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The Direct Carotid Approach with a Small Skin Incision for Carotid Angioplasty and Stenting

Masanori Tsutsumi, Kiyoshi Kazekawa, Minoru Iko, Tomonobu Kodama, Kouhei Nii, Masanari Onizuka, Shuko Matsubara, Hiroshi Aikawa, Makoto Tomokiyo and Akira Tanaka

Department of Neurosurgery, Chikushi Hospital, Fukuoka University, Chikushino, Japan

Abstract：Back ground：One major limitation of carotid angioplasty and stenting (CAS) is the inaccessibility of the lesion due to systemic atherosclerotic changes. This report introduces a new technique for performing CAS utilizing a direct carotid approach with a small skin incision. Method：This technique was used in five patients in whom a transfemoral approach was not appropriate. The proximal common carotid artery was exposed and directly cannulated with a 7–French sheath, and then the CAS procedure was performed with cerebral protection. The sheath was withdrawn and the puncture site was sutured to achieve definite and quick hemostasis. Results：In all cases, the CAS procedures could be successfully carried out. None of the patients experienced any complications attributable to the direct carotid approach. Conclusions：The direct carotid approach with a small skin incision for CAS is therefore considered to be a safe and effective treatment in cases in which the transfemoral approach is either inappropriate or difficult to perform.

Key words：Carotid stenosis, Direct carotid approach, Endovascular, Skin incision, Stent

Introduction

Carotid angioplasty and stenting (CAS) has been shown to be a durable and effective treatment for patients with carotid artery stenosis. Many reports have demonstrated either good short or long–term outcomes of CAS.[1)–6)] There is a general consensus that establishing CAS is preferable in patients at high risk for undergoing a carotid endarterectomy (CEA).[7)] The transfemoral route is used in most cases for the endovascular treatment of carotid artery stenosis. However, transfemoral intervention is often difficult to perform due to systemic atherosclerotic changes. Under these conditions, a direct carotid puncture is an important and very useful option as an alternative vascular access route. We herein present our technique for performing CAS using a direct carotid artery puncture with a small cervical incision.

Clinical Material and Methods

Patient population

During the period between February 1999 and March 2005, 141 consecutive patients with carotid artery stenosis were treated with CAS at Fukuoka University Chikushi Hospital. Five among the 139 patients were treated with a direct carotid artery puncture using a small cervical incision. The characteristics of these patients are summarized in Table 1. The patient ages ranged from 67 to 77 years (mean 73.6 years). All patients had a history of hypertension and two had diabetes mellitus. CEA was considered to be high risk because the lesion was located at the level of the axis or higher in all patients. Four patients were treated with a direct carotid approach, as transfemoral CAS had been

Corresponding to：Kiyoshi Kazekawa, Department of Neurosurgery, Fukuoka University Chikushi Hospital, 1–1–1 Zokumyoin, Chikushino, Fukuoka, 8188502, Japan
Tel：+81–92–921–1011, Fax：+81–92–928–3890 e–mail：kazekawa@xb3.so–net.ne.jp

unsuccessfully attempted due to the presence of a tortuous cervicocerebral aortic arch. In addition, one patient had been initially treated with a direct carotid approach due to severe arteriosclerosis obliterans (Case 2).

Endovascular treatment

All endovascular treatments were performed under general anesthesia in the operation room with an OEC/GE Model 9800 mobile C－arm (GE－OEC, Salt Lake City, Utah., USA). All patients received aspirin (81 mg/day) and ticlopidine (200 mg/day) for at least 3 days before CAS and continued to receive the same medication after the treatment. The PercuSurge Plus (Medtronic AVE, Santa Rosa, Calif., USA) system was used to prevent the occurrence of distal embolisms during CAS in all patients. A 3–cm longitudinal skin incision was made at the border of the sternocleidomastoid muscle at 2 cm above the clavicle. The proximal CCA was circumferentially exposed and encircled with the vessel tape. An 18–gauge needle was introduced directly into the CCA through the skin just above the clavicle. A 0.035－inch J wire was advanced to the distal CCA, and a 7－French Brite–Tip sheath (11 cm) (Cordis, Miami, Fla, USA) was carefully inserted and positioned under fluoroscopic guidance to avoid the stenotic lesion. The sheath was fixed percutaneously on the skin above the clavicle with sutures (Fig. 1). A 6–0 polypropylene (Prolene) Z stitch was placed around the entrance of the sheath to enable to rapid hemostasis of the puncture site when the sheath was removed. Intraoperative angiograms were obtained through the side arm of the sheath (Fig. 2). The activated clotting time was then maintained at between 200 and 250 seconds throughout the procedure by the intravenous injection of heparin. The PercuSurge GuardWire was gently advanced through the sheath and passed through the stenosis. Next, predilation angioplasty, stent deployment and postdilation angioplasty were performed with cerebral protection. The debris under a protection balloon was removed from the ICA using an aspiration catheter. After the satisfactory treatment of the lesion was completed, the sheath was withdrawn and the puncture site was repaired with the previously placed 6–0 prolene. The skin was closed with 4–0 vicryl and nylon sutures. Systemic heparinization was then continued for 2 days after treatment.

