Title: DOPPLER-ASSISTED RADIAL ARTERY CANNULATION

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Introduction. Percutaneous radial artery cannulation attempts, using the traditional digital palpation method for insertion, are occasionally unsuccessful. Even when successful, multiple arterial punctures, which increase the risk of complications,[1] may be required. The goal of this study was to determine the efficacy of a hand-held Doppler device for assisting radial artery cannulation in a series of patients in whom traditional attempts at cannulation failed.

Methods. All adult patients presenting for surgery from 10/80 to 10/81 who were under the anesthetic supervision of the authors and who required intra-arterial monitoring were evaluated. Attempts at traditional radial arterial cannulation, using a 20-gauge, 1" Angiocath (Deseret Co., Sandy, UT) were discontinued if: 1) attempts at cannulation were unsuccessful after 30 minutes, or 2) arterial spasm or hematoma made further efforts by traditional techniques unwise. In these patients, the Doplette 10 (IMEX, Inc, Golden, CO), a 10 M Hz, unidirectional, battery powered, portable Doppler device, was immediately used in an attempt to assist percutaneous cannulation of the same vessel. The device was placed perpendicular to the skin approximately one cm proximal to the proposed catheter insertion site and positioned to achieve the maximum audible signal. The catheter was then inserted at a 45° angle to the skin and aimed at the center of the directed Doppler beam. Paired t test was utilized for comparing the time and number of arterial punctures required for the traditional cannulation attempts versus Doppler-assisted cannulation attempts. Also, the success rate of Doppler-assisted cannulation and the primary reasons for failure of traditional techniques were noted.

Results. Doppler-assisted percutaneous arterial cannulation was attempted following failure of traditional techniques in 45 patients and was successful in 41 (91%). The primary reasons for difficulty and eventual failure of traditional arterial cannulation attempts were: arterial spasm-26, hematoma-14, and low output states-5. The time required for and number of arterial punctures resulting from both traditional and subsequent Doppler-assisted cannulation attempts are recorded in the table.

	Traditional		Doppler-Assisted
Minutes	22.0 ± 8.6	*	3.7 ± 2.7
# Punctures	4.9 ± 2.2	*	1.6 ± 1.1

($\bar{X}$ ± SD)
(*P < 0.05, Traditional vs. Doppler-Assisted)

Discussion. The use of Doppler devices to assist percutaneous arterial cannulation has been described previously in several case reports. However, this is the first reported series of adult patients presenting for surgery where the effectiveness of a Doppler device for difficult percutaneous arterial cannulation has been defined. In these patients, the time and number of punctures required for arterial cannulation were markedly reduced when Doppler assistance was utilized. This was accomplished even in the presence of arterial spasm or hematoma, created by the previous cannulation attempts. Thus, use of a Doppler device helps to salvage previously unsuccessful percutaneous arterial cannulation attempts without subjecting the patient to arterial cut-down or to cannulation attempts at a different arterial site. Use of a Doppler device may shorten the time required for cannulation of a poorly palpable artery, reduce intimal trauma of the artery (by reducing the number of arterial punctures) and thus reduce the likelihood of post-cannulation sequelae.

References

1. Davis FM, Steward JM; Radial artery cannulation: a prospective study in patients undergoing cardiothoracic surgery. Brit J Anaesth 52:41-47, 1980.