Incidence of Cranial Nerve Injuries after Carotid Eversion Endarterectomy with a Transverse Skin Incision under Regional Anaesthesia

A. Assadian,1* C. Senekowitsch,1 N. Pfaffelmeyer,2 O. Assadian,1 H. Ptakovsky1 and G.W. Hagmüller1

Departments of 1General and Vascular Surgery, and 2Neurology, Wilhelminenspital Vienna, Austria

Objectives. The objective of this prospective study was to evaluate the incidence and distribution of cranial nerve injuries after carotid eversion endarterectomy (EEA) performed under regional anaesthesia using a transverse skin incision.

Patients and methods. The study included 165 patients and 180 carotid arteries. All patients had a standard pre-operative assessment performed by a neurologist and ENT specialist. All carotid endarterectomies were performed by the eversion technique under regional anaesthesia.

Results. Ten cranial nerve injuries were observed. Seven patients had injuries of the marginal mandibular branch of the facial nerve, two patients had lesions of the hypoglossal nerve, and one patient had an injury of the recurrent laryngeal nerve. Eleven patients developed hoarseness without cranial nerve injury. Injuries of the marginal mandibular branch recovered after 3–8 months (mean 5.2 months). Both hypoglossal nerve injuries recovered after 4 months. The patient with the recurrent laryngeal palsy had no improvement after 19 months. Patients with hoarseness secondary to laryngeal haematoma recovered within 1 month.

Conclusion. The incidence of cranial nerves injury after carotid EEA under regional anaesthesia is comparable to that reported for conventional carotid surgery. Postoperative hoarseness is most frequently due to laryngeal haematoma.

Keywords: Peripheral cranial nerve injuries; Carotid surgery; Local anaesthesia; Eversion endarterectomy.
and magnetic resonance angiography. All patients had a preoperative standard evaluation by a neurologist and ENT specialist. All three branches of the facial nerve, especially the marginal mandibular branch, the glossopharyngeal nerve, the vagus nerve, the recurrent laryngeal nerve, superior laryngeal nerve, the accessory nerve and the hypoglossal nerve were evaluated according to a protocol. The vocal cords were assessed by fiberoptic laryngoscopy. The same examiner carried out the pre- and postoperative evaluation.

All operations were carried out under regional anaesthesia applying a C2-C3 cervical block. The skin incision was about 2 cm inferior and parallel to the mandible. The reconstruction of the ICA was performed by EEA in all 165 patients and 180 ICA. In all patients, the hypoglossal nerve was identified in order to protect it from traction damage or heat injury.

Postoperatively, re-evaluation was conducted after 4–5 days by a neurologist and ENT specialist. Patients without cranial nerve injuries were discontinued from follow up by ENT specialist and neurologist. Patients with cranial nerve injuries or hoarseness had a monthly follow up until signs and symptoms had resolved.

Results

A total of 10 (5.5%) cranial nerve injuries were observed. In seven patients (3.9%), injuries to the marginal mandibular branch of the facial nerve were identified, and in two patients lesions of the hypoglossal nerve were observed. One patient had an injury of the recurrent laryngeal nerve. Eleven patients (6.8%) developed postoperative hoarseness without detectable neurological deficit. On direct fiberoptic laryngoscopy, all these patients had a considerable haematoma of the larynx of the operated side without compression or obstruction of the airway. No revision was performed, since sonography did not reveal any fluid filled areas indicating the necessity for evacuation.

The marginal mandibular branch of the facial nerve recovered in all patients after 3–8 months (mean 5.2 months). Both hypoglossal nerves recovered after a follow up of 4 months. The patient with the recurrent laryngeal nerve palsy had no improvement after 19 months of follow up and speech therapy. The patients with hoarseness secondary to a laryngeal haematoma all recovered after the haematoma had resolved after 1 month of follow up.

All surgeons performing the operations were right handed. Three lesions of the marginal mandibular branch of the facial nerve were on the right side, four on the left. One hypoglossal lesion was on the left, one on the right side. The recurrent laryngeal nerve palsy was on the right, and of the patients with hoarseness, seven had their haematomas on the left and four on the right side.

The incidence of perioperative neurological deficit was 1.7% (n=3), two being transient without CT changes, the other being a non-disabling stroke. Thus, the incidence of perioperative stroke was 0.5%. One patient suffered from a non q-wave myocardial infarction. No perioperative mortality was observed.

