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# An Easy Technique for Catheterization of the Internal Jugular Bulb

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**Abstract** A new technique using an ultrasound Doppler blood flow detector was applied during anesthesia in 48 patients for the percutaneous catheterization of the internal jugular bulb. It is recognized that the technique is very easy and no complication or dislocation of the catheter tip occurred.

*Key Words:* Doppler detector, percutaneous catheterization, internal jugular bulb

## Introduction

It is essential to insert a catheter into the internal jugular bulb for clinical brain research, such as the measurement of cerebral metabolic rates for oxygen, glucose, glycolytic metabolites, and of cerebral blood flow by means of Kety-Schmidt method[1]. Many techniques utilizing various anatomical landmarks have been published about cannulating the internal jugular bulb[2-5]. But the catheterization has been very difficult and some complication, such as inadvertent carotid puncture, facial pulsy and nerve injuries may occur.

An ultrasound Doppler blood flow detector was used to determine the location of the internal jugular vein[6] transcutaneously for the central venous catheterization. We applied this technique for the internal jugular bulb catheterization and recognized that it was a very easy and useful technique with no complication.

## Methods and Results

This technique was applied during enflurane anesthesia in patients for the measurements of cerebral metabolic rate for oxygen and cerebral blood flow by means of the Kety-Schmidt method[1]. The location of the internal jugular vein was detected by an ultrasound pencil-shaped Doppler blood flow detector (Ultrasonic Doppler Flow Detector, Model 811, Parks electronics laboratory, Beaverton, Oregon, U. S. A.), following Ullman's procedure, which was used for the central venous catheterization[6]. Briefly, the patient was placed in the head-down position with his head turned maximally to the opposite site of the catheterization, and the Doppler detector was applied vertically to the skin. A continuous low frequency signal, called "wind-storm" was audible 1 to 2 cm apart laterally and parallel to the carotid artery, which was detected by the characteristic pulsatile sound. If the venous sound is not clear, you can hear it easily on the external jugular vein. The procedure was repeated at least three times at the following levels: the mandibular angle, the thyroid cartilage, and 2 cm above the clavicle. The vascular points (X) were marked on the skin in ink.

After sterilizing the neck skin, a 22 gauge nee-

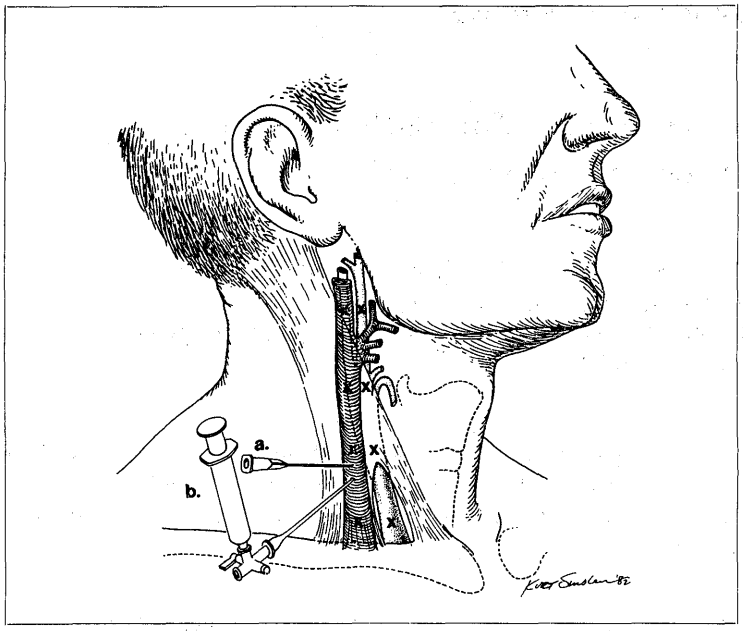


**Figure :** Diagram of the right neck. The internal jugular vein is indicated by the shaded areas. The symbols (X) are the vascular points of the jugular vein and the carotid artery, detected by the Doppler detector. 'a' represents a 22 gauge needle inserted at a 90 degree angle into the jugular vein. 'b' is the catheter introducer inserted 1 centimeter below 'a' and at a 30 degree angle to the jugular vein.

dle with a syringe was vertically inserted into the skin at the level of the thyroid cartilage between the marks of the internal jugular vein. This procedure gave us the depth of the vein from the skin. Then, a 16 gauge central venous catheter introducer (Intramedicut catheter kit, Nippon Sherwood Co. Ltd, Japan) fitted with a three-way stop cock and a syringe was inserted from 1 cm below the 22 gauge needle at an angle of 30° to the skin, along the line corresponding to the internal jugular vein (figure). After the removal of the inner metalic needle, a radio-opaque cental venous catheter was introduced upward until the tip of the catheter was obstructed by the bone. Then, the catheter was drawn back 0.5 cm. The catheter tip location was verified by an antero-posterio X-ray taken in the recovery room. This technique was applied for 48 patients so far and the catheterization was successful in all application except one which was succeeded in the other side. The mean length of insertion from the skin was 13+0.2 cm (mean±SD). No complications occurred using this new technique.

## Discussion

The catheterization of the internal jugular bulb is important not only for clinical brain research, but also for the management of the patients during neurosurgical anesthesia and in the neurological intensive care unit. Previously, internal jugular bulb catheterization has been very difficult, particularly in an obese, a short-neck or a pediatric patient ,even for the experienced physician. Complications, such as inadvertent carotid puncture,

facial palsy[2] and nerve injuries might occur with the standard technique, but none of these complications occured using this new technique.

When intracranial compliance of the patient is decreased by the neuropathophysiology, the head-down position and extreme flection of the neck must be avoided to maintain adequate cerebral blood perfusion[7]. Even in this situation, the new technique simplifies cannulating the internal jugular vein. In conclusion, this technique is very easy to perform with no complications, even for the inexperienced physician.

## References


1) Kety, S.S. and Schmidt, C.F.: The effects of active and passive hyperventilation on cerebral blood flow, cerebral oxygen consumption, cardiac output, and blood pressure of normal young man. *J. Clin. Invest.*, 25 : 107–119, 1946.

2) Gibbs, E.L., Lennox, W.G. and Gibbs, F.A.: Bilateral internal jugular blood. Comparison of A-V differences, oxygen-dextrose ratios and respiratory quotients. *Am. J. Psychiat.*, 102 : 184–190, 1945.

3) Herrmann, V.E.: Punktion unt Kontrastdarstellung der Vena jugularis interna. Anwendung unt diagnostische Bedeutung. *Fortschr. Roentgenstr.*, 108 : 511–514, 1968.

4) Meyer, J.S., Wiederholt, I.C., Toyoda, M., Ryu, T., Shinohara, Y. and Guiraud, B.: A new method for continuous sampling of cerebral venous blood without extracranial contamination in man. Bilateral transbrachial catheterization of the cerebral venous sinuses. *Neurology* (Minneap), 19 : 353–358, 1969.

5) Griffiths, D.P.G. and Greenbaum, R.: A simplified technique for cannulation of the jugular bulb. *Stroke*, 4 : 955–957, 1973.

6) Ullman, J.I. and Stoelting, R.K.: Internal jugular vein location with the ultrasound doppler blood flow detector. *Anesth. Analg.*, 57 : 118, 1978.

7) Shapiro, H.M.: Intracranial hypertension. Therapeutic and anesthetic considerations. *Anesthesiology*, 43 : 445–471, 1975.