

Tetraplegia after Coronary Artery Bypass, a Rare Complication

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Paraplegia after coronary artery bypass is rare. We present here a rare case of acute paraplegia after coronary artery bypass due to cervical disc herniation. This patient further developed respiratory failure due to denervation of respiratory muscles, resulting in tetraplegia. Prompt diagnosis with MRI and surgical decompression should be performed, otherwise permanent neurological impairment may occur. (Ann Thorac Cardiovasc Surg 2005; 11: 270–2)

Key words: coronary artery bypass, spinal cord, paraplegia

Introduction

We encountered a case showing tetraplegia after coronary artery bypass due to herniated cervical discs.

Case Report

A 65-year-old male with unstable angina due to 3-vessel disease underwent urgent coronary artery bypass, using the in situ left internal mammary artery (LIMA) to the left anterior descending artery, free right internal mammary artery as a Y graft taking off the LIMA to the diagonal artery, radial artery to the lateral circumflex artery, saphenous vein graft to the posterolateral circumflex artery, and another saphenous vein graft to the right coronary artery. His preoperative medical co-morbidities included diabetes, hypertension, peripheral vascular disease, and previous stroke. Preoperative CT scan of the chest showed a normal ascending aorta; however, calcification of the descending aorta was noted. The patient denied any prior history of neck pain or muscle weakness. There was no hypotensive episode during the perioperative period. He awoke from general anesthesia 2 hours after surgery, and was found to be paraplegic. Neurological examinations revealed loss of motor function in both lower

extremities, bilateral weakness of upper extremities, absence of deep or superficial sensation below T1 level, and absence of rectal tone. Contrast CT scan was negative for aortic dissection, or intracranial lesions. Hydrocortisone therapy was initiated and his perfusion pressure was optimized, with a possible diagnosis of spinal ischemia. MRI of the neck 2 days after surgery demonstrated a large posterior disc herniation at C7-T1 level, with edema of the spinal cord from C5 to T2 level (Fig. 1). After consultation with neurosurgeons he underwent surgery of anterior C6-7 and C7-T1 discectomies and C7 copectomy followed by interbody fusion. Postoperatively, neurological finding exams persisted complete loss of motor and sensory function below T1 level, upper extremity weakness and difficulty of breathing. The patient was reintubated and subsequently underwent tracheotomy for pulmonary toilet. He was then transferred to a long-term care facility 30 days after coronary artery bypass grafting (CABG).

Comments

A major cause of paraplegia after open heart surgery is spinal infarction, which is relatively common after thoracic aortic surgery.¹⁾ Prolonged aortic cross clamp, low perfusion pressure to the spinal cord, and microemboli to the spinal artery are known to contribute to spinal infarction. However, paraplegia after CABG is very rare, and only a few cases have been reported in the literature.²⁾ Most of these were related to the use of intraaortic balloon pump, which may cause atherosclerotic plaque emboli.³⁾ Plaque dislodgement from the aortic wall and em-

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Fig. 1. T2-weighted MRI of the cervical spine shows a herniated cervical disc compressing the spinal cord at C7-T1 level, with increased signal intensity from C5 to T2 suggesting the presence of spinal cord edema.

bolization to the spinal artery by intraaortic balloon pump has been considered, and a hypertensive event was reported to contribute to this pathology.⁴⁾ Paraplegia related to spontaneous epidural hematoma after cardiac surgery was reported previously.⁵⁾ Paraplegia related to intraoperative hypotension, because the lower thoracic spinal cord is more susceptible to systemic hypotension due to lack of collateral supply, was also reported in the literature.⁶⁾ Iatrogenic aortic dissection secondary to cannulation or involving the proximal aortic anastomosis site may also cause compromise of the internal costal arteries, resulting in acute paraplegia.⁷⁾ Initially, we thought the cause of paraplegia in our patient was secondary to hypoperfusion or aortic dissection, because the onset of the symptom was sufficiently acute enough to suspect vascular origin and because the patient had peripheral vascular disease with a calcified thoracic aorta, suggesting athero-

matous emboli to the spinal artery. After ruling out these by CT scan, MRI was performed and the correct diagnosis was established.

Spinal cord injury by acute cervical disc herniation in non-trauma patients is rare.^{8,9)} Acute spinal injury due to disc herniation is known to occur most frequently in the thoracic spine, but is rare in the cervical spine.^{8,9)} Patients with spinal cord compression due to cervical disc herniation usually present with progressive symptoms of numbness or weakness in the upper and lower bilateral extremities. However, the patient may present with Brown-Sequard syndrome if the herniated disc focally compresses the spinal cord with some laterality.¹⁰⁾ Most patients may have mild neck pain or stiffness before spinal injury occurs. However, our patients denied any of these symptoms before the surgery. Diagnosis was made by MRI after the development of complete paraplegia. MRI showed significant spinal compression at the level of C7-T1 and cord edema extending from C5 to T2, which corresponds with his symptoms.

