Clinical Case Report

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Cervical disc herniation causing Brown-Sequard syndrome

Case report and review of literature (CARE-compliant)

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Abstract

Rationale: Brown-Sequard syndrome (BSS) is manifested as ipsilateral motor deficit and contralateral sensory loss. BSS caused by herniated cervical disc is extremely rare and easily be misdiagnosed, and clinical features of this problem were not fully understood.

Patient concerns: A 57-year-old man presented with a 3-month history of weakness in his right arm, and he experienced progressive right hemiparesis at 2 days before admission, along with contralateral deficit in sensation of pain and temperature below T2.

Diagnoses: Magnetic Resonance Imaging (MRI) showed severe cord compression due to a large paracentral extradural C4-C5 cervical disc herniation (CDH).

Interventions: Subtotal cervical corpectomy, decompression, and fusion through anterior approach were performed. The patient recovered rapidly after surgery.

Outcomes: Complete recovery of sensory and motor functions was obtained at a 4-months follow-up after surgery.

Lessons: Our case, along with a review of the literature, highlights that careful medical history inquiries, detailed neurologic examinations, and cervical spinal MRI scans are essential for diagnosis of CDH caused BSS. Prompt surgical decompression according to individual condition is commonly warranted. Early diagnosis with prompt surgical decompression could lead to favorable recovery.

Abbreviations: BSS = Brown-Sequard syndrome, CDH = cervical disc herniation, IDH = intradural disc herniation, MRC = Medical Research Council, MRI = magnetic resonance imaging.

Keywords: Brown-Sequard syndrome, cervical spine, disc herniation, surgical decompression

1. Introduction

Brown-Sequard syndrome (BSS) is caused by hemi-compression or hemisection of the spinal cord, which is characterized by ipsilateral loss of motor function, deep sensation and crude touch, as well as contralateral loss of pain and temperature sensitivity.[1,2] The syndrome is mostly seen in traumatic injuries and spinal cord neoplasms. A herniated cervical disc is an exceptional cause of BSS with rare cases.

In 1928, Stookey reported the first case of BSS produced by cervical disc herniation (CDH).[3] BSS caused by CDH is rare and often be delayed or incorrectly diagnosed.[4–6] The patient might initially be admitted into the medical ward for suspected cerebrovascular accidents as the manifestation of hemiparesis. Although a number of cases had been reported, clinical features of this problem were not fully understood, and no consensus was reached for the choice of treatment strategies. Herein we report a case of BSS resulted from C4-C5 cervical herniated cervical discs, along with a review of the pertinent literature.

2. Case report

A 57-year-old man presented with a 3-month history of weakness in his right arm, and he experienced progressive right hemiparesis at 2 days before admission, along with contralateral deficit in sensation of pain and temperature below T2. He claimed no history of trauma. Upon physical examination, he demonstrated reduced neck mobility. No amyotrophy was shown on either side. Muscle power was measured by Medical Research Council (MRC) grading, and neurological evaluation revealed motor weakness in the right arm (MRC Grade 3/5) and lower limb (MRC Grade 1/5). Spasticity and hyperreflexia were also revealed in the right lower extremities. Reduced sensation of pain and temperature below T2 was noted on the left side. These findings were consistent with the diagnosis of BSS.

Magnetic Resonance Imaging (MRI) of the cervical spine showed a large central and right-sided extradural C4-C5 CDH severely compressing the spinal cord, associated with spinal stenosis (Fig. 1A and B). Computed tomography (CT) scan revealed evidence of spondylosis at C5–C7 vertebrae and posterior vertebral osteophyte of C5 and C6 (Fig. 1C). No ossified posterior longitudinal ligament was showed.

