

Ultrasound-guided central venous catheterization: efficacy of simultaneous perioperative ultrasonographic scanning for the presence of carotid plaques in the prevention of the perioperative development of ischemic stroke

Yusuke Asakura · Yuka Nakamichi ·
Kikuko Mori · Koichi Ibuki · Hirotake Kasuga ·
Hiroshi Hori

Received: 24 January 2012 / Accepted: 7 February 2012 / Published online: 24 February 2012
© Japanese Society of Anesthesiologists 2012

To the Editor:

Carotid plaques are frequently seen in patients who have suffered from an episode of stroke. Conversely, the risk of stroke is strongly correlated with the presence of carotid plaques [1]. Thrombus formed on atherosclerotic plaques, as well as the plaques themselves, may migrate and embolize the intracranial arteries, resulting in an artery-to-artery embolic cerebral infarction. Apart from cardiac and carotid artery surgery, in which the risk of stroke perioperatively is well recognized [2], the incidence of stroke in the general surgical population is reported to be between 0.2 and 0.7% [3]. Approximately 40% of cases of stroke in this population were attributable to cardiogenic embolism associated with atrial fibrillation, followed by carotid arterial disease, which accounts for approximately 10% of perioperative cerebrovascular disease. In order to prevent the accidental release of thrombus formed on atheromatous plaques, as well as the the accidental release of plaque itself, blood pressure should be kept within the patient's normal range [3]. Additionally, hyperextension of the neck should be avoided because it can stretch the carotid artery, thereby causing intimal tears which can act as a nidus for thrombus formation [4].

Y. Asakura (✉)

Department of Anesthesiology, Nagoya Kyoritsu Hospital,
1-172 Hokke, Nakagawa-ku, Nagoya 454-0933, Japan
e-mail: yasakura@kaikou.or.jp

Y. Nakamichi · K. Mori · K. Ibuki
Department of Physiological Laboratory,
Nagoya Kyoritsu Hospital, Nagoya, Japan

H. Kasuga · H. Hori
Department of Internal Medicine, Nagoya Kyoritsu Hospital,
Nagoya, Japan

Recently, ultrasound guidance for central venous catheterization has gained in popularity, and it has been shown to reduce the time required for catheterization, to increase the overall success rate, and to reduce the rate of complications. We have surveyed the presence of carotid plaques perioperatively, and have noted that a considerable number of patients have carotid plaques. Of 20 patients who were examined for the presence of carotid plaques perioperatively (14 men, 6 women; age range 46–82 years, median 67, average 66.25), using a Philips CX50 device equipped with a linear 12-MHz transducer probe (Philips, Andover, MA, USA) or a GE Vivid7 Pro equipped with a linear 10-MHz transducer probe (GE, Pollard Woods, UK), our skilled cardiovascular ultrasound technicians diagnosed 12 patients as having carotid plaques and 4 patients as having carotid stenosis. In some of the patients, these findings were highly likely to cause cerebral infarction.

For example, in the 77-year-old man whose ultrasound image is shown in Fig. 1a, the presence of carotid plaque was apparent in his right common carotid artery. In the longitudinal section, the ultrasound morphology of the plaque was heterogeneous, consisting of hypoechoic and echo-lucent parts, as indicated by the arrows in Fig. 1b, c. Such parts contain deposits of lipids and cholesterol, respectively, and are highly associated with an increased risk of stroke [5]. Because there was a possibility of compressing the common carotid artery during the insertion of the catheter, puncture of the ipsilateral side had to be avoided, and the patient must be followed postoperatively with the use of anticoagulants.

In longitudinal views in another patient, a 58-year-old man (Fig. 1d, e), the plaque bulged from the carotid arterial wall and appeared as if it would be unstable upon pressure. Hence, cannulation of the ipsilateral side must be avoided in this patient, and careful control of blood pressure would be required.

