

Epidemiological Characteristics of Traumatic Spinal Cord Injury in Shaanxi, China

Jinpeng Du*, MD;, Liang Yan*, MD;, Baorong He†, MD;, Dingjun Hao†, MD;, Jiawei Ouyang, MD;, He Zhao, MD;, Keyuan Ding, MD;, Haodong Shi, MD;, Yang Cao, MD;, Ying Zhang, MD;, Yuan Liu, MD;, Ye Tian, MD;, Hao Chen, MD;, Lulu Bai, MD;, Chenchen Mu, MD;, Youhan Wang, MD

Department of Spine Surgery, Honghui Hospital, Xi'an Jiao Tong University, Xi'an, China. (All authors) Corresponding Author; Dingjun Hao, Department of Spine Surgery, Honghui Hospital, Xi'an Jiao Tong University, Friendship East Road, Xi'an, 710000, Shaanxi Province, China. Email: hhyhdj@126.com. Tel/Fax: 0086-13909297839.

Online Resource 1.1 Raw data for Etiology

Etiology	Traffic accidents	Sports	Low falls	High falls	Other	Total
N	158	7	185	279	65	694
Proportion	22.8%	1.0%	26.7%	40.2%	9.4%	100.0%

Online Resource 1.2 Distribution of Etiology for TSCI patients by the severity of injury (number)

Severity of injury	Traffic accidents	Sports	Low falls	High falls	Other	Total
Complete paraplegia	29	1	38	97	28	193
Incomplete paraplegia	129	6	147	182	37	501
Total	158	7	185	279	65	694

Online Resource 1.2 continued Distribution of Etiology for TSCI patients by the severity of injury (Proportion)

Severity of injury	Traffic accidents	Sports	Low falls	High falls	Other	Total
Complete	15.0%	0.5%	19.7%	50.3%	14.5%	100.0%
Incomplete	25.7%	1.2%	29.3%	36.3%	7.4%	100.0%
Total	22.8%	1.0%	26.7%	40.2%	9.4%	100.0%

Online Resource 1.3 Distribution of Etiology for TSCI patients by the age group (number)

Age group	Traffic accidents	Sports	Low falls	High falls	Other	Total
≤15	0	1	2	3	2	8
16-25	12	0	3	23	2	40
26-35	21	2	19	45	10	97
36-45	41	2	26	57	16	142
46-55	39	1	44	69	25	178
56-65	26	0	48	57	7	138
66-75	17	1	36	22	3	79
≥76	2	0	7	3	0	12
Total	158	7	185	279	65	694

Online Resource 1.3 continued Distribution of Etiology for TSCI patients by the age group (Proportion)

Age group	Traffic accidents	Sports	Low falls	High falls	Other	Total
≤15	0.0%	12.5%	25.0%	37.5%	25.0%	100.0%
16-25	30.0%	0.0%	7.5%	57.5%	5.0%	100.0%
26-35	21.6%	2.1%	19.6%	46.4%	10.3%	100.0%
36-45	28.9%	1.4%	18.3%	40.1%	11.3%	100.0%
46-55	21.9%	0.6%	24.7%	38.8%	14.0%	100.0%
56-65	18.8%	0.0%	34.8%	41.3%	5.1%	100.0%
66-75	21.5%	1.3%	45.6%	27.8%	3.8%	100.0%
≥76	16.7%	0.0%	58.3%	25.0%	0.0%	100.0%
Total	22.8%	1.0%	26.7%	40.2%	9.4%	100.0%

Online Resource 1.4 Distribution of Etiology for TSCI patients by the injury level (number)

Injury level	Traffic accidents	Sports	Low falls	High falls	Other	Total
Cervical spinal cord	96	7	123	83	29	338
Thoracic spinal cord	26	0	27	65	14	132
Lumbosacral spinal cord	36	0	35	131	22	224
Total	158	7	185	279	65	694

Online Resource 1.4 continued Distribution of Etiology for TSCI patients by the injury level (Proportion)

Injury level	Traffic accidents	Sports	Low falls	High falls	Other	Total
Cervical spinal cord	28.4%	2.1%	36.4%	24.6%	8.6%	100.0%
Thoracic spinal cord	19.7%	0.0%	20.5%	49.2%	10.6%	100.0%
Lumbosacral spinal cord	16.1%	0.0%	15.6%	58.5%	9.8%	100.0%
Total	22.8%	1.0%	26.7%	40.2%	9.4%	100.0%

Online Resource 2.1 Raw data for injury level of the patients

Parameter	Cervical spinal cord	Thoracic spinal cord	Lumbosacral spinal cord	Total
N	338	132	224	694
Proportion	48.7%	19.0%	32.3%	100.0%

Online Resource 2.2 Distribution histogram of the injury level of the patients by the age group (number)

