



Review Article

T1–T2 disc herniation: Report of four cases and review of the literature

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ABSTRACT

Background: Symptomatic T1–T2 disc herniations are rare and, in most cases, are located posterolaterally. Posterior approaches may utilize transfacet pedicle-sparing techniques, while the less frequent central/anterolateral discs may warrant anterior surgery.

Case Description: Here, we reviewed four cases of symptomatic T1–T2 disc herniations; two patients were paraparetic due to central discs and underwent anterior surgery utilizing a cage construct. The latter two cases had posterolateral discs contributing to a Brown-Sequard syndrome and radiculopathy, respectively; one patient required a transfacet pedicle-sparing procedure, while the second case was managed conservatively. All surgically treated patients recovered fully.

Conclusions: We reviewed 4 cervical T1–T2 disc herniations; two central/anterolateral lesions warranting anterior surgical approaches/cages, and 2 lateral discs treated with a posterolateral transfacet, pedicle-sparing procedure and no surgery respectively. Follow-up magnetic resonance studies documented full resolution for the patient with radiculopathy and a posterolateral disc.

Keywords: Disc herniation, spontaneous resolution, sternal splitting approach, T1–T2 disc space, thoracic disc, upper thoracic disc herniation

INTRODUCTION

Thoracic disc herniations make up 0.25%–0.75% of all disc ruptures.^[3,6,19,28,30,34] Most thoracic disc herniations occur below the T8 level, and the majority are found at T11–T12.^[3,6,19,28,30,34] T1–T2 discs account for only approximately 1–3% of all thoracic discs. The first reported case was in 1945; since then, only 31 additional cases have been published.^[1,2,4,5,7,8,11–15,17,18,25,26,29,32,33,35–37] T1–T2 disc herniation can present with either radiculopathy or myelopathy.

In this article, we reviewed these 32 prior cases of T1–T2 disc herniations and added our four cases. We focused on the clinical presentation, e.g. T1–T2 myelopathy and/or radiculopathy, magnetic resonance

(MR) localization (anterior/anterolateral/lateral posterior), and optimal surgical management.

METHOD

Cases 1 and 2

The four cases of T1–T2 discs included two females and two males who ranged in the age group from 36 to 67 years (average: 47 years). Two females aged 67 and 48 years presented with acute cord infarction and paraparesis, respectively; the modified Japanese Orthopaedic Association (JOA) score for thoracic myelopathy (maximum 11) was 6 and the second patient was 7 [Table 1]. MR studies documented a soft central disc in one patient, and a calcified central disc in the second [Figures 1 and 2]. Both were approached anteriorly with low cervical-suprasternal approaches and accompanied by cage application.

Cases 3 and 4

Cases 3 and 4, respectively exhibited, a Brown-Sequard syndrome and radiculopathy alone. For the former patient, cervicothoracic MRI showed a left centro-laterally disc at the T1–T2 level. This was excised utilizing a transfacet pedicle-sparing left-sided approach with left-sided T1–T3 pedicle screw fixation to avoid instability [Figure 3]. The fourth patient had an MR left-sided laterally located extruded disc at the T1–T2 level managed nonsurgically [Figure 4a and b].

RESULT

The surgically treated patients all markedly recovered over an average of 3.87 years' follow-up (range: 6 months–7 years). Postoperative MR imaging (MRI) studies in the first two patients showed adequate cord decompression following placement of T1–T2 anterior interbody cages [Figures 1 and 2]. The third patient undergoing a

Table 1: The details of 36 cases with T1–T2 disc herniation.

