

Tethered Cord Syndrome in the United States: Cluster Analysis of Presenting Current Anomalies and Associated Conditions

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Learning Objectives

- 1) Describe the importance of identifying the top concurrent anomalies present in tethered cord patients in the United States
- 2) Discuss, in small groups, the most common concurrent anomalies for each body system

Introduction

- Tethered cord syndrome(TCS) is a form of an occult spinal dysraphism which includes:
 - Low lying conus, tight filum terminale, lipomeningomyelocele, split cord malformations, dermal sinus tracts, and dermoids
- Associated with musculoskeletal, neurological, and gastrointestinal abnormalities

Methods

- Retrospective review of the prospectively collected Nationwide Inpatient Sample(NIS) database from 2003-2012.
- NIS supplied hospital- and year-adjusted weights allowed for:
 - accurate assessment of incidence of TCS, cardiac and gastrointestinal(GI) and genitourinary(GU) anomalies

Body System Anomaly	Frequency
Spine	3298 (24.48%)
Syndrome	9.67%
Cardiac	6.27%
Urinary	5.37%
Gastrointestinal	4.55%
Nervous	3.16%
Genital & Urinary	2.48%
Bone	1.01%
Neck	1.00%
Face	0.68%
Eye	0.44%
Ear	0.40%
Lung	0.36%
Endocrine system	0.01%

Results

N=13,470 patients w/ TCS diagnosis

- 40.7% have at least one additional anomaly
- Secondary anomalies most frequently presented in the following systems:
- spine (24.48%), cardiac (6.27%), urinary (5.37%), GI (4.55%), nervous (3.16%), GU (2.48%), and bone (1.01%)
 - 12.55% of TCS patients had more than one body system anomal

Of patients with more than one associated anomaly, the most common combination of body system anomalies were:

- GI and cardiac (4.55%), urinary and GI (4.26%), and urinary and cardiac (4.19%).

The most common spinal associations were:

- 13.65% spina bifida, 0.39% Klippel-Feil, and 0.12% with torticollis

The most common neurological and musculoskeletal anomalies were:

- 13.45% with any VACTERL association, 3.58% with Rubenstein-Taybi syndrome, 0.42% with hydromyelia, 0.16% with chromosome 22 defect/deletion

23.8% of TCS patients with microcephalus also had patent ductus arteriosus and 18.0% of TCS patients with reduction deformities of the brain presented with atrial septal defect

The most common specific anomalies were:

- spina bifida, large intestine atresia, Rubenstein-Taybi syndrome, and atrial and ventral septal defects

Anomaly Type	Neck	Bone	Nervous System	Genetic	Spine	Urinary Genital	Gastro-Intestinal	Cardiac
Cardiac	53	30	107	124	130	230	250	
Gastrointestinal	31	20	42	138	98	234		250
Urinary & Genital	21	29	59	120	151		234	230
Spinal	8	46	66	52		151	98	130
Syndrome	48	36	87	96	471	225	201	287
Genetic	12	8	26		52	120	138	124
Nervous system	31	11		26	66	59	42	107
Bone	5		11	8	46	29	20	30
Neck		5	31	12	8	21	31	53
Eye	6	2	15	3	8	8		16
Ear	4	3	7	9	7	17	7	20
Lung	4	13	9	8	6	13	8	16
Facial	10	2	19	26	4	25	22	44

Conclusions

- This study provides a nationwide prospective on congenital anomalies and concurrent conditions present in the tethered cord syndrome patient population in the United States.
- 40.7% of TCS patients have at least one associated anomaly reported.
- The most common congenital anomalies studied were spina bifida, urogenital with or without cardiac septal defects, cytourethral anomaly or cystic kidney disease with or without large intestinal atresia.

References

1. Healthcare Cost and Utilization Project (HCUP): Overview of the Nationwide Inpatient Sample (NIS). Agency for Healthcare Research and Quality;2014.
2. Healthcare Cost and Utilization Project (HCUP): 2010 Introduction to the Nationwide Inpatient Sample (NIS). Agency for Healthcare Research and Quality;2014.

Scoliosis Diagnosis	N	Percentage
No scoliosis	12173	90.37%
Idiopathic Scoliosis	751	5.58%
Congenital Scoliosis	227	1.69%
Scoliosis not elsewhere classified	156	1.16%
Postural Kyphosis	51	0.38%
Scoliosis Associated with Other Conditions	42	0.31%
Progressive Infantile Idiopathic Scoliosis	18	0.13%
Thoracic Congenital Scoliosis	17	0.13%
Kyphosis not elsewhere classified	10	0.07%
Kyphosis Associated with Other Conditions	10	0.07%
Post-laminectomy Kyphosis	1	0.01%
Curvature not elsewhere classified	1	0.01%
Lordosis Associated with Other Conditions	1	0.01%
Other Spine Curves	1	0.01%
Unspecified Curvature	1	0.01%