



FIG. 1. Equipment for bolus administration.

If an additional K-52 tubing and stopcock are interpolated into the patient's primary iv setup, boluses can be administered to the patient without the use of a needle.

It is important to avoid both hyperglycemia and hypoglycemia. This system saves time and money and avoids needles. We have found it quite useful.

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Doppler-guided "Percutaneous" Radial Artery Cannulation in Small Children

To the Editor:—Percutaneous cannulation of the artery in small children requires considerable technical expertise. Compression of the artery reduces the blood flow and this reduction can be assessed using a Doppler blood flow detector; thus, the artery can be located. Morray *et al.*¹ cannulated the radial artery in small children by applying the Doppler technique. In their report, contact of the tip of the intravenous cannula with the artery was evidenced by changes in the Doppler tone while the cannula was advanced through the skin towards the artery. We attempted to use their method, but precise control of the position of the tip was not achieved and access to the artery seemed unreliable. The tip of the cannula should be freely movable when attempting to correct its direction toward the artery. For this purpose, a small skin incision and separation of subcutaneous tissue were performed and location of the artery was determined using the Doppler technique.

Twenty-eight children ranging in age from 1 day to 2 yr and scheduled for cardiovascular surgery were studied. In all patients being anesthetized, radial artery cannulation was required for intraoperative

monitoring. The patient's hand and wrist were secured on an arm-board with the wrist slightly extended. A small Doppler probe (Hayashi Denki Co., Kawasaki, Japan) was placed on the skin over the radial artery proximal to the cannulation-planned point where the maximal pulsation was located on palpation. Under sterile conditions, the needle-tip of a 22-gauge cannula with a stylet (Medicut L-intravenous cannula, Nippon Sherwood Co., Tokyo) was placed on the skin surface. Gentle compression was then applied with the needle-tip while the Doppler tone was checked. The needle-tip was "walked" on the skin surface over the pulsation and the point where the Doppler tone showed a maximal decrease or disappearance was noted. Thus, the artery was located precisely in eight of 28 patients, without any invasive procedure. In the remaining 20, an incision 2-3 mm long was made above the pulsation and the subcutaneous tissue was separated with the tip of a forceps. Separation was performed beyond both margins of the artery. Arterial compression with a needle-tip was then repeated in the same manner used on the skin surface. Thus, the artery was located in 17 of the 20 patients. Overall, the artery was

located in 25 of 28 patients and cannulation was easily performed in 24 of these 25 children. In three of 28, however, the artery was not located either on or under the skin and a cut down had to be done. After the cut down, the artery was observed beneath a thick layer of flexor retinaculum in a patient and a bifurcation between the radial artery and its superficial palmar branch was observed proximal to the cannulation-planned point in two patients. These findings suggested that the side of the puncture should be chosen proximal to the flexor retinaculum and the arterial bifurcation.

Thus, the radial artery was located easily and "percutaneous" arterial cannulation was readily facilitated.

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A Postoperative Pain Management Service

To the Editor:—Ready *et al.*¹ propose that ASA physical status 1 and 2 patients under 50 yr of age receiving 6 mg epidural morphine or less be managed on routine wards under the care of specially trained nurses but without the mandatory use of respiratory monitors. An accompanying editorial² warmly supports the use of epidural opiates and goes on to state, "We need to know whether patients receiving epidural opiates can be safely cared for in a regular nursing ward, or whether a special care unit is necessary." I suggest we have ample evidence from volunteer studies and from reported problems with patients that the superb analgesia provided by epidural opiates is *not* safe without the combined resources of skilled human vigilance, effective apnea monitors, and continuous monitoring of gas exchange, preferably in special pain-management units.

As Ready *et al.*¹ point out, respiratory rate is not a reliable predictor of respiratory depression, apneic intervals, or impending respiratory failure, whether in patients or athletic unpremedicated volunteers.³⁻⁶ Serious "near misses" have been reported in high-intensity nursing areas when reliance has been placed on human monitors alone,^{7,8} while tragedy has been more comfortably averted by monitors alerting nurses in near, but not close, proximity.⁹

Marketplace forces and competition for patients* may make us unwilling to accept the unpalatable evidence that the dangers of intraspinal opiates are expensive to contain, but contained they must be. Accumulating evidence leaves no doubt that all intraspinal opiates *may* produce sudden respiratory arrest, and the only safe and ethically acceptable way to handle them is with the appropriate back-up systems operating throughout the danger period, whatever the patient's age and physical status.

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