No	Author	Year	Sex	Age	Clinical picture	Side	Management
1	Svien and Karavitis ^[35]	1954	Male	39	Radiculopathy	Left	Hemilaminectomy
2	Horwitz <i>et al.</i> ^[13]	1955	Female	43	Radiculopathy	Right	Hemilaminectomy
3	Abbott and Retter ^[1]	1955	Male	61	Radiculopathy	Right	Hemilaminectomy
4	Hammon ^[11]	1968	Male	33	Radiculopathy	Left	Hemilaminectomy
5	Gelch ^[7]	1978	Male	40	Radiculopathy	Right	Partial laminectomy
6	Patterson and Arbit ^[26]	1978	Male	39	Myelopathy	Central	Transfacet pedicle-sparing discectomy
7	Hann ^[12]	1980	Male	43	Radiculopathy	Left	Hemilaminectomy
8	Hann ^[12]	1980	Female	43	Radiculopathy	Left	Hemilaminectomy
9	Lloyd <i>et al.</i> ^[18]	1980	Male	50	Radiculopathy	Left	Laminectomy
10	Alberico <i>et al.</i> ^[2]	1986	Male	49	Radiculopathy	Right	Posterolateral approach
11	Kumar and Buckley ^[16]	1986	Male	45	Radiculopathy	Right	Hemilaminectomy
12	Hamlyn <i>et al.</i> ^[10]	1991	Female	72	Radiculopathy	Right	Partial laminectomy
13	Rossitti <i>et al.</i> ^[29]	1993	Male	43	Radiculopathy	Right	Anterior sternal splitting+interbody graft
14	Winter and Siebert ^[37]	1993	Female	66	Myelopathy	Central	Transthoracic approach (T2 subtotal corpectomy)
15	Nakahara and Sato ^[24]	1995	Male	56	Myelopathy	Central	Anterior suprasternal approach+discectomy+graft
16	Morgan and Abood ^[21]	1998	Female	69	Radiculopathy	Right	Laminectomy+foraminotomy
17	Morgan and Abood ^[21]	1998	Male	48	Radiculopathy	Left	Laminectomy+foraminotomy
18	Morgan and Abood ^[21]	1998	Male	54	Radiculopathy	Left	Laminectomy+foraminotomy
19	Morgan and Abood ^[21]	1998	Male	48	Radiculopathy	Left	Laminectomy+foraminotomy
20	Sharan <i>et al.</i> ^[31]	2000	Female	59	Myelopathy	Central	Anterior suprasternal approach+discectomy
21	Negovetić <i>et al.</i> ^[25]	2001	Female	64	Myelopathy	Central	Laminectomy+transdural disc removal
22	Takagi <i>et al.</i> ^[36]	2002	Male	56	Myelopathy	Left	Laminectomy
23	Caner <i>et al.</i> ^[5]	2003	Male	57	Radiculopathy	Left	Anterior manubrium splitting+discectomy
24	Gille <i>et al.</i> ^[8]	2006	Male	60	Radiculopathy	Right	Conservative
25	Gille <i>et al.</i> ^[8]	2006	Female	55	Radiculopathy	Left	Anterior suprasternal approach+discectomy
26	Kanno <i>et al.</i> ^[14]	2009	Male	57	Radiculopathy	Right	Laminectomy+medial facetectomy
27	Keachi <i>et al.</i> ^[15]	2010	Female	52	Myeloradiculopathy	Central	Anterior suprasternal approach+Arthroplasty
28	Bransford <i>et al.</i> ^[4]	2010	Male	67	Myelopathy	central	Bilateral pedicle sparing+instrumentation
29	Son <i>et al.</i> ^[32]	2012	Male	37	Radiculopathy	Left	Laminectomy+foraminotomy
30	Kuzma <i>et al.</i> ^[17]	2013	Male	23	Radiculopathy	Left	Laminectomy+foraminotomy
31	Spacey <i>et al.</i> ^[33]	2014	Female	54	Radiculopathy	Left	Conservative
32	Gokcen <i>et al.</i> ^[9]	2017	Male	45	Radiculopathy	Right	Hemilaminectomy, foraminotomy and discectomy
33	Current case 1	2018	Female	67	Myelopathy	Central	Anterior low cervical suprasternal+cage
34	Current case 2	2018	Female	46	Myelopathy	Central	Anterior Low cervical suprasternal+cage
35	Current case 3	2018	Male	37	Brown-Sequard	Lateral	Transfacet pedicle-sparing discectomy+PSF
36	Current case 4	2018	Male	36	Radiculopathy	Left	Conservative



