A Proposed Process for Resterilization

of the four coil hypobaric recirculating kidney

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In the Home Dialysis Training Center of the University of Utah we have been concerned with the possibility of lowering the cost of dialysis by saving coils. Cost is not, of course, our main objective. The safety of the patient comes first. In searching for an answer we determined these major problem areas:

1. *Debris — If left in the coil or lines it could produce pockets for bacterial growth.*
2. *Sterilization — A process that would not deteriorate the membranes or the lines, nor produce any toxic residue.*
3. *Technique — One neither costly nor time consuming for the patient and his family.*

We have been using a Sodium Hypochlorite solution (Clorox) to clean and disinfect our lines. Therefore, we decided to expand along these lines for saving the coils. The lines, however, are resterilized with ethylene oxide. This would not be practical in that saving coils for drying would be virtually impossible. As it turned out, a 5% Sodium Hypochlorite (Clorox) solution and prolonged contact is sufficient for the sterilization of our coils.

After the patient has been retransfused with Saline, disconnected and cared for, the arterial and venous lines are placed in the drained tub. The tub is then partially filled with cold water and the lines are cleaned in the manner described by Petersen. In order to clean the coils, we isolate each coil, in turn by placing hemostats at the "Y" junctions. A hemostat is placed on the venous line below the bubble catcher.

The pressure is allowed to climb to 200 mmHg and then released, expanding and contracting the membrane to insure the clearing of all debris.

When the lines and coils appear cleaned and there are no traces of blood left, the cold water is drained and replaced by water at 37°C. The process of cleaning lines and coils is repeated until the coils and lines are thoroughly clear of all debris. The tub is drained and the warm water replaced with a 5% Sodium Hypochlorite solution (made by adding 500 ml of Clorox to 100 liters of cold tap water). The 5% Sodium Hypochlorite solution is circulated through the lines, coils and the machine for ten minutes. The pressure is maintained at 200 mmHg by means of a screw clamp. At the end of ten minutes the arterial and venous lines are connected together and circulation discontinued. The lines are placed inside the tub and the tub covered. The machine is disconnected and allowed to stand until ready for reuse.

To Reuse the Kidney

In order to reuse the kidney the Sodium Hypochlorite solution must be thoroughly flushed from the lines and coils, and drained from the tank while maintaining sterility. Sterile, Normal Saline is used for this purpose. A Sodium Hypochlorite solution turns a hemastik blue, therefore the absence of color on the hemastik determines the point at which the lines and coils have been successfully flushed. A total of two liters of sterile normal saline is sufficient for the entire process.

The sterile Normal Saline is attached by means of a Blood Administration Set to the infusion line on the arterial line. The arterial line is clamped as if for priming. The tub, previously drained is partially filled with cold water and the circulating pump is turned on. Next the blood pump is turned on and the Normal Saline flushed through to the venous line which drains into a bucket. Sterile technique is maintained throughout. The process of clamping and releasing the venous line to expand and contract the membrane is applied. The hemastik is used at 300 cc intervals to determine the need for more flushing. The arterial line must be flushed by gravity.

Cultures were taken of the venous effluent, before and after flushing with sterile technique maintained throughout. In all cases the bacteriological report gave no growth after 72 hours. All the coils were taken apart and examined for debris and condition of membrane. All coils were free from debris and the membranes in good condition.

Points of Danger

There are points of potential danger in this technique, both of which are easily overcome, provided reasonable caution is taken. The first problem is in the construction of the coil. The placement of the tie so that the insert does not protrude into the cellophane envelope is critical. If it does protrude it will cause a pocket of debris that virtually cannot be cleaned, thereby providing media for bacterial growth.

The second problem is in the 5% Sodium Hypochlorite solution. 5% is maximum concentration allowable without deteriorating the membranes. Temperature of the 5% Sodium Hypochlorite solution cannot exceed 25°C.

We think that provided reasonable caution and adherence to technique is followed, the technique would reduce the cost of Home Dialysis to under ten dollars per dialysis. In addition, the burden of winding coils, assembly of coils and machine would be eased for the patient and his family. The time involved is very demanding on the patient and family. This entire process takes only 30 minutes as opposed to approximately 2 hours plus sterilization time.