Risk prone situations related to dialysis

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Electrical safety of haemodialysis machines in patients dialysing with central venous catheters

Dialysing patients with central venous catheters exposes them to a well documented risk of micro-shock to the myocardium with the potential of inducing ventricular fibrillation (VF). This risk comes from the fact that haemodialysis machines are not constructed to the same standard as other medical equipment that is designed for direct cardiac application.

With equipment designed for direct cardiac application which is designated as Type CF, the allowable electrical current that can leak from the equipment to the patient is 10 micro Amps in normal use and 50 micro Amps in single fault condition. With a dialysis machine which is designed to the less rigorous standard of Type B, the allowable current in normal use is 100 micro Amps and 500 micro Amps in single fault condition. Normally this current is taken to ground via the earth conductor in the main cable; however if this conductor is compromised the current will pass through the dialysate lines and dialyser to the central venous catheter and then to ground via any earthed surface the patient touches. As the current will be concentrated at the catheter tip it could exceed the level that would induce VF. Although the Medicines and Healthcare products Regulatory Agency (MHRA) are not aware of any patients being electrocuted in this way, as sudden deaths of patients occur on dialysis, it needs to be considered that there is the possibility that this could happen.

To mitigate this risk most dialysis machine manufacturers recommend attaching an additional earth conductor to the machine, and attaching this to a dedicated earth socket which is separate from that mains power socket. These sockets termed ‘earth potential equalisation sockets’ are not commonly found in dialysis units, making the provision of the additional earthing difficult.

Current Department of Health technical guidelines for wiring in clinical settings, (HTM 06-01) stipulate that these earth sockets should be provided in all newly build dialysis facilities, but those organisations designing the renal units are often unaware of this requirement.

Action:
Although formal guidance will be formulated, it would be prudent at this stage to broadcast this potential risk to all renal units in an effort to encourage the use of earth potential equalisation techniques in dialysis settings.
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