

Original Article

# Traumatic spondyloptosis of the cervical spine: A case report and discussion of worldwide treatment trends

Kelly E. Wong, Peter S. Chang, Mark S. Monasky<sup>1</sup>, Rodney M. Samuelson<sup>1</sup>

Department of Neurological Surgery, University of South Dakota, Sanford School of Medicine, <sup>1</sup>Neurological Surgery, Rapid City Regional Hospital, Rapid City, SD, USA

E-mail: \*Kelly E. Wong - [kelly.wong@coyotes.usd.edu](mailto:kelly.wong@coyotes.usd.edu); Peter S. Chang - [peter.chang@coyotes.usd.edu](mailto:peter.chang@coyotes.usd.edu); Mark S. Monasky - [msmonasky@msn.com](mailto:msmonasky@msn.com);

Rodney M. Samuelson - [rodsamuelson@hotmail.com](mailto:rodsamuelson@hotmail.com)

\*Corresponding author

Received: 01 November 16    Accepted: 09 February 17    Published: 26 May 17

## Abstract


**Background:** Cervical spondyloptosis is defined as the dislocation of the spinal column most often caused by trauma. Due to compression or transection of the spinal cord, severe neurological deficits are common. Here, we review the literature and report a case of traumatic C5–6 spondyloptosis that was successfully treated using an anterior-only surgical approach.

**Methods:** The patient presented with quadriplegia and absent sensation distal to the C5 dermatome following a rollover motor vehicle accident. The preoperative American Spinal Injury Association Impairment Scale was A. Computed tomography of the cervical spine revealed C5–6 spondyloptosis, lamina fractures on the right side at the C3–4 level, and widened facet joint on the right side at C6–7.

**Results:** The patient underwent cervical traction and anterior cervical discectomy and fusion at the C5–6, C6–7 levels; no 360° fusion was warranted. Six months postoperatively, the patient remained quadriplegic below the C5 level.

**Conclusion:** Presently, no consensus is present regarding the best treatment for spondyloptosis. Worldwide, the 360° approach is the most commonly used (45%), followed by anterior-only surgery (31%) and posterior-only surgery (25%). The surgical choice depends upon patient-specific features but markedly varies among geographical regions.

**Key Words:** Cervical, trauma, spondylolisthesis, spondyloptosis

<b>Access this article online</b>
<b>Website:</b> <a href="http://www.surgicalneurologyint.com">www.surgicalneurologyint.com</a>
<b>DOI:</b> 10.4103/sni.sni_434_16
<b>Quick Response Code:</b>


## INTRODUCTION

Cervical spondyloptosis, an exceedingly rare entity, may be caused by congenital or neoplastic entities.<sup>[3,15]</sup> However, it is most commonly caused by trauma attributed to motor vehicle accidents or falls.<sup>[6,7]</sup> Here, we reviewed the literature and reported a case of C5–6 spondyloptosis associated with quadriplegia treated with an anterior-only approach.

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

**For reprints contact:** [reprints@medknow.com](mailto:reprints@medknow.com)

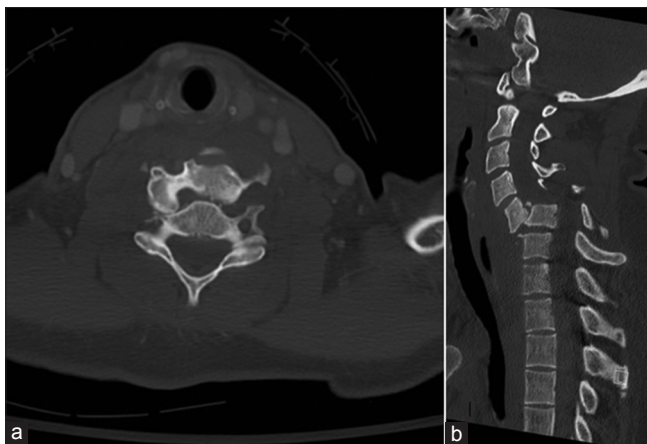
**How to cite this article:** Wong KE, Chang PS, Monasky MS, Samuelson RM. Traumatic spondyloptosis of the cervical spine: A case report and discussion of worldwide treatment trends. *Surg Neurol Int* 2017;8:89.

