

Title : EFFECT OF RADIAL ARTERY CANNULATION ON BLOOD FLOW AFTER DECANNULATION
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Introduction: Radial artery cannulation is frequently used in the care of critically ill patients but the long term effect of radial cannulation on postcannulation blood flow and thrombus formation is difficult to assess without invasive measures. In this study we used a new doppler device to measure actual blood flow in cc/sec, to evaluate whether there were any long term harmful effects in patients who had radial artery cannulation.

Materials and Methods: Ninety radial-artery cannulations in ninety ASA I-II patients aged 12 to 73 yrs undergoing general anesthesia for various neurosurgical procedure were studied. All patients were examined preoperatively and had both radial and ulnar blood flow measured and recorded using a transcutaneous Doppler Volume Flow Meter-VFM (Hayashi Denki Co., Japan). In all patients the radial artery was cannulated with a 20-gauge Telfon catheter. Postcannulation radial artery blood flow was assessed at 4 to 5 days after decannulation. VFM recordings were obtained 1 cm distal to the cannulation site. The effect of cannulation on blood flow was assessed by comparing the postcannulation flow with that of the precannulation and expressed as percent of change. Age of patient, number of attempts at cannulation and duration of cannulation were recorded and analyzed. Unpaired Student's t-test, and analysis of variance (ANOVA) were used for statistical analysis of the data.

Results: Average precannulation radial arterial blood flow is 0.52 ± 0.22 ml/sec, and diameter 2.75 ± 0.31 mm (mean \pm SD). The results are summarized in table 1. The duration of cannulation were between 5-72 hours with an average of 32 hours.

Forty-one of the 90 cannulations resulted in a various degree of reduction of blood flow. Nine patients had no postcannulation radial blood flow. In those patients whose postcannulation flow has decreased more than 50%, there was a significant increase in the number of attempts at cannulation. This was true despite the fact that there was no significant effect of age of patients or duration of cannulation on postcannulation blood flow. No

ischemic complications were observed in any of the patients.

Discussion: The principle and the accuracy of the VFM device has been discussed in detail elsewhere¹. This noninvasive flow meter allows simultaneous measurement of arterial diameter and blood flow in cc/sec. Dynamic changes in flow (cc/sec), hence the degree of obstruction can be evaluated quantitatively. Our findings have shown that even a short duration of cannulation resulted in a considerable number of arterial stenosis. Furthermore, the findings have indicated that the most important factor related to occlusion following arterial cannulation is the number of attempts at insertion. We conclude that the factor in determining the postcannulation blood flow is the skill of catheter insertion and the ability to avoid multiple arterial insertion attempts. Furthermore this new Doppler technique can be used to document decreased radial artery flow even in the absence of ischemic changes which should be helpful in further studies to evaluate better ways to place radial artery catheters.

TABLE 1

Characteristics and effect of cannulation on postcannulation radial artery blood flow

Postcannulation Blood Flow	Number of Patients	Number of Attempts	Duration of cannulation (hrs)
No Change	49	1.9 ± 1.0	31.3 ± 17.5
<25% decrease	7	1.9 ± 0.7	29.1 ± 9.4
25-50% decrease	12	1.8 ± 0.7	28.8 ± 10.0
51-75% decrease	9	$2.8 \pm 0.9^*$	21.1 ± 16.6
>76% decrease	13 ⁺	$3.1 \pm 0.2^*$	35.2 ± 23.0
Total	90		

Values are mean \pm SD. ⁺ included 9 patients with no post cannulation flow. * P<0.05

Reference:

1. Uematsu S, Yang A, Preziosi TJ, Kouba R, and Toung TJK: Measurement of Carotid Blood Flow in Man and its Clinical Application. Stroke, 14:2:256-266, 1983.