

## Utilization of Infrared Trans-illumination as an Aid for Peripheral Arterial Access

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**Objective:** The utilization of infrared and near-infrared light to exploit the absorptive qualities of hemoglobin through trans-illumination of peripheral vessels has previously been hypothesized and recently developed as a means for improved vascular access. The objective of this study was to evaluate the effectiveness of this technology in assisting with arterial blood gas sampling in the emergency setting.

**Methods:** This experimental study was a prospective, randomized, controlled trial performed at an urban, teaching institution with an annual emergency department census of 46,000 patients. During 2004, 58 patients requiring a diagnostic arterial blood gas as part of their clinical care in the emergency department were consented then randomized to either study group or control group. In the study group, infrared trans-illumination was used (using the IR Viewer, a device manufactured by Infrared Imaging Systems, Inc.) as an aid in localizing and cannulating the artery while the control group used traditional blind arterial palpation. Outcomes measured included time required for the procedure as well as the number of skin sticks, vessel sites used, and ABG kits used.

**Results:** 30 patients were enrolled in the study group and 28 in the control group. Mean time required for the procedure in the study group was 8.73 min.(95% Confidence Interval 5.74-11.73) vs. control group 16.0 min.(95% CI 12.87-19.06)  $p=0.001$ . Mean number of skin sticks in the study group was 1.70 (95% CI 1.29-2.11) vs. control group 2.93 (95% CI 2.49-3.36)  $p=0.000$ . Mean number of peripheral arterial sites used for the study group was 1.10 (95% CI .94-1.25) vs. control group 1.43 (95% CI 1.27-1.58)  $p=0.004$ . Mean number of ABG kits utilized in the study group was 1.14 (95% CI .91-1.38) vs. control group 1.71 (95% CI 1.48-1.95)  $p=0.001$ . The results are tabulated below in Table 1.

	Control Group (blind palpation)	Study Group (infrared transillumination)	% ?
Mean time of ABG procedure (min.)	16.0	8.73	↓ 45%
Mean # of skin sticks	2.93	1.70	↓ 42%
Mean # of arterial sites	1.43	1.10	↓ 23%
Mean # of ABG kits used	1.71	1.14	↓ 32%

Table 1. Comparison of ABGs performed by blind palpation and infrared transillumination.

**Conclusions:** Infrared trans-illumination is a very effective aid for peripheral ABG access, providing significant performance improvement over the traditional, unaided method.

\***Author's note:** Subjects were asked to **rate the pain** experience on a scale of 1 to 10, and practitioners were asked to **rate the difficulty** of the procedure on a similar scale. In both categories, subjects and practitioners reported that perception of pain and difficulty of procedure with the infrared visualization device were nearly half that without the device, typically around 3 out of 10 with the device vs. 5 to 6 out of 10 without.