Air elimination capability in rapid infusion systems

N. Zoremba, et al.

Introduction:
Pressure infusion devices are used in clinical practice to apply large volumes of fluid over a short period of time. In this investigation, the air elimination capabilities of the Fluido® (TSCI), Level 1® (Level 1 Technologies Inc.) and Ranger® (Augustine Medical GmbH) pressure infusion devices have been tested. All tested devices have a good air elimination capability.

Summary:
The Ranger® disposables incorporate a gas permeable membrane that allows the air to escape whilst ensuring that there is no leakage of fluid. There is no automatic air detection or shut-off mechanism. To avoid injection of air, the Ranger® device must be placed below the patient’s level. Next to that the maximum infusion flow is limited to 500 ml/min according to the manufacturer’s specifications and therefore the flow of 800 ml/min was not tested.

The use of ultrasonic air detection coupled with an automatic shut-off (only available in the Fluido® and Level 1®) is a significant improvement and can reliably prevent accidental air embolism at rapid flows.

While the air is eliminated automatically via a gas permeable membrane in the Level 1® system, the clamps remain closed in the Fluido® until the captured air is manually removed from the chamber with a syringe. The missing air elimination filter / membrane can therefore cause a delay in the administration of fluid. On the other hand, the air elimination filter of the Level 1® often fails in its venting function when the hydrophobic membrane becomes wet. These clogged membranes compromise the air elimination capabilities of the Level 1®, and, based on the manufacturers’ recommendation, the air eliminations filters must be changed after three hours of use.

Due to the abandonment of a gas permeable membrane for air eliminations, the Fluido® system may be used without any time limitations.

Discussion:
The infusion of packed red blood cells, fresh frozen plasma or platelets may affect the function of the gas permeable membrane of the Level 1® by proteins plugging the filter.