Mechanical thrombectomy for the treatment of acute ischaemic stroke following pulmonary lobectomy

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ABSTRACT

Acute ischaemic stroke is a devastating postoperative complication that significantly impacts upon a patient's quality of life. Endovascular retrieval of thromboembolic material from proximal cerebral arteries by mechanical thrombectomy is the new standard of care for patients presenting with a proximal artery occlusion. We report the case of a patient developing an acute ischaemic stroke following pulmonary lobectomy, who was transferred to the regional neurosciences unit, despite the absence of an established referral pathway, to undergo mechanical thrombectomy, with significant prognostic neurological benefit. We would advocate all cardiothoracic centres identify their regional neurosciences unit and initiate discussion to establish a referral pathway.

KEYWORDS

Acute ischaemic stroke – Mechanical thrombectomy – Postoperative

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Introduction

Following the introduction of thrombolysis as a treatment option in the management of acute ischaemic stroke, there has been some disparity in treatment options following acute ischaemic stroke between medical and postoperative surgical patients – since recent surgery is a contraindication for thrombolysis – which probably results in inferior neurological outcomes. More recently, percutaneous retrieval of thromboembolic material from the cerebral circulation, mechanical thrombectomy, has emerged as a highly successful treatment option.^{1,2} There is now accumulating evidence that mechanical thrombectomy results in significantly improved neurological outcomes when compared with alternative treatments, even when thrombolysis is contraindicated. To date, there are limited reports of mechanical thrombectomy being performed in postoperative acute ischaemic stroke. We report the case of a patient who suffered an acute ischaemic stroke on postoperative day one following a video-assisted thoracoscopic lobectomy who successfully underwent mechanical thrombectomy.

Case history

An 84-year-old man with a biopsy proven T2b N0 M0 squamous cell carcinoma of the left upper lobe was referred for

surgical resection (Fig 1). His past medical history included chronic obstructive pulmonary disease and hypertension. He also had a vocal cord lesion under investigation with ear, nose and throat surgeons. He was an ex-smoker with an 80-pack/year history. Preoperative pulmonary function tests revealed forced expiratory volume-one second 1.95 l (66.36%), forced vital capacity 5.12 l (129.3%) and transfer factor for carbon monoxide 3.75 mmol/minute/kPa (43.4%). Preoperative echocardiography revealed normal biventricular function, with mild aortic stenosis.

The patient underwent a uniportal video-assisted thoracoscopic left upper lobectomy. He made a good recovery from the anaesthesia and was transferred to the ward pain free after two hours. He received prophylactic tinzaparin on the night of surgery. The following morning the surgical team were called to review the patient as he had suddenly developed neurological symptoms. On review, he was found to be globally aphasic and dysarthric and had a dense hemiplegia with significant weakness and sensory deficit in his right arm and leg. Assessment confirmed a National Institute of Health Stroke Score (NIHSS) of 17, representing a moderate to severe stroke severity. He underwent unenhanced computed tomography (CT) 40 minutes later, which was reported not to demonstrate any acute intracranial pathology. In view of the degree of neurological impairment, we contacted our local neurology

service and were initially recommended to manage the patient conservatively.

We decided to pursue the possibility of mechanical thrombectomy and contacted our local neuroradiology team (based at the regional neurosciences centre 20 miles away). Fortunately, a neurointerventional radiologist was on call and advised a CT angiogram from the aortic arch to the vertex of the skull, which was performed 5.5 hours following the onset of symptoms. The scan was reviewed and the patient deemed appropriate for mechanical thrombectomy owing to the presence of an occlusion of the M1-segment of the left middle cerebral artery (MCA). The CT angiogram also demonstrated a tight stenosis of the left carotid bifurcation, complicating access to the intracranial occlusion, and an occlusion of the contralateral internal carotid artery. The patient was transferred to regional neurosciences unit by an emergency ambulance and the procedure was commenced five hours following the onset of symptoms. On arrival, the patient underwent perfusion CT, which confirmed a large perfusion deficit in the left MCA territory (Fig 2a), with a cerebral blood volume map of the same region demonstrating the ischaemic brain to be recoverable.