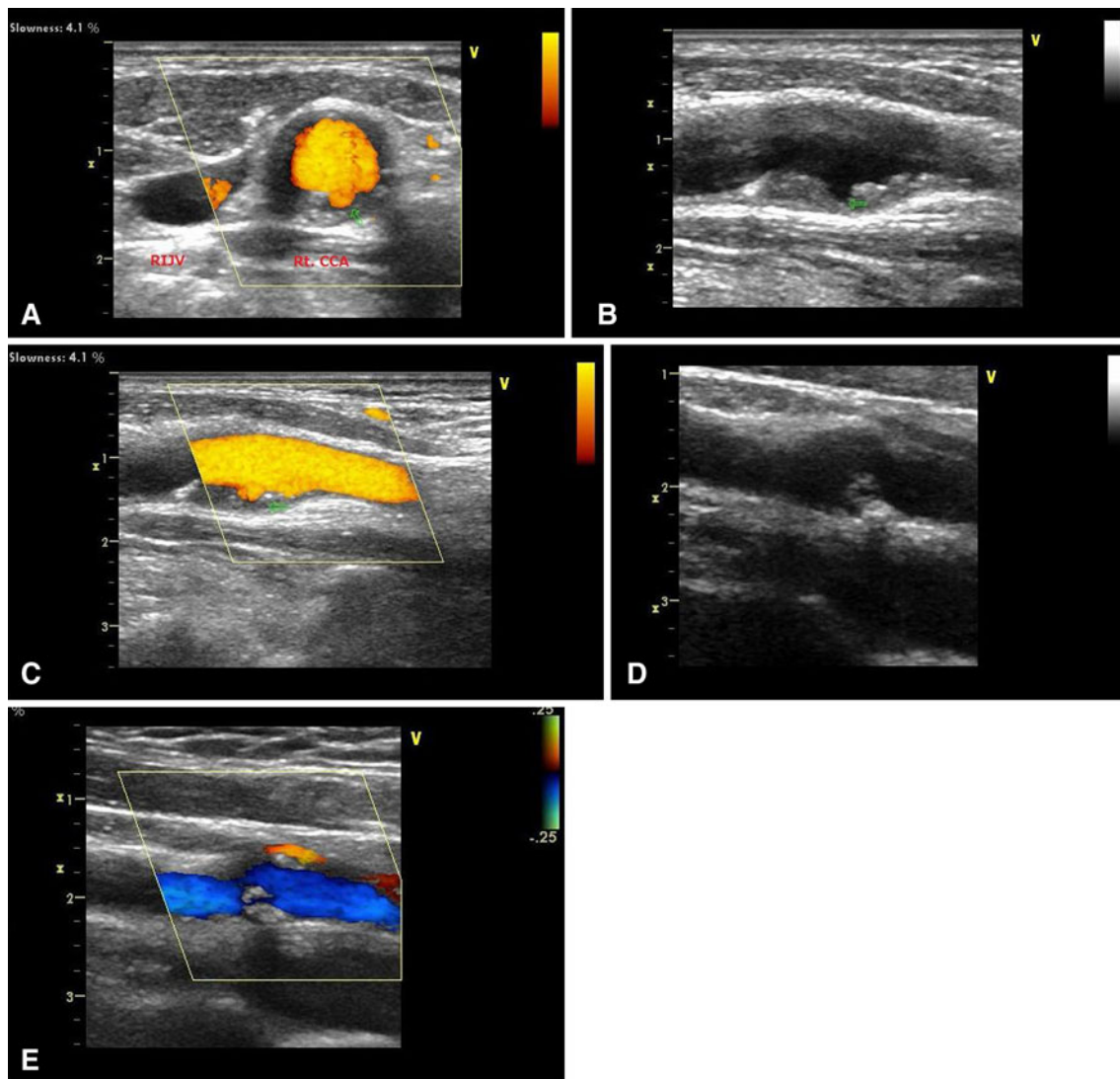


Fig. 1 **a** A transverse view of the B-mode ultrasonogram of the right internal jugular vein (RIJV) and the right common carotid artery (Rt. CCA) with color flow imaging in a 77-year-old man. Carotid plaque is indicated by the arrow. **b** A longitudinal B-mode view of the common carotid artery in the same individual. The morphology of the plaque is heterogeneous, consisting of hypoechoic and echo-lucent parts (indicated by the arrow), reflecting deposits of lipid and cholesterol,

respectively, as well as a hyperechoic part, which reflects stable fibrous tissue. **c** The same longitudinal B-mode view with color flow imaging. **d** A longitudinal view of the common carotid artery in a 58-year-old man. The plaque bulges from the arterial wall and appears to be unstable. **e** The same longitudinal view with color flow imaging

This report highlights the significance of scanning the carotid arteries at the time of performing ultrasound-guided internal jugular venous cannulation, and indicates the efficacy of this simultaneous scanning in reducing the perioperative development of cerebrovascular complications.

References

1. Hollander M, Bots ML, Del Sol AI, Koudstaal PJ, Witteman JC, Grobbee DE, Hofman A, Breteler MM. Carotid plaques increase

the risk of stroke and subtypes of cerebral infarction in asymptomatic elderly: the Rotterdam study. *Circulation*. 2002;105:2872–7.

2. Asymptomatic Carotid Atherosclerosis Study Group. Carotid endarterectomy for patients with asymptomatic internal carotid artery stenosis. *JAMA*. 1995;273:1421–8.

3. Kam PCA, Calcroft RM. Peri-operative stroke in general surgical patients. *Anaesthesia*. 1997;52:879–83.

4. Nosan DK, Gomez CR, Maves MD. Perioperative stroke in patients undergoing head and neck surgery. *Ann Otol Rhinol Laryngol*. 1993;102:717–23.

5. AbuRahma AF, Wulu JT, Crotty B. Carotid plaque ultrasonic heterogeneity and severity of stenosis. *Stroke*. 2002;33:1772–5.