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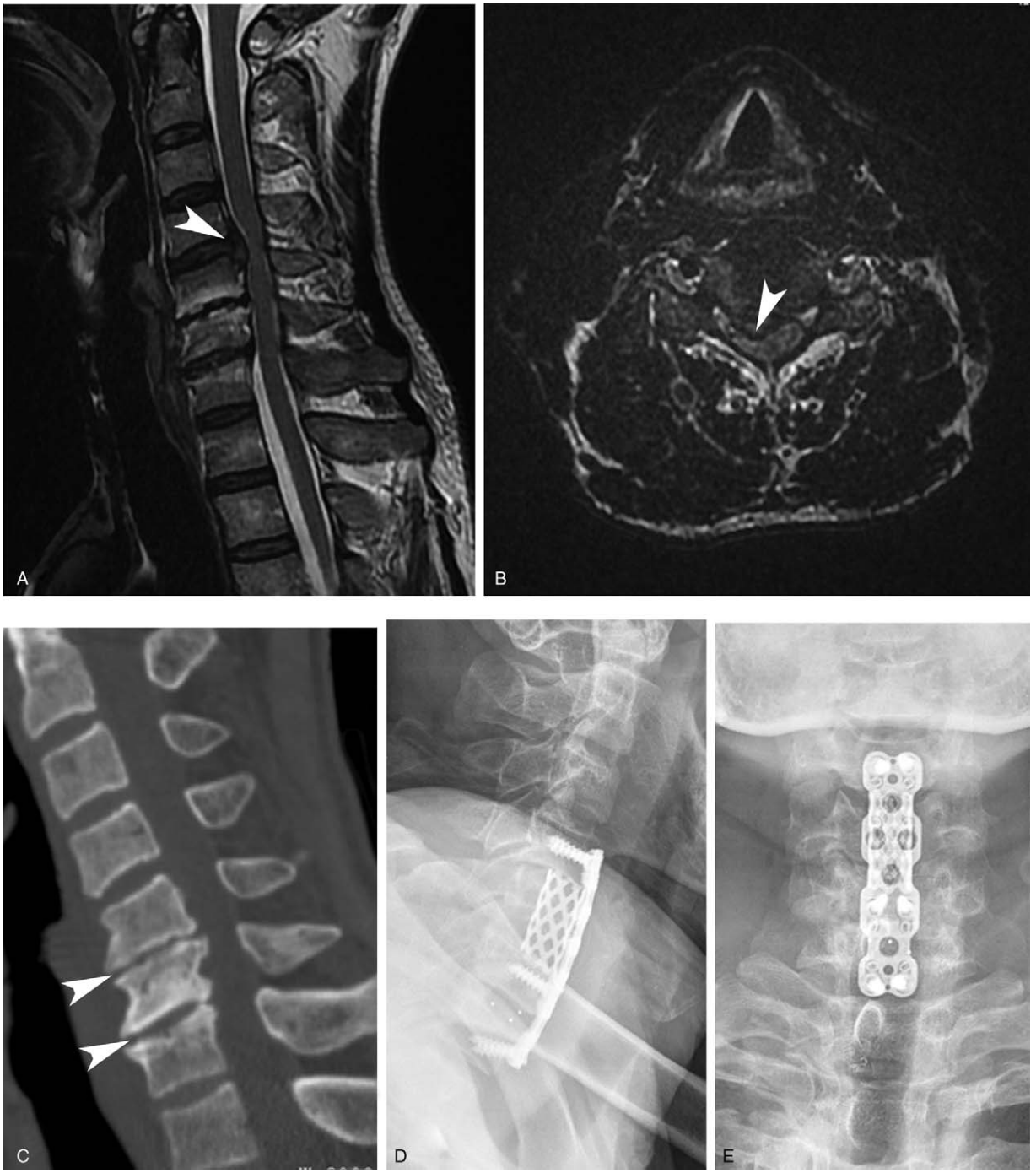

Figure 1. Sagital (*A*) and axial (*B*) view of MRI demonstrating a large posterior right paramedian C4–C5 herniated disc severely compressing the spinal cord (*arrow heads*). CT (*C*) revealed evidence of spondylosis at C5–C7 vertebra and posterior vertebral osteophyte of C5 and C6 (*arrow heads*). Lateral (*D*) and frontal (*E*) X-ray performed after subtotal vertebrectomy of C5 and reconstruction with titanium mesh cages, as well as C6/7 cervical discectomy and fusion through anterior approach. CT = computed tomography.