The procedure was performed under general anaesthesia. Angiography confirmed the presence of a significant stenosis at the bifurcation of the left common carotid artery (Fig 2b), which was angioplastied and stented (Fig 2c), and an occlusion within the left MCA (Fig 2d). The occlusive thrombus was retrieved by mechanical

thrombectomy (Fig 2e) and subsequent angiography demonstrated almost complete reperfusion of the ischaemic territory (Thrombolysis In Cerebral Infarction score 2b). The immediate post-procedure perfusion scan demonstrated complete normalisation of left MCA perfusion (Fig 2f). The patient was transferred to the neurocritical care unit and extubated successfully later the same day, then transferred back to our centre six days later. On arrival at our hospital, the neurological improvement was notable. His NIHSS score had reduced to 6. He was able to walk with almost normal power in his right leg and there was significant improvement in his right arm power. His dysarthria had also significantly improved. He had developed a postoperative lower respiratory tract infection, for which he was treated with intravenous antibiotics, and had dysfunctional swallow, for which he received temporary nasogastric feeding (although speech and language therapy review considered that this might represent a chronic problem). He was transferred to his local hospital for continuing stroke rehabilitation.

Discussion

Mechanical thrombectomy is an emerging treatment with excellent outcomes, proven in multiple large randomised controlled trials.^{1,5} In the immediate postoperative patient population, experience with mechanical thrombectomy is very limited with only a handful of cases reported.⁴⁻⁶

Figure 1 a) Perfusion computed tomography revealing the left middle cerebral artery perfusion deficit. b) Carotid angiography demonstrating stenosis at bifurcation of left common carotid artery (red circle); c) which was subsequently stented. d) Cerebral angiography revealed a filling defect within the proximal left middle cerebral artery (red circle); e) that was subsequently retrieved by mechanical thrombectomy. f) Immediate post-procedure perfusion computed tomography confirming restoration of left middle cerebral artery perfusion.

Unfortunately, this service is not widely available, but is currently being commissioned to provide a service not dissimilar to the percutaneous coronary intervention services that now exist for acute myocardial infarction.

Mechanical thrombectomy is currently indicated for the management of acute ischaemic stroke with proximal large artery occlusion of the anterior circulation in a patient in whom the procedure can be performed within six hours of symptom onset, although some recent studies extend selection of patients up to 24 hours following symptom onset if CT perfusion-based criteria can be met.^{3,7} Mechanical thrombectomy has been proven to be safe, superior to thrombolysis and effective for reducing disability with numbers needed to treat for one additional person to achieve functional independence as low as 3–7.5.^{1,2} Furthermore, there is also evidence that is cost effective in the management of patients suffering an acute ischaemic stroke.⁸ Thrombolysis is usually performed in addition to thrombectomy, but this is not possible in the post-surgical population. There is evidence though that thrombectomy alone is efficacious resulting in improved outcomes despite the absence of thrombolysis.^{5,9}

Our experience has demonstrated that it is feasible to diagnose, refer and transfer a patient for mechanical thrombectomy in a satisfactory timeframe, even in the absence of an established referral pathway. The process required some logistical effort and we have learnt a lot from this first experience which has prompted review of

our guideline for the management of acute postoperative stroke.

We will now request an unenhanced CT and CT angiogram as the initial investigations for a patient with presumed acute ischaemic stroke with a defined symptom onset and a NIHSS score greater than 6, who could therefore be a candidate for mechanical thrombectomy, as it is recognised that early appropriate imaging is central to the success of mechanical thrombectomy (Fig 2).¹⁰ We are also in discussion with the regional neurosciences centre with the aim of establishing a more streamlined referral pathway (acknowledging that this is not currently a service available at all times).

We would advocate that all surgical centres identify their regional neurosciences unit and initiate discussion to establish a referral pathway, to enable patients access to the best chance of regaining functional recovery following postoperative acute ischaemic stroke.

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