Age group	Cervical spinal cord	Thoracic spinal cord	Lumbosacral spinal cord	Total
≤15	4	1	3	8
16-25	13	8	19	40
26-35	29	23	45	97
36-45	61	19	62	142
46-55	88	36	54	178
56-65	84	25	29	138
66-75	51	17	11	79
≥76	8	3	1	12
Total	338	132	224	694

Online Resource 2.2 continued Distribution histogram of the injury level of the patients by the age group (Proportion)

Age group	Cervical spinal cord	Thoracic spinal cord	Lumbosacral spinal cord	Total
≤15	50.0%	12.5%	37.5%	100.0%
16-25	32.5%	20.0%	47.5%	100.0%
26-35	29.9%	23.7%	46.4%	100.0%
36-45	43.0%	13.4%	43.7%	100.0%
46-55	49.4%	20.2%	30.3%	100.0%
56-65	60.9%	18.1%	21.0%	100.0%
66-75	64.6%	21.5%	13.9%	100.0%
≥76	66.7%	25.0%	8.3%	100.0%
Total	48.7%	19.0%	32.3%	100.0%

Online Resource 3.1 Raw data for ASIA Grade

Parameter	A	B	C	D	Total
N	186	78	168	262	694
Proportion	26.8%	11.2%	24.2%	37.8%	100.0%

Online Resource 3.2 Distribution of ASIA Grade for TSCI patients by the age group (number)

Age group	A	B	C	D	Total
-----------	---	---	---	---	-------

≤15	1	1	2	4	8
16-25	11	9	12	8	40
26-35	30	11	21	35	97
36-45	46	10	25	61	142
46-55	43	16	44	75	178
56-65	39	19	33	47	138
66-75	15	9	26	29	79
≥76	1	3	5	3	12
Total	186	78	168	262	694

Online Resource 3.2 continued Distribution of ASIA Grade for TSCI patients by the age group (Proportion)

Age group	A	B	C	D	Total
≤15	12.5%	12.5%	25.0%	50.0%	100.0%
16-25	27.5%	22.5%	30.0%	20.0%	100.0%
26-35	30.9%	11.3%	21.6%	36.1%	100.0%
36-45	32.4%	7.0%	17.6%	43.0%	100.0%
46-55	24.2%	9.0%	24.7%	42.1%	100.0%
56-65	28.3%	13.8%	23.9%	34.1%	100.0%
66-75	19.0%	11.4%	32.9%	36.7%	100.0%
≥76	8.3%	25.0%	41.7%	25.0%	100.0%
Total	26.8%	11.2%	24.2%	37.8%	100.0%

Online Resource 3.3 Distribution of ASIA Grade for TSCI patients by the cause of injury (number)

Cause of injury	A	B	C	D	Total
Traffic accidents	30	17	49	62	158
Sports	0	1	3	3	7
Low falls	38	13	51	83	185
High falls	90	37	52	100	279
Other	28	10	13	14	65
Total	186	78	168	262	694

Online Resource 3.3 continued Distribution of ASIA Grade for TSCI patients by the cause of injury (proportion)

Cause of injury	A	B	C	D	Total
Traffic accidents	19.0%	10.8%	31.0%	39.2%	100.0%
Sports	0.0%	14.3%	42.9%	42.9%	100.0%
Low falls	20.5%	7.0%	27.6%	44.9%	100.0%

High falls	32.3%	13.3%	18.6%	35.8%	100.0%
Other	43.1%	15.4%	20.0%	21.5%	100.0%
Total	26.8%	11.2%	24.2%	37.8%	100.0%

Online Resource 3.4 Distribution of ASIA Grade for TSCI patients by the by the injury level (number)

ASIA grade	Cervical spinal cord	Thoracic spinal cord	Lumbosacral spinal cord	Total
A	68	74	44	186
B	42	7	29	78
C	102	22	44	168
D	126	29	107	262
合计	338	132	224	694

Online Resource 3.4 continued Distribution of ASIA Grade for TSCI patients by the by the injury level (proportion)

ASIA grade	Cervical spinal cord	Thoracic spinal cord	Lumbosacral spinal cord	Total
A	20.1%	56.1%	19.6%	26.8%
B	12.4%	5.3%	12.9%	11.2%
C	30.2%	16.7%	19.6%	24.2%
D	37.3%	22.0%	47.8%	37.8%
合计	100.0%	100.0%	100.0%	100.0%

Online Resource 4 Raw data for severity of injury of TSCI patients

Parameter	Complete tetraplegia	Incomplete tetraplegia	complete paraplegia	Incomplete paraplegia
N	43	267	150	234
Proportion	6.2%	38.5%	21.6%	33.7%

Online Resource 5.1 Distribution histogram of fracture level of the patients by the age group (number)