Figure 1: (a) T2-weighted sagittal image demonstrating a disc herniation at T1–T2 level with considerable cord compression. (b) Axial view showing the central location of the disc. (c) Manubrium line and cervicothoracic (CT) angle on T2-weight magnetic resonance imaging (MRI): manubrium line intersects T2 vertebral body near to T2–T3 disc, CT angle is about 38°. (d) Chest X-ray showing that T1–T2 disc space is far enough above biclavicular line. (e) Showing removal of the sequestered disc fragment. (f) After placement of peek cage, note brachiocephalic vein at lower border of the scene. (g) Post-operative CT AP X-ray: shows the cage in T1–T2 disc space. (f) Postoperative T1-weighted MRI, at 3-year follow-up, note clearance of the cord. (i) Postoperative T2-weighted MRI demonstrates the cage in T1–T2 interspace.

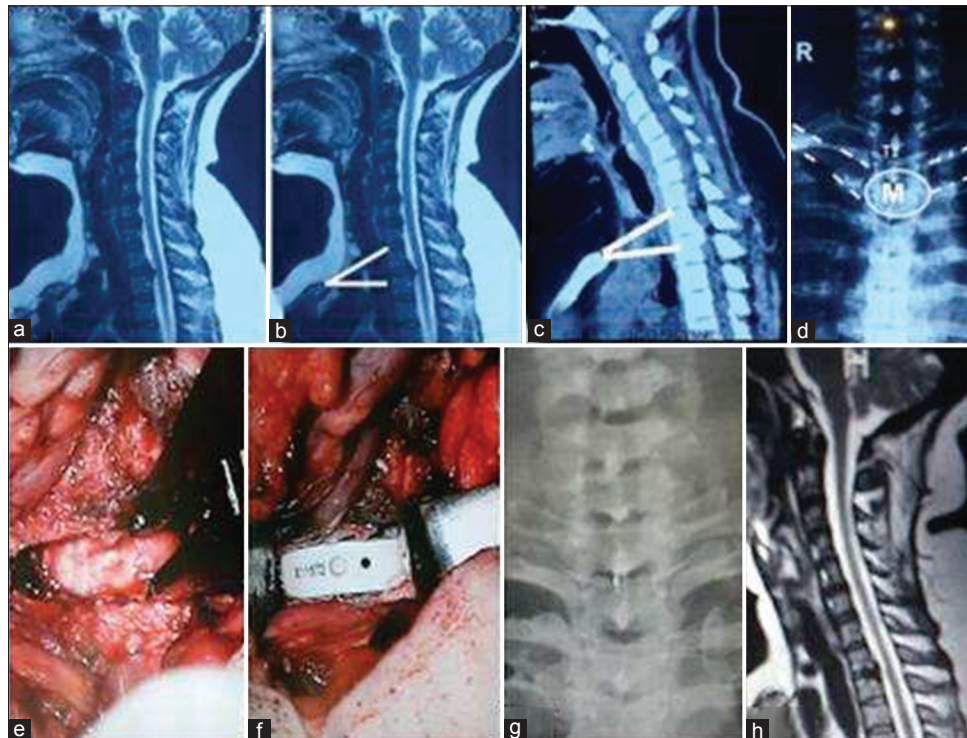


Figure 2: (a) T2-weighted sagittal magnetic resonance imaging (MRI) of the second case showing a hard disc at T1–T2 level. (b) The disc space is a little bit above the manubrium line and cervicothoracic (CT) angle is 27°. (c) Reconstructed sagittal computed tomography (CT) scan of the CT region showing T1–T2 hard disc, indicating that the compression, also note that CT angle is 10°. (d) Chest X-ray shows that T1–T2 disc is a few mm above the manubrium. (e) Intraoperative clearance of the disc space from both hard disc and osteophytes. (f) After placement of a large cage. (g) Plain CT radiograph showing that the cage is located at bicalvicular line. (h) Postoperative T2-weighted MRI: showing appropriate decompression of the spinal cord at T1–T2 level.

