FUNCTIONAL RECOVERY AFTER CORPECTOMY AND CORTICO CANCELLOUS ILIAC BONE GRAFTING FOR CERVICAL SPINAL CORD INJURY : INITIAL EXPERIENCE

Lt Col PK SAHOO*, Lt Col JR SHARMA*,
Brig HS GILL⁺

ABSTRACT

Twelve patients with post-traumatic cervical spinal cord injury from C3 to C7 having anterior compression and instability underwent corpectomy and corticocancellous iliac bone grafting from Jan 95 to Dec 96. Corpectomy and tricortical iliac bone grafting was carried out at one level in 10 and two levels in 2 patients. Neurological function was recorded using a functional scale pre and post-operatively. There was complete functional recovery in 5, improvement in 5 and no change in neurological status in 2 patients. This technique is simple, safe, biomechanically sound providing stability with good functional recovery in these patients.

MJAFI 1998; 54: 208-211

KEYWORDS : Cervical spinal cord injury; Corpectomy; Functional recovery.

Introduction

Acute injuries to the cervical spine and spinal cord are among the common causes of severe disability and may be associated with quadriplegia and respiratory distress leading to morbidity and mortality if untreated. In recent years, better understanding of mechanism of spinal cord injuries, the biomechanics of spine with Dennis 3 column concept and pathophysiological changes that occur in spinal cord following injury has revolutionised the management.

The availability of computerised tomography (CT) and magnetic resonance imaging (MRI) scans has further aided the diagnostic evaluation of cervical spine injury by delineating exact site, extent of injury, stability of spine and guides for anterior or posterior surgical decompression. It is now possible to operate cervical spinal cord injured patients early even in the presence of respiratory and cardiovascular compromise state in a Neuro intensive care unit (ICU) setting with advanced monitoring and ventilator facilities.

The pioneering work of Smith and Robinson and Cloward in anterior removal of cervical discs and fusion is a commonly performed procedure today [1,2]. The insight provided by these basic surgical approaches, use of operating microscope, high speed drill, image intensifier, availability of bone bank and internal metallic implants for stabilisation of spine has

made significant difference in the outcome of cervical spinal cord injured patients.

Anterior compression due to burst or wedge compression fracture of vertebral body and dislocation needs corpectomy [3]. Stabilisation may be done by bone graft and metallic implants anteriorly as devised by Wolfhard Casper and coworkers [4,5]. Anterior metallic implants may produce oesophageal perforation and dysphagia. Cortico cancellous bone graft fusion without metallic implants obviates these complications [6].

Material and Methods

Over the past two years from Jan 95 to Dec 96, 42 patients of cervical spinal cord injury were admitted and operated at the Neurosurgical centre of the Army Hospital (R and R) Delhi Cantt. Amongst them 12 patients underwent corpectomy and corticocancellous iliac crest bone grafting for anterior cervical cord compression due to burst fracture, wedge compression fracture and dislocation of C3 to C7 cervical spine.

On admission patients were clinically evaluated including mode of injury, extent of neurological deficit (Frankels grade) and associated injuries.

Anterior posterior (AP) and translateral radiographs and MRI scan of cervical spine was carried out in all patients (Figs 1,2,3 and 4). CT scan was carried out in 8 patients to study the bony injury. All patients were put on Gardner Wells tong traction and operated within 1 to 4 weeks.

Operative Technique

Patient is put on supine position with cervical traction and moderate extension of neck. A vertical incision along the anterior

*Classified Specialist (Surg & Neurosurgery), *Consultant (Surg & Neurosurgery), Dept of Neurosurgery, Neurology Centre Army Hospital (R&R), Delhi Cantt 110010

Fig. 1 : X-ray cervical spine lateral view with compression fracture C6.

Fig. 2 : MRI cervical spine sagittal view showing burst fracture C4 with anterior compression and displacement of cord at C4 with cord changes.

Fig. 3 : MRI cervical spine sagittal view T2 and T1 images showing burst fracture C6 with cord compression anteriorly at C6.

border of sternomastoid from angle of mandible to suprasternal notch used for exposure from C3 to C7. Platysma incised in the same line. Middle layer of cervical fascia splitted between sternomastoid and strap muscles. Common facial vein at C3 and omohyoid at C6-C7 level requires division. Deep cervical fascia overlying the longuscolli and anterior longitudinal ligament of cervical spine are incised and the prevertebral fascia reflected laterally. The fracture body is confirmed by image intensifier. The longuscolli muscles are dissected on both sides above and below the required area and blades of self retaining retractor are placed underneath the longuscolli and horizontally to avoid injury to soft tissues.

The disc below and above the fracture vertebral body are ex-

Fig. 4 : MRI cervical spine sagittal view showing compression fracture C6 with anterior compression of the cord at C6.

Fig. 5 : X-ray cervical spine lat. view post-op showing anteriorly placed bone graft C5-C7 in situ for C6 corpectomy and bone grafting.

cised under microscope. Using high speed drill the fracture body drilled until the posterior longitudinal ligament is reached. A trough is created in the vertebral bodies above and below to allow the seating of cortico-cancellous iliac bone. Care is taken to ensure that no residual anterior compression from disc or bone material persists. Removal of lateral pillars of vertebra is not required unless causing compression. A tricortical graft is harvested from the iliac crest in the standard manner to conform to the dimensions of the vertebral defect. Manual traction to the head is applied. The cranial end of the graft is first inserted and with distraction the caudal end is gently stamped in to place. This manoeuvre generally locks the graft in place (Fig 5). A woven vicryl (polyglactin-910) mesh, cut to appropriate size is sutured to the longuscolli muscles on either side to cover the vertebral defect and to prevent forward migration of the graft. Wound closed in layers.