Age group	Cervical	Thoracic	Lumbosacral	Total
≤15	0	1	4	5
16-25	12	9	21	42
26-35	18	38	42	98
36-45	42	42	49	133
46-55	41	53	49	143
56-65	46	35	28	109
66-75	26	19	12	57
≥76	5	5	1	11
Total	190	202	206	598

Online Resource 5.1 continued Distribution histogram of fracture level of the patients by the age group (proportion)

Age group	Cervical	Thoracic	Lumbosacral	Total
≤15	0.0%	20.0%	80.0%	100.0%
16-25	28.6%	21.4%	50.0%	100.0%
26-35	18.4%	38.8%	42.9%	100.0%
36-45	31.6%	31.6%	36.8%	100.0%
46-55	28.7%	37.1%	34.3%	100.0%
56-65	42.2%	32.1%	25.7%	100.0%
66-75	45.6%	33.3%	21.1%	100.0%
≥76	45.5%	45.5%	9.1%	100.0%
Total	31.8%	33.8%	34.4%	100.0%

Online Resource 5.2 Distribution histogram of fracture level of the patients by the type of fracture (number)

Fracture site	Compression	Burst	Seat-belt	Dislocation	Total
C1	2	2	6	11	21
C2	3	4	5	25	37
C3	5	2	2	11	20
C4	10	8	1	23	42
C5	11	6	2	37	56
C6	17	9	2	45	73
C7	16	2	3	22	43
T1	11	2	0	1	14
T2	9	0	0	0	9
T3	8	4	0	2	14
T4	12	4	0	4	20
T5	12	8	0	2	22
T6	12	9	0	2	23
T7	13	10	1	1	25
T8	7	6	2	3	18
T9	9	2	0	0	11
T10	12	5	0	1	18
T11	16	11	1	9	37
T12	39	50	0	17	106
L1	31	88	0	9	128
L2	27	36	0	1	64
L3	11	21	0	2	34
L4	10	5	0	2	17
L5	7	6	0	3	16
Total	310	300	25	233	868

Online Resource 5.2 continued Distribution histogram of fracture level of the patients by the type of fracture (proportion)

Fracture site	Compression	Burst	Seat-belt	Dislocation	Total
C1	0.23%	0.23%	0.69%	1.27%	2.42%
C2	0.35%	0.46%	0.58%	2.88%	4.26%
C3	0.58%	0.23%	0.23%	1.27%	2.30%
C4	1.15%	0.92%	0.12%	2.65%	4.84%
C5	1.27%	0.69%	0.23%	4.26%	6.45%
C6	1.96%	1.04%	0.23%	5.18%	8.41%
C7	1.84%	0.23%	0.35%	2.53%	4.95%
T1	1.27%	0.23%	0.00%	0.12%	1.61%
T2	1.04%	0.00%	0.00%	0.00%	1.04%
T3	0.92%	0.46%	0.00%	0.23%	1.61%
T4	1.38%	0.46%	0.00%	0.46%	2.30%
T5	1.38%	0.92%	0.00%	0.23%	2.53%
T6	1.38%	1.04%	0.00%	0.23%	2.65%
T7	1.50%	1.15%	0.12%	0.12%	2.88%
T8	0.81%	0.69%	0.23%	0.35%	2.07%
T9	1.04%	0.23%	0.00%	0.00%	1.27%
T10	1.38%	0.58%	0.00%	0.12%	2.07%
T11	1.84%	1.27%	0.12%	1.04%	4.26%
T12	4.49%	5.76%	0.00%	1.96%	12.21%
L1	3.57%	10.14%	0.00%	1.04%	14.75%
L2	3.11%	4.15%	0.00%	0.12%	7.37%
L3	1.27%	2.42%	0.00%	0.23%	3.92%
L4	1.15%	0.58%	0.00%	0.23%	1.96%
L5	0.81%	0.69%	0.00%	0.35%	1.84%

Online Resource 6.1 Distribution of multiple injuries for TSCI patients by the age group (number)

Age group	Head	Chest	Abdomen	Limbs	Pelvis	Total
≤15	0	1	0	1	1	3
16-25	11	14	2	12	2	41
26-35	22	28	7	23	13	93
36-45	38	47	6	24	6	121
46-55	54	61	6	29	6	156
56-65	36	47	5	16	5	109
66-75	24	24	0	9	2	59
≥76	1	2	2	2	0	7
Total	186	224	28	116	35	589

Online Resource 6.1 continued Distribution of multiple injuries for TSCI patients by the age group (proportion)