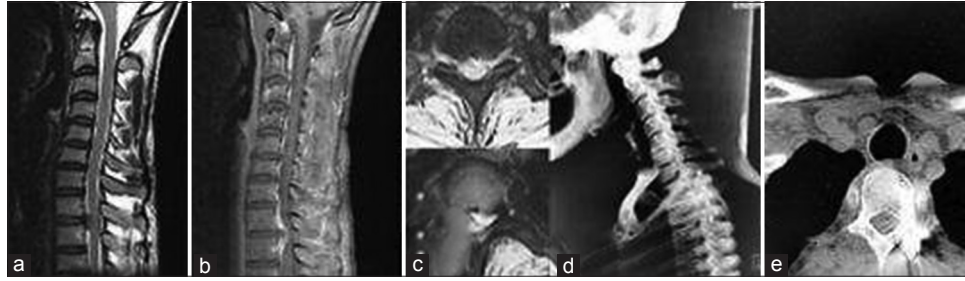


Figure 3: (a) T2-weighted sagittal magnetic resonance imaging (MRI) shows T1–T2 disc herniation. (b) Sagittal cervical fat saturated MRI shows the same. (c) Axial T2-weighted MRI shows a hyperintense disc on the left side. (d) Three-dimensional cervical computed tomography (CT) scan shows T1–T2 and T3 screw rod fixation on the left side. (e) Axial CT scan shows a pedicle screw in an upper thoracic vertebra.



Figure 4: (a) T2-weighted sagittal magnetic resonance imaging shows a T1–T2 extruded disc migrated up. (b) Axial view shows the posterolaterally located disc is on the left side. (c) T2-weighted sagittal image shows complete resolution of the disc at 5-month follow-up. (d) Axial T2-weighted axial view also confirms disappearance of the disc.

transfacet pedicle-sparing left-sided approach had a postoperative three-dimensional computed tomography scans showing adequate root decompression and screw placement screws [Figures 3e and d]. For the fourth patient, the sequestered disc disappeared 5 months later [Figures 4c and d]. Outcomes were based on the modified JOA scores for the three patients with thoracic myelopathy and their scores were 10, 11, and 11, respectively, while the visual analog scale for the fourth patient was 0.

DISCUSSION

Frequency of T1–T2 discs

Symptomatic disc herniation in the upper thoracic spine from T1 to T4 is rare, with most occurring at T1–T2 levels^[3,6,19,28,30,34] [Table 1]. We added our cases (four cases) of T1–T2 disc herniations to those 32 cases found in the literature.^[1,2,4,5,7,8,10-17,21,24-26,29,31-33,35-37] There were 24 males and 12 females averaging 49.1 years of age (range 23–72 years of age) [Table 2]. Most T1–T2 discs were posterolateral in location (25 cases); only 11 were purely central or centrolateral. In one case, a central disc fragment extended through the dura.^[15] Patients with thoracic discs typically present with neck pain (i.e. 24/36 patients).^[1,2,4,5,7-9,11-15,17,18,21,24-26,29,31-33,35-37]

Diagnosis of T1–T2 discs and therapeutic intervention

MRI best documents soft T1–T2 thoracic discs, while computed tomography is typically optimal for calcified herniations.

Table 2: Patients demographic data and common clinical features of the corresponding location at which they generate.

	Descriptive statistics
Age	
Mean	50.3611
Median	49.5000
Standard deviation	11.42467
Range	49.00
Minimum	23.00
Maximum	72.00
Sex (n)	
Female	12
Male	24
Diagnosis (n)	
Radiculopathy	25
Myelopathy	9
Myeloradiculopathy	1
Brown-sequard	1

Conservative versus surgical treatment for T1–T2 discs

Conservative treatments are appropriate for T1–T2 discs resulting in just mild radiculopathy (e.g. posterolateral discs) and, in some cases, spontaneously resolved (2 of 36 cases).

Surgery for T1–T2 posterolateral herniated discs may require transfacet pedicle-sparing decompression with pedicle screw fixation.^[4,6,27,30,34] However, for central T1–T2 disc herniations, resulting in significant myelopathy, anterior surgery may be

warranted (e.g., the low cervical-manubrium method and/or limited sternal splitting procedures).^[6,20,22,23,27,34]

CONCLUSIONS

T1–T2 thoracic disc herniations are an extremely rare, and optimal results depend on the central and centrolateral location of the discs and the operative/nonoperative choices were made based on the clinical presentation.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understand that her name and initial will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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