We made prompt preoperative preparations and performed the surgery the day after admission. Subtotal vertebrectomy of the C5 and titanium mesh cages filled with autogenous bone were carried out for reconstruction through anterior approach (Fig. 1D and E). The patient was immobilized in a rigid cervical collar for 8 weeks postoperatively. After the operation, the patient recovered rapidly in 4 days. The motor power of right lower limb improved to MRC Grade 3, significant relief in pain and temperature sensation on the left side of the body was acquired. At 3 months follow-up, motor power of right upper and lower extremities improved to MRC Grade 4. The patient could walk independently without limitation on daily activities. 4 months after surgery, he had a normal motor and sensory function.

3. Discussion

Rare cases of BSS resulting from CDH have been reported. According to our knowledge, 69 cases have been reported in the

Table 1

Reported Cases in the Literature.

N	Reference	Age	Sex	Location	Level	Symptom Duration	History of Trauma	Surgery	Recovery
1	Stookey,1928[3]	44	M	ED	C3-C4	NR	N	LAM	NR
2		52	M	ED	C5-C6	NR	N	LAM	NR
3		68	M	ED	C6-C7	NR	N	LAM	NR
4	Düerig et al, 1977[7]	52	M	ID	C5-C6	2MTH	Y	LAM	INCR
5	Roda et al, 1982[8]	43	M	ID	C6-C7	1D	N	LAM	INCR
6	Eisenberg et al, 1986[9]	25	M	ID	C5-C6	4D	Y	LAM	INCR
7	Schneider et al,1988[10]	50	F	ID	C5-C6	1D	N	ACD	INCR
8	Sprick et al, 1991[11]	49	F	ID	C6-C7	10D	Y	ACDF	INCR
9	Fineli et al, 1992[12]	28	F	ED	C5-C6	18MTH	NR	ACDF	NR
10		61	M	ED	C6-C7	8MTH	N	ACD	CR
11		46	F	ED	C4–5,C5-6	18MTH	Y	ACD	CR
12	Rumana et al, 1996[13]	56	F	ED	C4-C5	5MTH	NR	ACDF	CR
13	Antich et al,1999[14]	73	F	ED	C2-C3	6MTH	NR	ACDF	CR
14	Kohno et al, 1999[15]	33	M	ED	C4-C5	1MTH	NR	ACDF	CR
15		31	M	ED	C5-C6	3MTH	NR	ACDF	INCR
16		38	M	ED	C5-C6	4MTH	NR	ACDF	INCR
17		34	M	ED	C3-C4	15MTH	NR	ACDF	INCR
18		45	F	ED	C4-5,C5-6	13MTH	NR	ACDF	INCR
19	Börm et al,2000[16]	40	M	ID	C5-C6	5WK	Y	ACDF	CR
20	Clatterbuck et al, 2000[17]	40	M	ID	C4-C5	5WK	N	ACDF+LAM	INCR
21		52	F	ID	C3-C4	2MTH	N	ACDF	CR