Acute herniation of the spinal disc due to general anesthesia was rarely reported previously, to our knowledge. Fujioka and colleagues reported a single case report of tetraplegia due to spinal stenosis of the cervical spine which occurred after CABG.¹¹⁾ They could not explain clear reasons for the acute tetraplegia after CABG; however, they postulated to the posture during surgery might have contributed to the patient's spinal cord injury. In our patient, intubation was the only apparent stress to the cervical spine during our entire surgical course, although it was an easy intubation. Since disc herniation in the cervical spinal by intubation is so rare in patients with normal neck exams that its prevention would be difficult. Iatrogenic paraplegia related to anesthesia has been reported; however all of the reported cases were related to epidural anesthesia,¹²⁾ which was not applied to our patient. Retrospectively, our patient had severe degenerative cervical spine disease, which may have been attributed to this catastrophic event.¹³⁾ Routine preoperative cervical spine evaluation by MRI would not be cost effective. However, if patients have a history of cervical spine degenerative disease, handling of the neck during intubation should be performed in more careful manner and fiberoptic intubation should have been considered. Otherwise, irreversible spinal cord injury secondary to disc herniation may occur by non-traumatic motion such as changing the position or intubating the patient during surgery. The only treatment option for this injury would be early surgical decompression of the spinal cord before

spinal injury, usually within 24 hours after onset of symptoms, becomes permanent.⁵⁾

A major concern after spinal cord injury is respiratory compromise secondary to the loss of innervation of respiratory-related muscles, including the diaphragm, pectorals muscles, and intercostal muscles. In patients with cervical spinal cord injury, the frequency of requiring intubation or tracheostomy was reported to be 87% for those with an injury at C4 or higher and 61% for patients with C5-T1 injury.¹⁴⁾ A study showed the patients with quadraplegia more frequently require intubation.¹⁴⁾ Our patient had C6-7 spinal cord injury and he required re-intubation and subsequent tracheotomy for pulmonary toilet, making him tetraplegic.

Spinal cord injury due to cervical disc herniation during surgery is a rare occurrence. Prompt diagnosis and surgical decompression should be performed, otherwise the injury will result in permanent neurological impairment.

References

1. Svensson LG, Crawford ES, Hess KR, Coselli JS, Safi HJ. Experience with 1509 patients undergoing thoracoabdominal aortic operations. *J Vasc Surg* 1993; **17**: 357–68.
2. Geyer TE, Naik MJ, Pillai R. Anterior spinal artery syndrome after elective coronary artery bypass grafting. *Ann Thorac Surg* 2002; **73**: 1971–3.
3. Gottesman MH, Saraya I, Tenti F. Modified Brown-Sequard syndrome following coronary artery bypass graft: case report. *Paraplegia* 1992; **30**: 178–80.
4. Thomas NJ, Harvey AT. Paraplegia after coronary artery bypass operations: relationship to severe hypertension and vascular disease. *J Thorac Cardiovasc Surg* 1999; **117**: 834–6.
5. Imanaka K, Kyo S, Yokote Y, Asano H, Tanabe H, Ohuchi H. Paraplegia due to acute spinal epidural hematoma after routine cardiac surgery. *Intensive Care Med* 2000; **26**: 826.
6. Singh U, Silver JR, Welply NC. Hypotensive infarction of the spinal cord. *Paraplegia* 1994; **32**: 314–22.
7. Archer AG, Choyke PL, Zeman RK, Green CE, Zuckerman M. Aortic dissection following coronary artery bypass surgery: diagnosis by CT. *Cardiovasc Intervent Radiol* 1986; **9**: 142–5.
8. Suzuki T, Abe E, Murai H, Kobayashi T. Nontraumatic acute complete paraplegia resulting from cervical herniation: a case report. *Spine* 2003; **28**: E125–8.
9. Ueyama T, Tamaki N, Kondoh T, Miyamoto H, Akiyama H, Nagashima T. Non-traumatic acute paraplegia associated with cervical disc herniation: a case report. *Surg Neurol* 1999; **52**: 204–7.
10. Mastronardi L, Ruggeri A. Cervical disc herniation producing Brown-Sequard syndrome: case report. *Spine* 2004; **29**: E28–31.
11. Fujioka S, Niimi Y, Hirata K, Nakamura I, Morita S. Tetraplegia after coronary artery bypass grafting. *Anesth Analg* 2003; **97**: 979–80.
12. Collier CB. Postoperative paraplegia: an usual case. *Anaesth Intes Care* 1994; **22**: 293–5.
13. Bentley PI, Grigor CJ, McNally JD, et al. Lesson of the week: degenerative cervical disc disease causing cord compression in adults under 50. *BMJ* 2001; **322**: 414–5.
14. Velmahos GC, Toutouzas K, Chan L, et al. Intubation after cervical spinal cord injury: to be done selectively or routinely? *Am Surg* 2003; **69**: 891–4.