Simultaneous Bilateral Carotid Endarterectomy under Cervical Plexus Blockade

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In patients with severe carotid artery stenosis who developed transient ischemic attack, carotid endarterectomy is one of the most effective treatments. In particular, in patients with contralateral carotid artery lesions, there is a risk of serious neurologic complications during the intra-operative period. Experienced staff can perform simultaneous bilateral carotid endarterectomy safely in carefully selected patients. The advantages of regional anaesthesia in carotid endarterectomy are evaluation of intra-operative neurological condition and defining correct indications for shunt usage. It is a cheap, reliable and easy method that reduces the length of stay in the intensive care unit and in the hospital and may influence the overall cost of care. However, it is important to make dose adjustments to avoid potential complications of nerve involvement during bilateral procedure. In this case report, we share our experiences regarding bilateral carotid endarterectomy under cervical plexus blockade.

Keywords: Cervical plexus, nerve block, carotid endarterectomy, carotid stenosis

Introduction

After cancer and heart diseases, cerebrovascular diseases are diseases that cause the most deaths worldwide. Carotid artery stenosis is one of the leading causes of cerebrovascular diseases and it is responsible from 20% to 25% of all strokes (1). Carotid endarterectomy (CEA) is the gold standard treatment in symptomatic patients with stenosis of >70%, whereas the debate still continues for asymptomatic patient group (2). CEA reduces the risk of stroke in symptomatic patients with high-grade internal carotid artery (ICA) stenosis. Even though bilateral carotid artery stenosis is common, performing endarterectomy in the same session is not commonly preferred. Staged endarterectomy approach is commonly accepted. However, in particular, patients with bilateral stenoses of ≥90% and those with ulcerous, calcified and high-risk embolism plaques, bilateral endarterectomy in the same session is preferred because of a high risk of embolism in the time between staged treatments.

CEA is performed under general or regional anaesthesia. There is no conclusive result regarding the superiority of either method (3). Cervical plexus block facilitates following of the patient's neurological status during CEA and allows early response in case of deterioration. Particularly in patients who also have contralateral carotid stenosis, performing CEA on an awake patient is advantageous regarding closely monitoring the neurological condition and determining the need for a shunt. However, dose adjustment is required during bilateral practices to prevent respiratory distress, particularly because of phrenic nerve involvement.

In our case report, we shared our experience of cervical plexus blockage of a patient that was planned to undergo bilateral CEA in the same session.

Case Presentation

An 80-year-old male patient who was 176 cm tall and weighed up to 72 kg having hypertension, type 2 diabetes mellitus and a history of coronary artery bypass surgery from 3 years ago was admitted to the out patient clinic with complaints of fainting, numbness on the left side and loss of power. His physical examination revealed a 3/5 motor function disorder on the left side. His computed tomography angiography revealed 90% stenosis in bifurcation level, 70% stenosis in ICA proximal as well as

severe calcified plaques on the right and 70% stenosis in bifurcation level and ICA proximal on the left (Figure 1). Because of the presence of critical stenoses on both sides and widespread ulcerous and calcified plaques, patient was planned for bilateral CEA in the same session, taking the high risk in the waiting period of the staged treatment into account. Patient's laboratory findings were normal and consent regarding surgical and anaesthesia operations as well as regarding the possible use of intervention as a scientific publication were obtained from him. Upon finalizing pre-operative preparations, the patient was admitted to the operation theatre. Pre-medication was performed with 2-mg midazolam; peripheral vascular access was established with 16-G catheter and routine monitoring of the patient was performed with electrocardiography. Peripheral oxygen saturation and blood pressure were monitored with radial artery cannulation. On admission to the operation theatre, the patient's blood pressure values were measured as 190/95 mmHg, heart rate as 86/min and oxygen saturation as 96%. Patient's arterial blood gas values at the start of the operation were as follows: pH: 7.38, pO_2 : 85 mmHg, pCO_2 : 35 mmHg and HCO_3 : 22 mmol/L. With regard to choosing the side to start the operation, the right side took priority because of a higher level of stenosis and presence of ulcerous plaque. For deep cervical block application, C2, C3 and C4 transverse processes were determined first on the right and then on the left; 3 cc to each spot on the right side (9 cc in total) and 4 cc to each spot on the left (12 cc in total) of 0.5% bupivacaine (Marcaine 0.5%; AstraZeneca, Istanbul, Turkey) were administered. For superficial cervical block application; skin was entered perpendicularly from the mid-point of the posterior border of the sternocleidomastoid muscle, deep cervical fascia was passed and 4 cc of 2% of prilocaine (Priloc 2%; Vem Medicine, Istanbul, Turkey) to each side at caudal and cephalic directions (8 cc in total) were administered. During the operation, the patient's state of consciousness was observed by the answers that he provided to verbal questions; his motor functions were observed by ensuring the squeezing of a stress ball placed on the opposite hand of the operation side.