22		32	M	ID	C5-C6	9WK	N	ACF	CR
23	Iwamura et al, 2001[18]	45	M	ID	C6-C7	15MTH	N	ACF	INCR
24	Ugarriza et al, 2001[19]	41	F	ED	C5–C6	3D	N	ACDF+LAM	CR
25	Malone et al, 2002[20]	35	F	ED	C5-C6	NR	Y	ACD	CR
26		55	M	ED	C4-C5	NR	Y	ACDF	CR
27	Kobayashi et al, 2003[21]	64	M	ED	C5-C6	6MTH	N	ACDF	CR
28		39	M	ED	C2-C3	1MTH	N	ACDF	CR
29	Fujimato et al, 2004[22]	54	M	ED	C5-C6	3MTH	N	LAM	INCR
30	Mastronardi et al, 2004[23]	36	M	ED	C5-C6	9MTH	N	ACDF	CR
31	ÇAGAVİ et al, 2005[24]	46	M	ED	C4-C5	2WK	N	ACD	CR
32	Sani et al, 2005[25]	44	F	ED	C5-C6	6WK	Y	ACDF	CR
33	Wang et al, 2006[26]	44	M	ED	C3-C4	45D	NR	ACDF	CR
34	Kim et al,2007[27]	35	M	ED	C5-C6	2WK	N	ACDF	INCR
35	Lee et al, 2007[4]	56	M	ED	C5-C6	8D	N	AF	CR
36		47	M	ED	C5-C6	2WK	N	AF	CR
37		45	M	ED	C5-C6	2MTH	N	AF	CR
38	Sathirapanya et al,2007[28]	63	M	ED	C5-C6	8D	N	ACDF	CR
39	Sayer et al, 2008[29]	46	M	ED	C3-C4	3MTH	N	ACDF	CR
40	Choi et al, 2009[5]	31	M	ED	C3-C4	4MTH	N	ACDF	CR
41		66	F	ED	C5-C6,C6-C7	2MTH	N	ACDF	CR
42		66	M	ED	C5-C6	4MTH	NR	ACDF	INCR
43		46	M	ED	C4-C5	2D	NR	ACDF	INCR
44		50	F	ED	C3-C4,C4-C5	3MTH	NR	ACDF	INCR
45	Kim et al, 2009[30]	28	M	ED	C3-C4	1W	NR	ACDF	CR
46	Laghmari et al,2009[31]	79	M	ED	C4-C5	1MTH	N	ACF	CR
47	Hsieh et al, 2010[32]	61	F	ID	C4-C5	2WK	Y	ACDF	CR
48	Karadag-Saygi et al, 2010[33]	34	M	ED	C5-C6,C6-C7	2D	Y	LAM	CR
49	Yang et al,2010[34]	57	F	ED	C4-C5	1D	Y	ACF	CR
50	Rustagi et al, 2011[35]	42	M	ED	C5-6,C6-7	8MTH	N	ACDF	INCR
51	Ghasemi. 2012[36]	56	F	ED	C5-C6,C6-C7	4D	Y	ACDF	CR
52	Sharifi et al, 2012[37]	32	M	ED	C3–C4	1D	Y	ACDF	INCR
53	Urrutia et al, 2012[38]	51	M	ED	C6–C7	2WK	Y	ACF	CR
54	Yeung et al, 2012[39]	35	M	ED	C5-C6	NR	N	ACDF	CR
55	Yokoyama et al, 2012[40]	63	M	ED	C3-4	4D	N	LAM	CR
56	Abouhashem et al, 2013[2]	23	F	ED	C4-C5	2D	N	ACDF	CR
57		56	M	ED	C5-C6,C6-C7	14D	Y	ACDF	CR
58		47	F	ID/ED*	C5-C6	7D	Y	LAM	CR
59		37	F	ID/ED*	C5-C6	21D	N	LAM	INCR
60		72	M	ED	multiple	30D	N	LAM	NR
61		51	M	ED	multiple	10D	N	ACDF	INCR
62		31	M	ED	C5-C6	14D	Y	ACD	CR
63	Wang et al, 2014[41]	52	M	ID	C5-C6	6MTH	N	ADF+LAM	INCR