Age group	Head	Chest	Abdomen	Limbs	Pelvis	Total
≤15	0.0%	33.3%	0.0%	33.3%	33.3%	100.0%
16-25	26.8%	34.1%	4.9%	29.3%	4.9%	100.0%
26-35	23.7%	30.1%	7.5%	24.7%	14.0%	100.0%
36-45	31.4%	38.8%	5.0%	19.8%	5.0%	100.0%
46-55	34.6%	39.1%	3.8%	18.6%	3.8%	100.0%
56-65	33.0%	43.1%	4.6%	14.7%	4.6%	100.0%
66-75	40.7%	40.7%	0.0%	15.3%	3.4%	100.0%
≥76	14.3%	28.6%	28.6%	28.6%	0.0%	100.0%
Total	31.6%	38.0%	4.8%	19.7%	5.9%	100.0%

Online Resource 6.2 Distribution of multiple injuries for TSCI patients by the cause of injury (number)

Etiology	Head	Chest	Abdomen	Limbs	Pelvis	Total
Traffic accidents	49	50	6	33	9	147
Sports	1	0	0	0	0	1
Low falls	45	38	2	12	3	100
High falls	75	114	16	57	22	284
Other	16	22	4	14	1	57
Total	186	224	28	116	35	589

Online Resource 6.2 continued Distribution of multiple injuries for TSCI patients by the cause of injury (proportion)

Etiology	Head	Chest	Abdomen	Limbs	Pelvis	Total
Traffic accidents	33.3%	34.0%	4.1%	22.4%	6.1%	100.0%
Sports	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Low falls	45.0%	38.0%	2.0%	12.0%	3.0%	100.0%
High falls	26.4%	40.1%	5.6%	20.1%	7.7%	100.0%
Other	28.1%	38.6%	7.0%	24.6%	1.8%	100.0%
Total	31.6%	38.0%	4.8%	19.7%	5.9%	100.0%

Online Resource 7.1 Raw data for clinical complications

Parameter	Urinary system	Respiratory system	Digestive system	Electrolyte disorder	Bedsore	Venous thrombosis	Cardiovascular system	Other	Total
N	39	99	34	50	11	42	31	15	193

Proportion	20.2%	51.3%	17.6%	25.9%	5.7%	21.8%	16.1%	7.8%	100.0%
------------	-------	-------	-------	-------	------	-------	-------	------	--------

Online Resource 7.2 Distribution of complications for TSCI patients by the ASIA Grade (number)

ASIA grade	Urinary system	Respiratory system	Digestive system	Electrolyte disorder	Bedsore	Venous thrombosis	Cardiovascular system	Other	Total
A	22	52	17	26	6	25	17	5	193
B	5	10	4	9	2	8	1	0	193
C	9	21	8	10	3	6	9	5	193
D	3	16	5	5	0	3	2	5	193
Total	39	99	34	50	11	42	29	15	193

Online Resource 7.2 continued Distribution of complications for TSCI patients by the ASIA Grade (proportion)

ASIA grade	Urinary system	Respiratory system	Digestive system	Electrolyte disorder	Bedsore	Venous thrombosis	Cardiovascular system	Other	Total
A	11.4%	26.9%	8.8%	13.5%	3.1%	13.0%	8.8%	2.6%	100.0%
B	2.6%	5.2%	2.1%	4.7%	1.0%	4.1%	0.5%	0.0%	100.0%
C	4.7%	10.9%	4.1%	5.2%	1.6%	3.1%	4.7%	2.6%	100.0%
D	1.6%	8.3%	2.6%	2.6%	0.0%	1.6%	1.0%	2.6%	100.0%
Total	20.2%	51.3%	17.6%	25.9%	5.7%	21.8%	15.0%	7.8%	100.0%

Online Resource 7.3 Distribution of complications for TSCI patients by the injury level (number)

Online Resource 7.3 continued Distribution of complications for TSCI patients by the injury level

Injury level	Urinary system	Respiratory system	Digestive system	Electrolyte disorder	Bedsore	Venous thrombosis	Cardiovascular system	Other	Total
Cervical spinal cord	19	52	11	29	6	19	16	7	193
Thoracic spinal cord	7	25	10	13	3	13	10	3	193
Lumbosacral spinal cord	13	22	13	8	2	10	5	5	193
Total	39	99	34	50	11	42	31	15	193

(proportion)

Injury level	Urinary system	Respiratory system	Digestive system	Electrolyte disorder	Bedsore	Venous thrombosis	Cardiovascular system	Other	Total
Cervical spinal cord	9.8%	26.9%	5.7%	15.0%	3.1%	9.8%	8.3%	3.6%	100.0%
Thoracic spinal cord	3.6%	13.0%	5.2%	6.7%	1.6%	6.7%	5.2%	1.6%	100.0%
Lumbosacral	6.7%	11.4%	6.7%	4.1%	1.0%	5.2%	2.6%	2.6%	100.0%

spinal cord									
Total	20.2%	51.3%	17.6%	25.9%	5.7%	21.8%	16.1%	7.8%	100.0%