Discussion

ICA re-vascularisation and avoidance of perioperative stroke is the main objective of carotid artery surgery. However, cranial nerve injuries are a complication of carotid artery surgery,¹³–¹⁶⁷ which is partly explainable by the anatomic topography of the carotid triangle (Fig. 2). Cranial nerve damage may not always
be avoidable under specific anatomic circumstances in order to perform a safe ICA reconstruction without central neurological deficit. Nevertheless, meticulous surgical technique and exposure of anatomic structures may avoid a great proportion of peripheral cranial nerve lesions.

The reported incidences of hypoglossal nerve injuries after carotid artery surgery vary from 2.2 to 10.7%.6–8 The predominant operative technique applied in these studies was open endarterectomy with or without a patch. This technique does not necessitate as much dissection of the ICA and its surrounding structures as is necessary in EEA. We believe visualisation of the hypoglossal nerve to be imperative to avoid damaging the nerve, which makes traction and heat injuries less likely. Yet, higher incidences of cranial nerve lesions after EEA compared to endarterectomy with or without patch have been reported.8 The authors concluded that extensive dissection of the ICA in EEA may be the reason for higher nerve injury rates.

In our study, we observed hypoglossal nerve palsy in only 1.1%. Both patients with hypoglossal nerve lesions had an unfavourable anatomy with a high carotid artery bifurcation necessitating exposure of the distal ICA with a hand held Langenbeck retractor by lifting the hypoglossal nerve. The neurological deficits, difficulties in mastication, speech and foreign body feeling in the mouth, disappeared gradually within 4 months.

Injuries of the marginal mandibular branch of the facial nerve encompassing carotid artery surgery occur between 0.4 and 12%,4,8 resulting in lip drop of the operated side. Compared to other elective surgery of this region, these numbers are favourably low. In parotid gland surgery, lesions of the marginal mandibular branch occur in 17–43%.10,11 In submandibular surgery for benign tumor resections, the incidence of marginal mandibular branch lesions was reported to be more than 28%.12 The incidence of injuries of the marginal mandibular branch of the facial nerve in our patients was 3.9%. A skin incision parallel to the mandible necessitates frequent traction towards the margin of the mandible in order to expose the ICA properly. Therefore, compression of the nerve is sometimes inevitable. Nonetheless, since all neurological deficits in our series were reversible, it appears to be an acceptable trade-off for the favourable cosmetic outcome. The transverse skin incision and its almost invisible scar is also an important aspect in patient satisfaction.

Due to its long anatomic course, the vagus nerve and its recurrent laryngeal branch are particularly at risk of damage during surgery of the neck. In thyroid surgery, transient recurrent laryngeal nerve palsy is reported to occur in 6.6–8.7%.13,14 Permanent palsy to this cranial nerve occurs in more than 1%.14

The reported incidence of recurrent laryngeal nerve lesions after carotid endarterectomy varies between 1.2 and 7%.6,8 The lesion of the recurrent laryngeal nerve in our study was a solitary event (0.5%) and hardly explainable by technical shortcomings. One possible explanation is a non-recurrent laryngeal nerve. This is described with an incidence of 0.3–0.8%.15,16 This variety is predominantly on the right side, which was also the operative side of our patient with the recurrent laryngeal nerve injury. The patient has only little improvement of his symptoms. Nevertheless, long follow up and reassurance of patients is warranted, since a recovery interval of up to 37 months is possible.5

The most common cause of hoarseness in our series was not due to cranial nerve injuries but associated with laryngeal haematoma. A lesion of the superior laryngeal nerve and recurrent laryngeal nerve could definitely be excluded in these patients by fibreoptic laryngoscopy. Since all patients were operated on under a cervical block, trauma from intubations was not responsible. However, an alteration in voice...
quality without fibreoptically detectable nerve damage appears to be highly prevalent in patients with extensive mobilisation of the ICA and all neighbouring structures. This might be due to more subtle nerve damages or irritation due to haematoma.

In conclusion, functional impairment of cranial nerves after carotid surgery with a cosmetically favourable transverse skin incision is comparable to previously reported series. All but one cranial nerve impairments were transient. Postoperative hoarseness was most frequently due to laryngeal haematoma and not due to cranial nerve lesions.

References


Accepted 21 June 2004
Available online 10 August 2004