<http://surgicalneurologyint.com/Traumatic-spondyloptosis-of-the-cervical-spine:-A-case-report-and-discussion-of-worldwide-treatment-trends/>

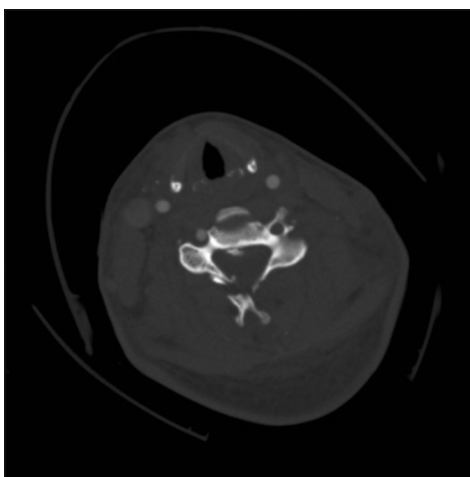
## CASE HISTORY

A 49-year-old woman presented with neck pain, quadriplegia, and a complete motor and sensory deficit at the C5 level attributed to a rollover motor vehicle accident. Her preoperative American Spinal Injury Association Impairment Scale (ASIA) was A. Computed tomography (CT) of the cervical spine demonstrated C5–6 spondyloptosis, superior and inferior lamina fractures on the right at the C3–4 level, and widened facet joint on the right at C6–7 [Figure 1].

Preoperative partial anatomic reduction was achieved using Gardner–Wells traction and incrementally increased to 30 lbs (13.6 kg) under direct fluoroscopy. The patient was treated with anterior C5–6 and C6–7 discectomy with fusion (Puros S<sup>2</sup> allograft bone grafts; Zimmer Spine, Minneapolis, MN, USA) and a 40-mm



**Figure 1:** Axial (a) and midsagittal reconstruction (b) of the cervical spine CT at the C5–6 level demonstrating complete spondyloptosis, with the body of the C5 vertebra placed in front of that of the C6 vertebra



**Figure 3:** CT angiography taken on postoperative day 2 revealed 100% occlusion of the left vertebral artery within the left transverse foramen. The dissection extends from the origin at the subclavian to the C4–5 level. The contralateral vertebral artery of the patient

Invidia (Zimmer Spine; plates C5–C7); no posterior stabilization was used [Figure 2].

## Postoperative angiography

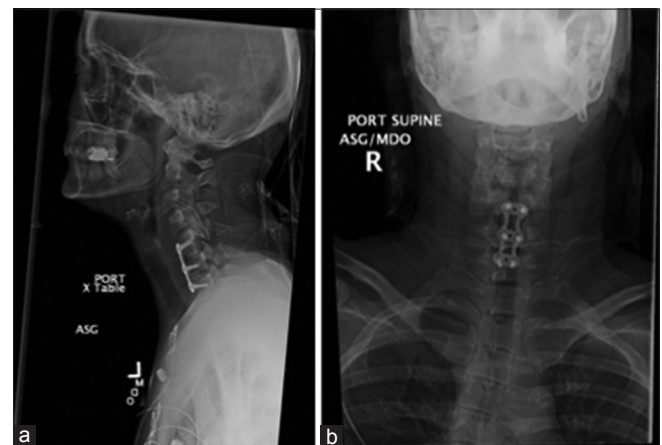
Postoperative CT angiography showed dissection and occlusion of the left vertebral artery originating at the C4–5 level with distal reconstitution via muscular collaterals [Figures 3 and 4]. This was treated with aspirin (325 mg for 3 months).

## Postoperative status

Postoperatively, the patient showed ASIA A at a C5 motor and sensory level. The patient was discharged to a rehabilitation hospital on postoperative day 5; her condition remained unchanged 6 months later [Figure 5].

