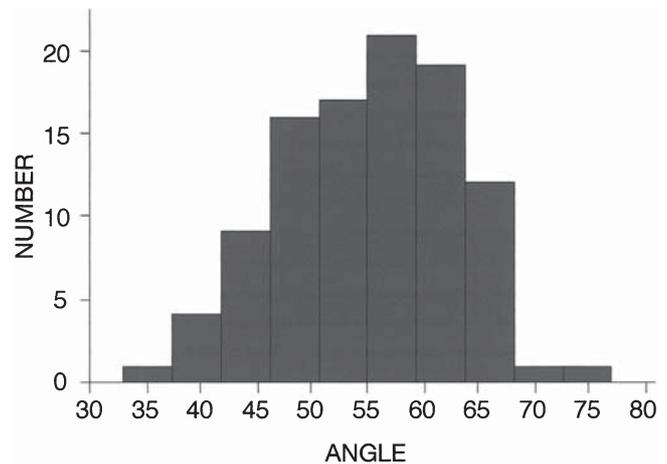


## The angle of needle insertion during internal jugular vein cannulation

Yoshihiro Hirabayashi

Department of Anesthesiology and Critical Care Medicine, Jichi Medical School, 3311-1 Yakushiji, Shimotsuke, Tochigi 329-0498, Japan

*To the editor:* Cannulation of the internal jugular vein (IJV) is a popular technique for anesthetists. Numerous articles have described the technique of IJV cannulation, and the insertion angle of the needle above the plane of the skin is recommended to be 20°, 30°, or 45° [1–4]. As a rule, estimating angles by eye is grossly inaccurate. We measured the insertion angle of the needle during IJV cannulation at our institution. The study was conducted in 101 patients who underwent general anesthesia. After the induction of general anesthesia, the operating table was kept at a slight Trendelenburg position for facilitating IJV puncture. The IJV was cannulated using a guidewire-based vascular cannulation method (Argyle Micro-needle Seldinger Kit; Nippon Sherwood, Shizuoka, Japan) via the central approach. We took a photograph of the patient's neck during jugular venipuncture with the syringe. The camera's angle was adjusted with the platform of the operating table and the camera was held so as to face the sagittal plane for each patient. Using a printed photograph, we measured the insertion angle of the needle. The insertion angle was defined as the angle of collision between the axis of the needle and the plane of the skin, whose tangential plane was parallel with the platform of each operating table. The mean  $\pm$  SD measured insertion angle was  $55 \pm 8^\circ$  (rang, 33°–77°). No insertion was performed at angles less than 30°, while 12 insertions were done at angles of 30°–45°, 65 insertions were done at angles of 46°–60°, and 24 insertions were done at angles of more than 60° (Fig. 1). Our results showed that the needle was advanced at much greater angles than the recommended angles. In spite of the difference between the recommended and actual insertion angle, every guidewire-based vascular cannulation was successful, and hence, cannulation of the IJV can be performed even if the needle is advanced at greater angles than the recommended angles. The greater the angle of needle insertion above the plane of the skin, the shorter the distance from the skin puncture site to the anterior wall of the IJV. Thus, the physician can make the most of small-diameter and short-length needles, the type of cannulating needles which are likely to be advanced into the vessel lumen without “through-and-through puncture” entailing aspiration of blood during needle withdrawal rather than during insertion. This is important, because inadvertent arterial puncture can most easily occur when the artery lies just beyond the vein along the line of needle in-



**Fig. 1.** Histogram of the insertion angles of the cannulation needle during internal jugular venipuncture, measured on printed photographs taken during the insertion

sertion. A blunter, larger-diameter cannulating needle tends to compress the IJV and simultaneously to traverse both walls of the IJV, easily leading to an unintentional puncture of the artery that is just beyond the IJV. A shorter distance from the skin to the IJV, achieved by “single-wall puncture” might reduce the incidence of unintentional arterial puncture. On the other hand, much greater angles of needle insertion may sometimes cause the guidewire to collide with the posterior wall of the jugular vein. It is not uncommon to have some resistance to guidewire insertion, especially with the utilization of a small, thin, cannulating needle. When faced with such a difficulty, once venous blood is aspirated into the syringe, decreasing the angle from the tangential plane may allow the guidewire not to collide with the posterior wall of the vessel. In conclusion, at present, we do not know whether an insertion angle of 20°, 30°, 45°, or more than 45° produces the best results.

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Address correspondence to: Y. Hirabayashi  
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