All procedures were successfully carried out. None of the patients developed any complications including new neurological symptoms, neck hematoma at the puncture site, or cranial nerve

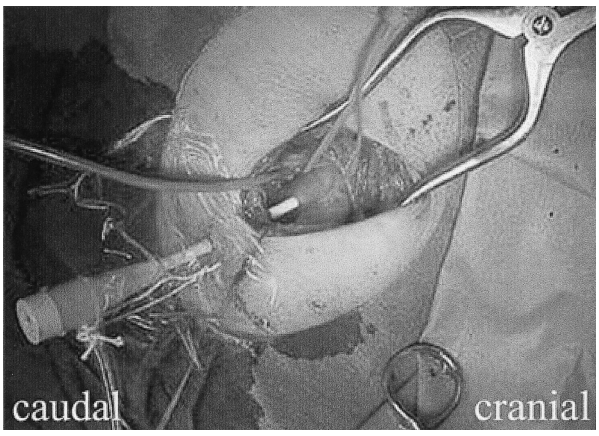

Fig. 1. An intraoperative photograph showing the cannulation of a 7－French sheath directly into the common carotid artery through the skin just above the clavicle. The sheath was fixed percutaneously on the skin above the clavicle with sutures.

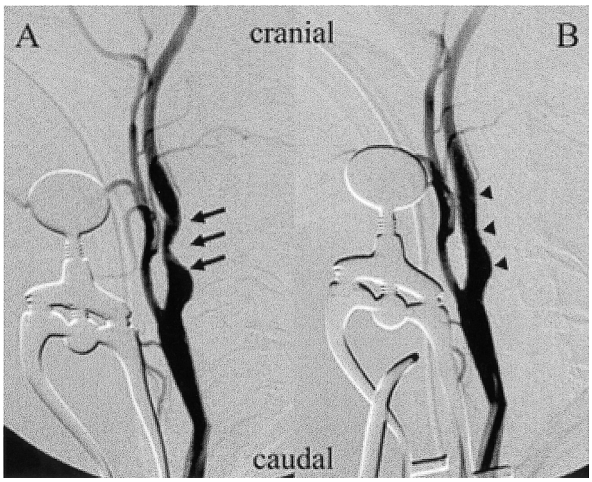

Fig. 2. An intraoperative digital subtraction angiogram (DSA) obtained through the side arm of the sheath demonstrating a high grade stenosis of the left internal carotid artery (arrows) (A). DSA after carotid angioplasty and stenting demonstrating an excellent dilation of the stenosis (arrow heads) (B) .

Table 1 Characteristics of five patients treated with CAS using the direct carotid approach

Case No.	Age (yrs), Sex	Symptom	Location of Lesion	Stenosis (%)		Contraindication for CEA	Complication	Follow Up (month)
				Preop	Postop			
1	67, M	infarct	lt	80	10	high position	—	25
2	76, M	TIA	rt	70	5	high position, IHD	—	13
3	72, M	infarct	rt	60	0	high position	—	12
4	77, M	infarct	lt	70	0	high position	—	11
5	76, M	infarct	lt	80	5	high position, IHD	—	3

M : male, F : female, infarct : infarction, TIA : transient ischemic attack, lt : left, rt : right, preop : preoperation, postop : postoperation, CCA : common carotid artery, — : negative finding, CEA : carotid endarterectomy, IHD : ischemic heart disease

palsy. A follow-up angiogram at 6 months for the all patients demonstrated an excellent dilation of the treated site of the carotid artery.

Discussion

The transfemoral route is used in most cases for the endovascular treatment of carotid artery stenosis. However, the transfemoral approach is sometimes impossible in elderly patients and patients with severe systemic arteriosclerosis due to the presence of severe arterial tortuosity of aortic arches, the brachiocephalic artery, and the cervical carotid artery and aortic aneurysms.[8] Although an approach through or by making use of the brachial artery can be used in some cases, [9)-11)] an approach from the cervical artery can be applied in patients who have aortic aneurysms in aortic arches. As CAS needs a large caliber sheath, small caliber vessels such as the radial or brachial artery are thus sometimes inappropriate thus leading to a risk of postoperative vessel occlusion.[10)12)] The direct carotid approach for CAS is not influenced from other diseased vessels and it has the advantages of shortening the catheter-positioning times and for providing a short access route for reaching the lesion.[5)13)-16)] At our institute, as all CAS procedures were performed by neurovascular surgeons, there was no difficulty in manipulating the proximal CCA. In this study, no complications were observed associated with this technique. The direct carotid approach with a small skin incision for CAS is a safe and effective treatment in cases in which the transfemoral approach is either inappropriate or difficult to perform.

CAS requires strong anticoagulation and antiplatelet therapy during the perioperative period. Under such conditions, sheath removal exposes patients to the risk of neck hematoma and tracheal compression if the hemostasis of puncture site is not sufficient. Recently, percutaneous hemostatic devices have reduced the time to hemostasis, and they have thus been applied for hemostasis after a carotid artery puncture.[17)] However, these devices are still not perfect and they may also cause potential complications such as hematoma, thrombosis, pseudoaneurysm, infection, granuloma formation and arteriovenous fistula.[18)-20)] Therefore, we sutured the puncture site to achieve definite and quick hemostasis to avoid cervical hematoma and prolonging manual carotid compression.[13)15)21)]

Although, this technique has the disadvantage of requiring an incision in the neck, we believe this to be a safe and useful technique especially in cases with both a high surgical risk for CEA and difficulty in performing a transfemoral approach for CAS.

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