic cycling machine.

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minutes. As soon as the upper level is reached the valve (8) opens and the dialysis solution runs into the abdomen by hydrostatic pressure. The valve closes again as soon as the determined quantity is run in and the disposable container is then refilled. The period for leaving the dialysis solution in the abdomen can be regulated by an adjustable time-switch (3) from zero up to thirty minutes. After this period a valve (11) opens and the dialysis solution descends into the measuring box. The outflowing volume of the dialysate can be determined in advance as well, by adjusting a knob (12) so that a dialysis is possible with a residual volume in the abdomen. When the upper level of the run-out box is closed, valve (11) closes as well and valve (8) opens again for the input into the abdomen. At the same time valve (14) opens for the outflowing dialysate into the run-out container. As soon as the solution reaches the lower level of the run-out box, valve (14) closes again. A counter shows the number of dialysis cycles completed.

Of course it is possible to combine the two machines.

REFERENCES