Post-operatively patient immobilised with cervical traction for 2 to 3 days and with Philadelphia collar for a period of 3 to 6 months.

Results

Eight patients in the present series were in the age group of 31

to 40 and 2 each between 21 to 30 and 41 to 50 years. Males (11) were predominantly affected. The maximum number of patients (7) sustained injury due to road traffic accident. Other causes of injury were fall from height in 3, wrestling and boxing in one patient each.

The extent of neurological deficit as per Frankels grade was as follows:-

Grade A - complete motor and sensory loss - 2

Grade B - complete motor loss and incomplete sensory - 1

Grade C - preserved motor power below the injured segment but no practical use - 8

Grade D - preserved motor power with minimal function - 1

Level of anterior cervical spinal cord compression due to burst fracture/compression fracture/dislocations as delineated by radiography, CT and MRI scans was mostly found at C4 and C5 levels (Table 1).

TABLE 1
Level of injury : Radiography, CT and MRI scan

Level of injury	No of patients
C4	3
C5	3
C4 and C5	2
C6	3
C7	1

Corpectomy and tricortical iliac bone grafting was carried out for one level in 10 patients and two levels in 2 patients.

The neurological recovery of the patients was assessed as per Frankels grade after 2 months, 6 months and one year. Excellent recovery was observed in 5 patients (Table 2).

TABLE 2
Recovery as per Frankels grade

Initial Grade	No	Improved				No improvement			
		B	C	D	E	A	B	C	D
A	2	—	—	—	—	2	—	—	—
B	1	—	1	—	—	—	—	—	—
C	8	—	—	4	4	—	—	—	—
D	1	—	—	—	1	—	—	—	—

One patient developed disc space infection post-operatively. There was no oesophageal leak, dysphagia, hoarseness of voice or bone graft displacement in any of these patients.

Discussion

The goal of surgery in cervical spinal cord injury is to prevent or minimise neurologic injury, provide an optimal environment for the spinal cord and nerve roots to recover from damage and to obtain a stable healed cervical spine. This goal is achieved by realigning bony fragments, reducing the dislocation, decompression of the spinal cord of disc material anteriorly or bony fragment both anteriorly and posteriorly delineated by MRI. After anterior decompression the sta-

bility is maintained by anterior bony fusion or by metallic implants.

Anterior cervical fusion by metallic implant achieved by Casper technique [4] provides immediate post-operative stability but may produce dysphagia and oesophageal perforation. Our experience with cortico-cancellous autogenous iliac bonegraft and anterior cervical fusion in this small group of patients adequately document that, the procedure is biomechanically sound providing stability with good results. In the present series there was no oesophageal perforation, injury to major vessels or graft displacement. One patient who developed disc space infection post-operatively, was managed successfully conservatively.

Patients in the present series were taken up for surgery between one to four weeks. It has been suggested that neurological recovery is better if surgical treatment is done early [7]. However Benzel and Larson [3] advocated delayed surgical intervention in a retrospective analysis of 99 surgically treated patients with lower cervical spine injuries after they are metabolically and neurologically stable.

In the present series all the patients showed neurological recovery except 2 patients with initial Frankel grade A who failed to recover. The failure to recover, Frankels grade A patients is consistent with observation of others [9].

One patient with Frankels B recovered neurologically but remained nonfunctional. Amongst 8 patients with Frankels C, four had excellent and 4 had good recovery. In the present series there was neither increase in neurological deficit nor death following corpectomy and anterior fusion with cortico-cancellous iliac bone grafting.

Anterior neural decompression by corpectomy and anterior cervical fusion by cortico-cancellous iliac bone graft is simple, safe, stable technique for treating cervical trauma with anterior compression at one or two vertebral levels. The study also documents good functional recovery in incomplete spinal cord injured patients.

REFERENCES

1. Smith GW, Robinson RA. Anterolateral cervical disc removal and Interbody fusion for cervical disc syndrome. Bulletin of the John Hopkins Hospital 1955; 96: 223-4.
2. Cloward RB. The anterior approach for removal of ruptured cervical disc. J Neurosurgery 1958; 15: 601-6.
3. Benzel EC, Larson SJ. Functional recovery after decompressive spine operations for cervical spine fractures. Neurosurgery 1987; 20: 742-6.
4. Casper W, Barbier D, Klara PM. Anterior cervical fusion and casper plate stabilization for cervical trauma. Neurosurgery

- 1989; 25: 491-502.
5. Deopujary CE, Bhagawati SN, Pachor JA, Parulekar GD. Anterior cervical osteosynthesis trapezoid fusion with Casper technique. *Neurology India (suppl)* 1995; 43: 125-9.
6. Ramani PS. Stabilisation of lower cervical spine injuries. *Neurology India (suppl)* 1995; 43: 113-8.
7. Carol M, Ducker TB, Byrnes DP. Mini myelogram in cervical spinal cord trauma. *Neurosurgery* 1980; 7: 219-24.
8. Maynard FM, Reynold GG, Fountain F, Wilmot C, Hamilton R. Neurological prognosis after traumatic quadriplegia. *J Neurosurgery* 1979; 50: 611-6.
-