Cervical Nerve Injury After Carotid Endarterectomy

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Objective: to determine the extent and direct significance of cervical nerve injury after carotid endarterectomy.

Material and methods: fifty-two patients (61 operations) were followed by means of patient history and neurological examination between 3 and 55 months following carotid endarterectomy.

Results: sixteen operated sites showed normal sensitivity. Patients assessed 3–6 months after surgery showed on average a neurological loss of 3.4 points (scale from 0–4). Patients assessed after 7–12 months had on average a deficit of 2.1 points. After 13–24 months the score was at 1.4 and after the second postoperative year the score yielded only 0.4 points.

Conclusion: loss of cervical nerve sensation is always present after carotid endarterectomy but tends to improve with time. However, the timing and extent of this improvement is unpredictable. Patients are usually not disturbed by these changes.

Key Words: Cervical nerve dysfunction; Cervical nerve damage; Carotid endarterectomy.

Introduction

Cervical nerve injury following carotid endarterectomy has received little attention.

The aim of this study was to determine the degree of postoperative cervical nerve dysfunction and to determine whether our patients were bothered by the change of sensation.

Material and Methods

From March 1995 until June 1999 52 patients, all operated on due to carotid stenosis, were followed-up at our hospital. Male gender dominated with 40 vs 12 patients. The average patient age was 67.7 years with a range between 49 to 83 years. Due to the fact that nine patients were operated on both side, 61 operations could be evaluated. The right side was operated on 33, the left side 28 times.

All patients were operated on by the same surgeon. The surgical access was standardised. Skin, subcutis and platysma were transected parallel to the anterior border of the sternomastoid muscle. Nerve branches running across the operative field were not spared.

As a result of the encountered anatomy¹ all nerve branches from the transversus colli nerve were transected. The anterior part of the greater auricular nerve was divided if necessary to gain access to the carotid artery lesion. This led to typical postoperative sensitivity deficits in the anterior cervical region, the angle of the jaw and the anterior part of the ear² (Fig. 1). Wound closure was performed using a continuing resorbable platysma suture and skin stapling.

Data regarding operation were registered retrospectively using patient records. Patients were seen postoperatively, after 3 and 12 months by a neurologist.

The examination of objective and subjective disability of the patients by sensory impairment was done by an independent neurologist prospectively using standardised test with emphasis on hypesthesia/dysaesthesia, hypalgesia/dysalgesia, Tinel sign and scar pain. The time interval between this examination and operation was at least 3 days and at the most 55 months. Aesthesia (sensation of touch) was tested with a cotton swab, algesia (sensation of pain) with a pin prick. Neurological discrepancies were documented graphically and depending on the size of dysfunction graded using a score ranging from 0–4 points. Any type of change of sensation in the entire innervation region of the transversus colli nerve or the greater auricular nerve were each given two points. For example, the typical postoperative scenario of complete loss of both nerves (Fig. 1) resulted in a score of 4.

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Fig. 1. Surgical access parallel to the anterior border of the sternomastoid muscle. Resulting in transection of different nerve branches, leading to sensibility dysfunction in the marked areas.

Table 1. Degree of neurological dysfunction dependent on the time interval between surgery and follow-up.

<table>
<thead>
<tr>
<th>Interval (month)</th>
<th>Neurological dysfunction (points)</th>
<th>Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>3–6</td>
<td>72%</td>
<td>14%</td>
</tr>
<tr>
<td>7–12</td>
<td>7%</td>
<td>29%</td>
</tr>
<tr>
<td>13–24</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>&gt;24</td>
<td>5%</td>
<td>28%</td>
</tr>
</tbody>
</table>

Results

At the time of follow-up 16 cases out of 61 operations showed completely normal sensitivity. In the other 45 we found a sensitivity dysfunction, usually in form of hypalgesia or hypaesthesia. Nine patients showed dysesthesia or dysalgesia. To simplify matters we will speak only of sensibility dysfunction and not differentiate between dys- and hypalgesia or dys- and hypaesthesia. Table 1 shows the degree of neurological dysfunction depending on the time interval between operation and follow-up. It can clearly be seen, that the number of patients with grave neurological deficits, scored with 4 points decreases as the interval between operation and follow-up is increased. Parallel to this decrease in severity over time one finds an increase in patients with only slight neurological deficits (1 point) and those presenting normal sensitivity (0 points). A restitutio ad integrum (normal sensitivity) could be found at the earliest after 15 months. Figure 2 shows the course of the average neurological deficit. Here too, one can see a clear regression of neurological deficit as the time interval between operation and follow-up is increased.

