

How Much is Catheter Flow Influenced by the Use of Closed Luer Lock Access Devices?

Eloot S, De Vos J, Houmbrouckx R, Verdonck P, Nephrol Dial Transplant 2007;22:3061–3064

PURPOSE

Several luer lock access devices are available to protect hemodialysis patients from infection arising from repeated handling of the catheter hub. These devices remain in place during dialysis, so it is also important that any resistance to blood flow be minimal. This study evaluated blood flow resistance in three different closed luer lock connectors.

MATERIALS AND METHODS

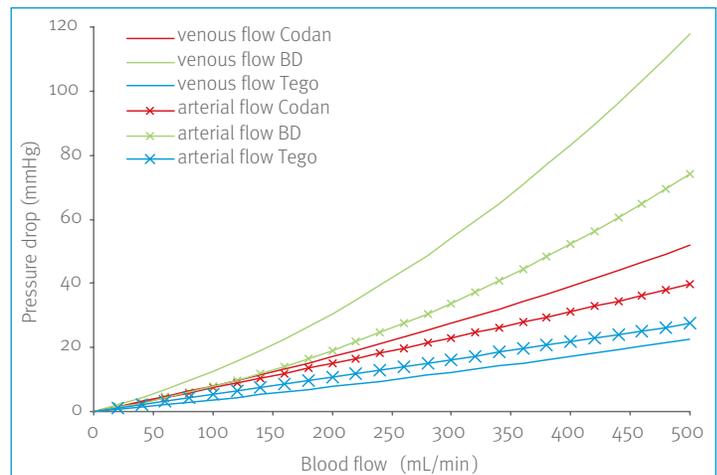
This in vitro study investigated pressure/flow relationships in the ICU Medical Tego®, BD (Becton Dickinson) Q-Syte™, and Codan Swan-Lock® connectors compared to a simple male/female hub-to-hub connection. The connectors were attached to a dialysis machine, and steady water flow was used to simulate blood. Venous and arterial flows were measured up and downstream of the catheter hubs. These connectors were attached to four different brands of dialysis tubing, and sections were observed opening under flow. Geometry of the connectors was analyzed. Differences in viscosity between blood and water were compensated for mathematically. Statistical analyses were performed. $P < 0.05$ was the limit of significant difference.



RESULTS

All of the closed connectors created more resistance to blood flow than the standard hub-to-hub connection. During both venous and arterial flow experiments, the Q-Syte created the highest resistance to blood flow. The Tego connector created the least resistance. Differences were statistically significant. In Q-Syte and Swan-Lock connectors, the pressure drop over the connection during arterial flow was significantly smaller than the pressure drop over the connection during venous flow.

By contrast, in the Tego connector, the pressure drop over the connection during arterial flow was larger than the pressure drop over the connection during venous flow. Play was present between connectors and four different tubing brands, even when luer locks were tightened. The Tego connector opened fully in all cases, but in many cases, the Q-Syte and Swan-Lock connectors did not open all the way, as the male ends of the tubing connectors were not able to fully open their split septums. The restricted flow space resulted in more resistance to blood flow.



CONCLUSION

Although the silicone split septum was designed to not interfere with blood flow, applying a closed luer lock access device was found to exert resistance compared with the standard male/female connection. The amount of additional resistance was minimal in the Tego and Swan-Lock connectors but significant in the Q-Syte connector. Improper connection between the tubing and the connector creates more resistance to blood flow if the geometry of the connector prevents it from being fully opened by the male tubing end. Both Q-Syte and Swan-Lock connectors were adversely affected by such connection flaws. In vivo studies are planned to determine whether the resistances are below the threshold for causing hemolysis.