Head and Neck Extension-Fixation With a Head Frame for Exposure of the Distal Internal Carotid Artery in Carotid Endarterectomy

—Technical Note—

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Abstract
Adequate exposure of the distal internal carotid artery (ICA) for carotid endarterectomy may be difficult to achieve because of the position of the mandible and associated soft tissues. A simple yet effective use of a head frame is described to gain several centimeters of exposure of the distal ICA. The patient’s head and neck are fixed in an extension position using a radiolucent head frame. Nasotracheal intubation and secure taping of the chin are also employed to keep the mouth closed and to prevent the mandible from spontaneously hanging down. The head frame tightly fixes the patient’s neck, so the mandible does not disturb the surgical field throughout the operation. This simple method maximizes exposure of the distal ICA. The radiolucent head frame also enables intraoperative angiography to confirm the patency of the ICA and the absence of flap formation. This simple technique is useful for exposing the distal ICA.

Key words: angiography, carotid endarterectomy

Introduction
The carotid bifurcation is occasionally located quite high in the neck, so a stenosis may be located at the level of the second cervical vertebra (C-2). Access to the internal carotid artery (ICA) above the C-2 can be challenging during carotid endarterectomy (CEA), even for experienced surgeons. Improving access to the distal ICA often requires a maneuver such as nasotracheal intubation, extended skin incision, anterior subluxation of the mandible, mandibular osteotomy, retraction or division of the posterior belly of the digastric muscle, or division of the styloid process and styloid group of muscles. These techniques may increase exposure, but are time consuming, complicated, and associated with a high incidence of morbidity. Here we describe a simple yet effective use of a head frame to gain several centimeters of increased exposure of the distal ICA.

Technique

The patient’s cervical radiographs or magnetic resonance images should be carefully examined preoperatively because most CEA candidates are elderly and often suffer from cervical spondylosis. Nasotracheal intubation should be employed in a patient with a high lesion expected to be difficult to access by the usual CEA surgical procedure. The patient’s head and neck are tightly fixed in an extension position using the four head pins of a radiolucent head frame (Mizuho Ika Co., Tokyo). After fixation, the patient’s chin is taped securely to keep the mouth closed (Fig. 1).

CEA is performed in the standard fashion as described elsewhere. To expose the distal ICA, we usually continue dissection of the sternocleidomastoid muscle to the skull base. In addition, the distal ICA is often exposed and secured above the hypoglossal nerve. With the patient’s head and neck in the extension position, the distal ICA can be easily exposed without the need to cut the digastric muscle, and the mandible does not disturb
Fig. 1 Photograph showing maximization of exposure of the distal internal carotid artery by nasotracheal intubation, secure taping of the chin, and head fixation in an extension position using a radiolucent head frame.

the operative field by spontaneously hanging down.

Discussion

CEA is one of the most commonly performed vascular procedures, because the outcome is more beneficial than that of medical therapy and because of the anatomic accessibility of the artery. Cases of distal carotid occlusive disease and high cervical carotid bifurcation may have limited surgical access to the distal ICA and so increase the danger of complications such as cranial nerve paresis. Exposure of the distal ICA above the C-2 level can be difficult, and standard approaches may not adequately expose the lesion. The major obstacle to access to the distal ICA is the mandibular ramus. Various techniques have been described to improve exposure of the ICA, such as anterior subluxation of the mandible and mandibular osteotomy. However, these techniques are complicated and associated with a high incidence of morbidity. The present technique using a head frame may improve exposure of the distal ICA without the need for such procedures.

The angle of the mandible in the closed-mouth position may be a full centimeter further from the carotid bifurcation than if the mouth is open. Thus, we employed nasotracheal intubation and secure taping of the chin to keep the mouth closed. The taping may also prevent the mandible from spontaneously hanging down. In general, the patient is usually placed in the supine position for CEA with the head placed on a firm head holder. Even if the head is fixed by taping, the mandible may spontaneously move down during the operation because the taping often becomes loose and thus disturbs the small operative field. Therefore, it is often necessary to retract the mandible and associated soft tissues, which may result in cranial nerve injuries. However, head frame fixation in an extension position provides tighter fixation and good access to the distal ICA without the need to retract the mandible. Head frame fixation has been especially useful for patients with short necks. In addition, the radiolucent head frame allows intraoperative angiography in every direction, as previously reported.

Therefore, although head frame fixation using pins seems a little invasive, there are a number of advantages.

Improved access to the distal ICA can be achieved by employing several techniques such as nasotracheal intubation, extension-fixation by head frame, secure taping of the mandible, extended skin incision, anterior subluxation of the mandible, mandibular osteotomy, or retraction or division of the posterior belly of the digastric muscle. We found head frame fixation to be the simplest, easiest, and least debilitating approach to reliably expose the distal ICA.

References


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Distal ICA Exposure in CEA

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Commentary

The authors have described the use of rigid head fixation with pins and nasotracheal intubation in order to achieve exposure of the high cervical internal carotid artery during endarterectomy. It is certainly an effective means. It would have been interesting for the reader to know how many cases were done this way and how high were they able to get. This technique would not be useful for surgeons doing the procedure under local anesthesia. The advent of endovascular techniques may also diminish the need for exposing the high cervical ICA. Nevertheless, it is a good technique to keep in mind when the surgeon needs access to this area for other purposes, e.g., tumor surgery.

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