

Midline Catheter Reduces Infiltrations for Coronary Artery Bypass Graft Patients



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Flagstaff Medical Center (FMC) sought to decrease use of central venous catheters (CVCs) in post-CABG patients as well as find an alternative to CVCs for patients in whom central venous access was not possible. Additionally, FMC sought to eliminate use of standard peripheral intravenous catheters (PIVs) for administration of Amiodarone, a vesicant anti-arrhythmic agent commonly used post-CABG. In 2010, administration of Amiodarone via PIVs resulted in 7 incidents of grade III-IV extravasation.

EARLIER MEASURES

1. PICCs were considered. However, the risks of CLABSI and DVT—in addition to excessive cost—rendered these devices undesirable, provided a viable alternative could be found.^{1,2} Additionally, administration of Amiodarone per CVCs is indicated (according to the package insert) when the concentration exceeds 2.5 mg/ml. FMC mixes and administers Amiodarone at a concentration of 1.8-1.9 mg/ml (pH = 3.9).

2. Traditional MST-placed midlines were tried. Excessive clotting, leaking and poor performance rendered these devices undesirable.

INITIATIVE/MEASURES

A new power-injectable, blood-drawable, extended-dwell catheter (POWERWAND® by Access Scientific, LLC. San Diego, CA)—technically a midline at 3.1 inches—had demonstrated a remarkably low complication rate and high completion-of-therapy rate in a peer-reviewed, prospective study.³ FMC decided to trial between 100-150 such devices, and, thereafter, to evaluate outcomes with respect to:



POWERWAND®

- A. Completion of Therapy
- B. Total Complications
- C. Blood-drawability for laboratory tests
- D. Subgroup outcomes, especially in CABG patients receiving amiodarone.

RESULTS

A total of 137 extended-dwell study devices were placed, resulting in 617 catheter-days indwelling. Notable results:

- A. No catheter-associated bloodstream infections occurred.
- B. 87.5% of patients completed intended therapy without complication
- C. Total complications were 8.9%, excluding 3.6% intentional dislodgements caused by confused and agitated patients.
- D. Blood-drawability to completion of treatment, across the total study population, was 68%. The average number of days the study device allowed for blood draws was 3.17 days. (Lines were maintained with q4 hr normal saline flush.)
- E. Two sub-groups emerged with noteworthy outcomes:
 - 1. Patients receiving Amiodarone.
 - Total Catheter-Days = 182
 - Completion of Therapy = 71%
 - Blood Drawable = 73%
 - Complications: 1 grade I phlebitis (14%)
 - 1 grade II infiltration (No tissue damage)
 - 1 non-occlusive thrombus on ultrasound
 - 2. Patients receiving Vancomycin.
 - Total Catheter-Days = 396
 - Completion of Therapy = 89%
 - Blood Drawable = 95%
 - Complications: 1 grade I phlebitis (11%)

Amiodarone Infiltration/Extravasation

DEVICE	NUMBER OF INCIDENTS	GRADE
PIV	7	III-IV
Extended Dwell Midline	1	II

	CATHETER DAYS	BLOOD DRAWS	COMPLETION RATE	COMPLICATIONS
Amiodarone	182	73%	71%	1 non-occluded DVT 1 Grade II infiltration 1 Grade I phlebitis
Vancomycin	396	95%	89%	1 Grade I phlebitis

DISCUSSION

The findings at FMC confirm published reports of the study device's efficacy.⁴ With only one grade II infiltration in the post-CABG study population and an overall 87.5% completion of therapy rate, the study device far exceeded the performance of all other devices previously evaluated.

Two additional benefits of the study device emerged. First, blood drawability resulted in a substantial improvement in patient satisfaction. Many patients said they "loved" their extended-dwell catheter.

Second, the ability of the device to allow for the acceptable administration of Amiodarone and Vancomycin is noteworthy. In patients administered Amiodarone, one incident of grade II infiltration compared favorably with 7 incidents of grade III-IV infiltration during the shorter pre-trial period using PIVs. In patients receiving Vancomycin, 1 incident of grade I phlebitis (11%), in a patient receiving multiple other drugs, is remarkable.

The deep vessels in the upper arm—where the study device was placed—are larger in diameter and have 5 times the flow rate of vessels in the hand and forearm. These facts, coupled with the fact that the study device is made of a novel material and inserted via a novel technique, likely contributed to the outcomes.

CONCLUSIONS

1. FMC adopted the extended-dwell, power-injectable midline catheter as part of its vascular access device portfolio. It is now being used broadly throughout the hospital patient population; since it replaces unnecessary CVCs and PICCs, the study device is considered an essential tool in FMC's CLABSI reduction program.

2. Since the study device represents a whole new class of intravenous catheter not previously available, results of the present study raise the question whether a more sophisticated clinical trial should be conducted to properly explore the pH restrictions on peripheral IV fluid administration as stated in the *INS Standards*.

LIMITATIONS

This is a relatively small, prospective, uncontrolled observation study. A larger, randomized, controlled study is now indicated.

References

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