(*continued*)

Table 1
(continued).

N	Reference	Age	Sex	Location	Level	Symptom Duration	History of Trauma	Surgery	Recovery
64	Guan et al, 2015[42]	51	M	ED	C4-C5	6MTH	N	ACF	INCR
65	Harel et al, 2016[43]	32	M	ED	C3-C4	1D	N	ACDF	CR
66	Meng et al, 2016[44]	51	F	ED	C3-C4,C5-C6	5D	N	ACF	INCR
67	Porto et al, 2016[45]	86	M	ED	C4-5	1WK	N	ACDF	INCR
68	Baudracco et al, 2017[46]	45	F	ID	C4-C5	1MTH	NR	ACF	INCR
69	Lau Janice et al, 2017[6]	27	M	ED	C3-C4	3WK	N	ACDF	INCR

ACD = anterior cervical discectomy, ACDF = anterior cervical discectomy and fusion, ACF = anterior corpectomy and fusion, AF = anterior foraminotomy, CR = complete recovery, D = day(s), ED = extradural, ID = intradural, INCR = incomplete recovery, LAM = laminectomy, MTH = month(s), N = no, NR = not reported, SD = symptom duration, WK = week, Y = yes.
* ID disc herniation was reported in 1 case but without mentioning which one.

English language literature up to now (Table 1).[2–46] According to a review of those reported cases, the mean age of the patients was 47.2 years and ranged between 23 and 86 years. C5-C6 was the most vulnerable level of discogenic BSS, which was involved in 45.7% of the case series. A male predominance was shown with a percentage of 70%. Single level disease was shown in most cases, but no significant relationship was found between the number of involved discs and clinical prognosis.

Classic manifestation of BSS caused by CDH is very rare; most of the reported cases were partial BSS. This can be explained by the anterior compression of spinal cord by CDH, thus the racile and cuneate tracts at dorsal column were less disturbed, leading to less impairment of deep sensation and crude touch.

BSS owing to CDH might develop over a long period, or emerge and aggravate rapidly. The mean symptom duration before admission of these cases is 88.5 days and ranged between 1 day and 18 months. Patients in most cases manifested partial BSS for a period of time before admission, but the symptoms were mostly mild and would therefore be attached insufficient attention. Patients usually come to hospital when the symptoms got worse, and our case is a typical example. After our careful inquiry of the medical history, the patient remembered that he started with slight paresis of right upper limb which lasted for 3 months before admission. The weak feeling was especially apparent when writing, but he paid no attention to it. He neglected to see a doctor until the paresis aggravated and extended to ipsilateral lower limb.

Acute presentation of cervical discogenic BSS after a pure trauma was even rarer. Sharifi et al[37] and Yang et al[34] had respectively reported their case who developed acute traumatic BSS following traffic injury, MRI both revealed paramedian CDH and ipsilateral spinal cord compression. The 2 cases both obtained good recovery after decompression surgery. Cases with histories of motor vehicle accidents before the onset of BSS were also reported.[9,10] However, histories of mild traumas, such as spinal manipulation therapy, carrying heavy object, wrong position and even an episode of severe coughing, were commonly reported among those cases, indicating that mild trauma might be an induction factor for onset of CDH induced BSS.[2,12,20,25,32,33]

Intradural disc herniation (IDH) is an extraordinarily rare pathology. It is reported to account for 0.27% of all herniated discs.[47,48] The pathogenesis of IDH remains uncertain, and it is difficult to be early diagnosed. BSS resulting from cervical IDH is even more rarely seen, with only 14 cases we could find.[2,7–10,16–18,32,41,46] The prognoses for those cases were supposed to be worse. Though most cases of BSS caused by IDH resulted in incomplete recovery, the outcomes were still relatively acceptable without apparent disturbance to daily life.

Two cases manifesting BSS and Horner syndrome that caused by CDH were reported.[44,46] Though the clinical manifestations of the 2 patients were exceptional, treatment principles were similar to other cases. Satisfactory clinical outcomes could also be achieved after surgery.

Including our case, all of those 70 patients underwent surgery. The most adopted approach was anterior in 55 patients (78.6%), and 38 patients (54.3%) underwent the anterior cervical discectomy and fusion surgery. Posterior surgery in the form of laminectomy or hemilaminectomy was performed in 12 patients. 3 patients carried out anterior combine with posterior approaches. The treatment decision of surgical approaches is based on multiple factors, such as the size or location of herniated discs, numbers of involved vertebral levels, the dimensions of the spinal canal, as well as whether presenting ossification of posterior longitudinal ligament or ligamenta flava. We believe that favorable outcomes could obtain if adequate decompression is achieved by early surgery.

We report a case of BSS resulted from C4-C5 cervical herniated cervical disc, and complete recovery of sensory and motor functions was obtained after surgery. Our case, along with the review of the literature illustrated that BSS caused by CDH is very rare and often be delayed or incorrectly diagnosed. Careful medical history inquiries, detailed neurologic examinations and cervical spinal MRI scans are indispensable for early diagnosis of CDH caused BSS. Prompt surgical decompression according to individual condition is commonly warranted. Proper treatment could lead to apparent recovery of neurological function in a short time and result in favorable prognosis.

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Our study was approved by the ethics committee of the Tongde Hospital of Zhejiang Province. Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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