SHORT REPORT

A Different Repair Technique for Carotid Artery Injury

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Introduction

In penetrating carotid injuries, surgical intervention must be performed as an emergency to prevent active bleeding and to restore cerebral blood flow. Preservation of the carotid circulation by direct repair or interposition grafting decreases mortality by 15–20% whereas the overall mortality from this injury has been reported to be as high as 66%.

Patient and Technique

A 20-year-old male received a single high velocity gunshot wound to his neck. He was awake and oriented, but quadriplegic. A 1.5 cm entry wound was seen at the angle of the mandible on the right. His neck was explored through a standard incision along the sterno-cleidomastoid muscle. The internal jugular vein, the carotid bifurcation and the spinal cord were all transected by the bullet.

An intraluminal shunt was immediately placed between the open ends of the common and the internal carotid arteries to restore continuity of flow. The external carotid artery and the internal jugular vein were ligated. After injured segments were excised, a reversed saphenous vein graft was anastomosed end-to-side to the common carotid artery and to the internal carotid artery (Fig. 1a). After the anastomoses were completed, the common and internal carotid arteries were clamped whilst the shunt was removed. The common carotid artery stump was ligated before the clamp was removed. As soon as the graft filled with blood, the clamp was replaced again. The internal carotid artery clamp was released and the internal carotid artery stump was ligated. Finally, the common carotid artery clamp was removed again and carotid circulation was reestablished (Fig. 1b).

Discussion

It is reasonable to employ shunting for complex injuries requiring graft reconstruction, especially in the presence of preoperative neurologic deficits or severe

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Fig. 1. (a) Injured carotid artery containing the shunt is bypassed with reversed saphenous vein graft. (b) After the anastomoses are completed, the shunt is removed and carotid stumps are ligated. ICA = internal carotid artery; ECA = external carotid artery; S = shunt; RSVG = reversed saphenous vein graft; CCA = common carotid artery.
hypotension. In routine use, an inlying shunt is passed through the conduit. With this manoeuvre the distal anastomosis and part of the proximal anastomosis can be performed over the shunt. The rest of the second anastomosis is completed after removing the shunt.\(^3\) In our technique, the shunt is removed as a single procedure, thus reducing cross-clamping time. Any type of shunt can be used. Both anastomoses are completed before removal of the shunt since the bypass vein does not contain the shunt. After completion of the anastomoses, the shunt is easily removed. Using this technique the anastomotic configuration does not appear to be ideal, because end-to-end anastomosis is more haemodynamically efficient than end-to-side anastomosis. The greater the angle between the graft and host vessels, the greater the energy losses become. A graft leaves or enters a host vessel at an angle and flow disturbances are created, resulting in zones of flow separation, stagnation, turbulence, and distorted velocity vectors.\(^4\) In our technique, ligated and free-ended arterial stumps minimise the anastomotic angle and the energy losses are reduced. Flow separation is also prevented by ligation of the stump close to the anastomosis. We think that flow disturbances are similar to those seen with end-to-end anastomosis.

An important limitation of this technique is that it is not possible where the carotid stump is short. However, we conclude that this technique may be advantageous as a simple manoeuvre in selected trauma cases.

**References**