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Use of blood temperature monitor for surveillance of vascular access in maintenance hemodialysis: Comparison with duplex ultrasonography hemodialysis patients

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Objectives:
Thermodilution method using the blood temperature monitor (BTM) was introduced for periodic vascular access flow measurements in patients undergoing maintenance hemodialysis (MHD). It is well correlated with saline dilution technique and better predictive for vascular access stenosis than static intra-access pressure ratio. This study was undertaken to compare BTM with duplex ultrasonography (DU).

Methods: Sixty-seven MHD patients were enrolled from three different university dialysis centers and followed over 12 months. At 6-month intervals, access flow was measured using BTM (Q-BTM) and DU on the same day. DU measures were classified into arterial inflow (Q-DUa), venous outflow (Q-DUv) and between punctures (Q-DUb). Intraclass correlation coefficients (ICC) and Bland-Altman plot were used to assess correlations and agreement between Q-BTM and Q-DU, respectively.

Results: A total of 201 measurement series were performed. At baseline, Q-BTM, Q-DUa, Q-DUv, and Q-DUb were 1297 ± 650 ml/min, 1003 ± 532 ml/min, 1136 ± 671 ml/min, and 1109 ± 734 ml/min, respectively. At 6 months, Q-BTM, Q-DUa, Q-DUv, and Q-DUb were 1194 ± 599 ml/min, 1052 ± 531 ml/min, 1063 ± 684 ml/min, and 1138 ± 713 ml/min, respectively. The final measurements at 12 months were Q-BTM 1304 ± 573 ml/min, Q-DUa 1101 ± 599 ml/min, Q-DUv 1131 ± 696 ml/min and Q-DUb 1266 ± 769 ml/min. When all measured values were taken together, mean ICCs were 0.525 (95% CI, 0.364-0.644) for Q-DUa, 0.349 (95% CI, 0.119-0.519) for Q-DUv, and 0.394 (95% CI, 0.180-0.552) for Q-DUb. The limits of agreement were -1035.9 ml/min to 1455.9 ml/min for Q-DUa, -1379.8 ml/min to 1664.5 ml/min for Q-DUv, and -1511.7 ml/min to 1654.1 ml/min for Q-DUb.

Conclusions: In MHD patients, Q-BTM moderately correlated with Q-DU. It is more related with arterial inflow than fistula or venous outflow.