Local postoperative complications were found in eight cases. The complication was always a wound haematoma. Surgical treatment was needed six times, twice conservative treatment was employed. There was no difference in the neurological course of these eight cases compared to patients without local wound healing complications.

We observed no injuries of the hypoglossal – and recurrent laryngeal nerves. Nevertheless we did not routinely performe laryngoscopy pre- and postoperatively. The 30 day combined mortality and neurological event rate was 0 percent.

No patient developed a Tinnel sign or showed any indication for a neuroma. At the time of follow-up only two patients, corresponding to three operations, described their neurological dysfunction as bothering. Nobody complained of scar pain. Four patients complained of the ability to feel weather changes.

Discussion

Cranial nerve lesions after carotid endarterectomy have been discussed in the literature previously. Lesions of sensitive cervical nerve branches are rarely mentioned. As a consequence the number of cervical
nerve lesions found in literature is very low (about 1%). One must assume that in reality there is a longer number. Dehn et al. found in a prospective study that one week postoperatively 26/43 operations showed a lesion of the greater auricular nerve and that 30/43 showed a lesion of the transversus colli nerve. The same study indicated an improvement of neurological function 6 months after surgery. Our patients always showed a few days after surgery a complete loss of the transversus colli nerve and of the anterior branch of the greater auricular nerve. The degree of neurological deficit at the site of the ear lobe varied.

The prospective study by Aldoori and Baird confirms our results about recovery of sensory loss in relation to the time interval between operation and follow-up. The lower incidence of injury to the anterior branch of the greater auricular nerve in the study of Aldoori of 42% 1 week postoperatively in comparison to our results (100% immediate after operation) needs explanation. Firstly, Aldoori and Baird did not define detailed criteria for the investigation of sensory nerve damage. Secondly, they used a transverse skin incision in one-third of their patients. In conclusion the studies cannot be compared because of differences in design.

Because the injury involved is a neuritis, recovery is caused by a sprouting of axons from the proximal end of the injured nerve. Without a guiding structure to follow, the process is disorganised and the regeneration differs greatly among individuals. This is the reason why there is such a large difference in the areas of intact and defective sensibility. Addressing the pace at which the recovery takes place our results differs to these reported by Whittemore.7 He reports an improvement of most lesions after 6–8 weeks. Recovery took longer with our patients. Complete recovery of sensation took at least 15 months.

Surprisingly, we found no neuromas. The tendency to form neuromas differs from nerve to nerve. We assume the tendency to form neuromas is much smaller with the greater auricular and the transversus colli nerve than with the superficial branch of the radial nerve or the saphenous nerve.

Primarily we expected dysaesthesias an dysalgesias to have a higher subjective morbidity than hypoesthesias and hypalgesias. This however was not true. As a consequence we did not differentiate the different qualities while analysing our data. Our patients were usually not bothered by postoperative changes in sensation. The two patients (three operations) complaining about subjective changes in sensitivity had relatively short postoperative time intervals (3, 5 and 10 months) and showed extended neurological deficits. According to our results both patients have a good chance that their neurological situation will improve over time. We hope, that the subjective morbidity will also improve in light of this information. One has to get used to a different feeling while using a telephone (ear lobe) or while wearing tight clothing around the neck e.g. tie, scarf. Men report that they have to be more careful while shaving.

A high degree of recovery over a period of months and the look of morbidity after transection of sensitive cervical nerve branches during carotid endarterectomy results in no disadvantage of surgical therapy in the treatment of carotid stenosis. This fact appears all the more important to us because the endovascular therapy is becoming increasingly more popular. However it is imperative that patients are informed pre-operatively about disturbances in sensation that might occur in the face/neck area. Whether or not a transverse incision might cause less neurological damage cannot be answered at present.

References

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