## MATERIALS AND METHODS

We reviewed the literature on spondyloptosis, including grade 5 spondylolithesis, and found 32 cases in total. Our case is the 33<sup>rd</sup> such case. Variables assessed included the



**Figure 2:** Postoperative lateral (a) and anterior–posterior (b) radiograph shows reduction and C5–6–7 anterior cervical disc fusion



**Figure 4:** The left vertebral artery distal to the occlusion shows reconstitution from the muscular collaterals and is contiguous with the patient contralateral vertebral artery



**Figure 5: Lateral plain radiograph obtained 1.5 months postoperatively reveals satisfactory alignment surrounding the instrumentation**

author, year, age, sex, injury level, injury mechanism, ASIA level (preoperative and postoperative), follow-up duration, surgical management choice, and country of origin. All single-staged 360° (anterior–posterior or posterior–anterior) or 540° (anterior–posterior–anterior or posterior–anterior–posterior) procedures were included under category 360°.

**Statistical analysis**

SPSS (Version 17, IBM, Chicago, IL, USA) was used for statistical analysis, and categorical variables were noted in number of patients (%). This relied on Pearson’s Chi-squared test to compare the surgical approaches with regard to sex, geographical region (USA, Asia, and Europe), injury level, preoperative ASIA grade, immediate postoperative ASIA grade, and postoperative ASIA grade at the end of the follow-up period. *P* < 0.05 was considered statistically significant.

**RESULTS**

**Clinical data**

Thirty-three total cases of traumatic spondyloptosis were identified in the literature. The average patient age was 46.8 years; 24 were men and 9 were women [Table 1].

**Mechanism and severity of injury**

Motor vehicle accidents were predominant, followed by being struck by falling objects, assault, and iatrogenic causes. Of the 24 cases that were followed, the mean follow-up was 13.63 months (2–60 months). The predominant levels were C6–7 (45.5%) and C7–T1 (33.3%) [Table 2], and most were ASIA D (27.3%) and ASIA E (30.3%) categories [Table 3].

**Surgery**

Thirty-two patients had received surgical treatment; only one patient, who was neurologically intact, refused surgery. Surgery was performed anteriorly alone in 31.3%

**Table 1: Patient Demographics in reported cases of spondyloptosis**

	Males	Females
Number of Cases	24	9

**Table 2: Level of Injury in reported cases of spondyloptosis**

	C1-2	C2-3	C3-4	C4-5	C5-6	C6-7	C7-T1
Number of Cases	0	2	1	2	2	15	11

**Table 3: Pre-operative severity of injury by ASIA score in reported cases of spondyloptosis**

	ASIA A	ASIA B	ASIA C	ASIA D	ASIA E
Number of Cases	7	2	5	9	10

**Table 4: Surgical approach in reported cases of spondyloptosis**

	Anterior approach	Posterior approach	360 Degree approach
Number of Cases	10	8	14

of cases and posteriorly only in 25.0% of cases; 43.8% of cases underwent 360° repair. Only two cases (6.3%) were treated in a staged manner [Table 4].

**Complications**

Four cases experienced worsening: Two demonstrated a deterioration of the neurological status (6.3%), one developed basal artery thrombosis leading to death (3.1%),<sup>[14]</sup> and one had an intraoperative CSF leak (3.1%).

**Distribution of cases**

Half of the cases were present in Asia, 43.8% in the United States, and 6.3% in Europe. The anterior-only approach was used significantly more frequently in Asia, whereas the posterior-only approach was significantly more common in the United States (*P* = 0.004). The 360° repair was used significantly more frequently in Asia, whereas the posterior-only approach was significantly more common in the United States (*P* = 0.003).

**DISCUSSION**

Cervical spondyloptosis typically results from severe hyperextension injury with bilateral pedicle fractures, and bilateral locked facets, with or without fracture of the laminae.<sup>[11]</sup> In certain cases, patients presented with a partial or complete spinal cord injury but a normal neurological exam.<sup>[1,2,4,8-13]</sup> The incidence of spondyloptosis at the C6–7 or C7–1 level is more common than that at all other levels combined.