Figure 1. Computed neck tomography angiography image

Neck was placed in the left hyperextension position in the supine position. Following surgical site cleaning, 5000-IU intravenous (IV) heparin was administered to the patient. Following the incision made along the medial border of the sternocleidomastoid muscle, common carotid artery was explored with blunt and sharp dissections and was returned. Test occlusion was performed in the right carotid artery. Patient was observed for 3 min and no change in his neurological status was observed; arteriotomy was performed. Endarterectomy was performed without applying shunts. Cross-clamp time on the right side was measured as 32 min. After endarterectomy, arteriotomy was closed with a Dacron patch. Following the control of haemorrhage, we proceeded to the left side. Herein, same processes were repeated and left endarterectomy was concluded after a cross-clamp time of 25 min (Figure 2). After removing the left cross-clamp, 100 cc of 20% mannitol, 250 mg methyl prednisolone and 50 mg ranitidine were intravenously administered to the patient. Following the control of haemorrhage for both sides, the drain was placed and the layers were closed considering their anatomical structures (Figure 3). During the intervention, the patient's blood pressure values remained between 150/80 mmHg and 190/90 mmHg, heart rate between 85/min and 100/min and oxygen saturation between 96% and 98%. His intraoperative blood gas values were observed as follows: pH: 7.36, pO_2 : 99 mmHg, pCO_2 : 32 mmHg and HCO_3 : 22 mmol/L. Patient was admitted to intensive care following the intervention. Upon no complications arising,

Figure 2. Image after bilateral carotid endarterectomy

the patient was sent to the ward in the 6th post-operative hour. After his follow-ups in the ward, he was discharged on the 3rd post-operative day.

Discussion

In patients with carotid artery stenosis, staged endarterectomy has certain disadvantages compared with bilateral endarterectomy that is performed in the same session. Among these are repeated anaesthesia application, repeated surgical stress, prolonged intensive care and hospitalisation times as well as their negative psychological effects on the patient and increase in the risk of cranial haemorrhage because of second heparinisation (4). Simultaneous bilateral CEA can be safely performed, particularly with an experienced team, a proper choice of patient and a careful pre-operative evaluation (5). There is no consensus yet regarding the preferred anaesthesia method; many clinics prefer CEA under regional anaesthesia, particularly in patients with bilateral lesions, to observe patient's neurological status and to determine the shunt indication. However, a study has shown that general anaesthesia has a protective effect for cerebral hypoxia (6). There is a 2%–7.5% risk of perioperative stroke solely because of CEA process (7). Temporary interruption in the cerebral blood flow after cross-clamp during CEA can cause haemodynamic neurological damage. This can be prevented using a shunt, but there is no sufficient evidence that support the routine or selective use of shunts during CEA. There is a 1%–3% risk

of embolism and dissection risk in shunt placement. Furthermore, it is not always possible to ensure the necessary blood flow in the brain with a shunt (8). As a result of the 'GALA Trial', a multi-centred, controlled randomised study, it is revealed that the use of local anaesthesia reduces the need for shunt from 43% to 14%. However, a difference could not be shown in the same study regarding peri-operative death, stroke or myocardial infarction between local anaesthesia and general anaesthesia (9). However, in a study, it has been reported that the risk of myocardial infarction increases in the general anaesthesia group (10). In another study, a neurological event occurred in 23 of the 310 patients that have contralateral carotid occlusion; no significance was detected among those operated under general anaesthesia regarding the risk (11). Even though regional anaesthesia does not affect the intervention results of CEA, it provides patient comfort in the post-operative period without the need of recovery time of general anaesthesia and reduces hospitalisation time and cost (12). Despite all these advantages, complications because of phrenic recurrent laryngeal nerve, vagus and stellate ganglion involvement can be observed, particularly in bilateral cervical plexus block applications. Among these, phrenic nerve involvement can lead to serious consequences (13). In particular, phrenic nerve involvement is observed more after deep cervical plexus block (14). The dose of local anaesthetics is an important limiting factor in bilateral cervical plexus blockage application. Limited and concentrated use of this dose may decrease the incidence of complications (15). In case of an urgent intubation after a respiratory distress or cardiac arrest that may occur during the manipulation of carotid arteries, one must be prepared, particularly for difficulty in airway control. Failures in baroreflex or chemoreflex mechanisms that may occur as a result of an injury in the carotid sinus during CEA can lead to circulatory or respiratory problems. Changes in vagal and sympathetic activities can be detected by baroreceptors in milliseconds, thereby enabling the regulation of blood pressure. A failure in this mechanism that may occur after CEA can result in a previously non-existing hypertension response; as a result, patients may develop post-operative hypertension. Because of our patient being old and having severe symptomatic carotid stenosis along with the presence of a seriously ulcerated lesion in his contralateral carotid artery, our council opted for same-session bilateral carotid artery endarterectomy considering the patient's high risk of stroke during the period between the staged processes. Owing to the above-mentioned risk factors, it was decided that the patient should be operated under cervical plexus blockage. Local anaesthetics used in the patient were administered at lower doses to prevent a possible phrenic nerve involvement. For this reason, hoarseness was not observed in the post-operative period. Precautions for difficult airway were taken considering the possibility of switching to general anaesthesia. No neurological problems were observed during the intraoperative period; therefore, there was no need for using a shunt.

Figure 3. Post-operative image

Conclusion

CEA can be safely performed with an experienced team in some patients. Regional anaesthesia in carotid endarterectomies is an effective method, both with regard to cost and quick detection of intraoperative neurological complications that may occur. It significantly reduces the duration of stay of patients in intensive care and in hospital.

Informed Consent: Written informed consent was obtained from patients who participated in this case.

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