**Surgical fusions**

The definitive management of spondyloptosis is through surgical fixation.<sup>[11]</sup> If preoperative magnetic resonance

imaging (MRI) demonstrates significant anterior cord compression, an anterior decompression with intraoperative reduction should be used first.<sup>[13]</sup> However, if spinal realignment is not achieved after surgical decompression, then posterior reduction and fixation is necessary followed by repositioning the patient for anterior fixation.<sup>[13]</sup> If the preoperative MRI does not demonstrate compressive pathology, preoperative traction with closed spinal realignment should be pursued.<sup>[13]</sup>

### Varying treatment choices

The treatment choice for patients with spondyloptosis widely varies. Surgical options include anterior cervical discectomy and fusion only, posterior lateral mass fusion with or without laminectomy, and 360° fusion.<sup>[5]</sup> No significant differences were observed between the anterior-only, posterior-only, and 360° repair groups regarding immediate postoperative ASIA grade ( $P = 0.161$ ) and ASIA grade at the end of the follow-up period ( $P = 0.724$ ). We conclude that future research must explore the relative costs and benefits of the various treatment options.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

## REFERENCES

- Acikbas C, Gurkanlar D. Post-traumatic C7-T1 Spondyloptosis in a patient without neurological deficit: A case report. *Turk Neurosurg* 2010;20:257-60.
- Dahdaleh NS, Dlouhy BJ, Greenlee JD, Smoker WR, Hitchon PW. An algorithm for the management of posttraumatic cervical spondyloptosis. *J Clin Neurosci* 2013;20:951-7.
- Goffin J, Grob D. Spondyloptosis of the cervical spine in neurofibromatosis. A case report. *Spine* 1999;24:587-90.
- Jayakumar P, Choi D, Casey A. Late presentation of a type III axis fracture with spondyloptosis. *Ann R Coll Surg Engl* 2008;90:W1-3.
- Keskin F, Kalkan E, Erdi F. The surgical management of traumatic c6-c7 spondyloptosis. *J Korean Neurosurg Soc* 2013;53:49-51.
- Lee CW, Hwang SC, Im SB, Kim BT, Shin WH. Traumatic Thoracic Spondyloptosis: A Case Report. *J Korean Neurosurg Soc* 2004;35:622-4.
- Mamindla RK, Kumar A, Bhattacharjee S, Sahu BP. A novel case of "ambulatory" cervical spondyloptosis: Case report with literature review. *Eur Spine J* 2014;23(Suppl 2):161-6.
- Menku A, Kurtsoy A, Tucer B, Oktem IS, Akdemir H. The surgical management of traumatic C6-C7 spondyloptosis in a patient without neurological deficits. *Minim Invasive Neurosurg* 2004;47:242-4.
- Munakomi S, Bhattarai B, Cherian I. Traumatic Cervical Spondyloptosis in a Neurologically Stable Patient: A Therapeutic Challenge. *Case Rep Crit Care* 2015;2015:540919.
- Padwal A, Shukla D, Bhat DI, Somanna S, Devi BI. Post-traumatic cervical spondyloptosis: A rare entity with multiple management options. *J Clin Neurosci* 2016;28:61-6.
- Ramieri A, Domenicucci M, Cellocco P, Lenzi J, Dugoni DE, Costanzo G. Traumatic spondylolisthesis and spondyloptosis of the subaxial cervical spine without neurological deficits: Closed re-alignment, surgical options and literature review. *Eur Spine J* 2014;23(Suppl 6):658-63.
- Srivastava SK, Agrawal KM, Sharma AK, Agrawal MD, Bhosale SK, Renganathan SR. C3-C4 spondyloptosis without neurological deficit-a case report. *Spine J* 2010;10:e16-20.
- Tumialan LM, Dadashev V, Laborde DV, Gupta SK. Management of traumatic cervical spondyloptosis in a neurologically intact patient: Case report. *Spine* 2009;34:E703-8.
- Tumialan LM, Theodore N. Basilar artery thrombosis after reduction of cervical spondyloptosis: A cautionary report. *J Neurosurg Spine* 2012;16:492-6.
- Wild A, Jager M, Werner A, Eulert J, Krauspe R. Treatment of congenital spondyloptosis in an 18-month-old patient with a 10-year follow-up. *Spine* 2001;26:E502-5.