Don't Miss Them! Associated Injuries in Spine Trauma Patients

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Background

- Spinal fractures are associated with high energy mechanisms and can lead to substantial morbidity and mortality in the trauma setting.

- Rapid identification and treatment of these fractures and their concomitant injuries is paramount in preventing adverse outcomes.

- Awareness of the associations between spinal fractures and other bodily injuries can increase diagnostic efficacy and improve patient care.

Methods

- The American College of Surgeons Trauma Registry was queried for patients suffering spine fractures.

- 3,399 patients had a trauma activation called upon admission from 1/2016-12/2019.

- Univariate logistic regression analysis was utilized on the spine fracture cohort to identify associated injuries, association with injury severity score (ISS) and Glasgow coma scale (GCS), mechanism of injury, and paralysis.

- Cox hazard regression was utilized to identify factors that increase in hospital mortality.

Conclusions

- Patients who experience fractures of the cervical, thoracic and lumbar spine are at risk for additional fractures, visceral injury, paralysis and death.

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Tables

C-Spine Associated Injuries Logistic Regression	OR	P-value	T-Spine Associated Injuries Logistic Regression	OR	P-value	L-Spine Associated Injuries Logistic Regression	OR	P-value
Associated Head Injury (contusion, concussion)	**2.20**	**0.003**	Associated Head Injury (contusion, concussion)	1.55	0.07	Associated Head Injury (contusion, concussion)	0.66	0.08
Associated Head Bleed (hemorrhage, artery dissection)	**2.77**	**<0.001**	Associated Head Bleed (hemorrhage, artery dissection)	0.88	0.64	Associated Head Bleed (hemorrhage, artery dissection)	0.67	0.15
Associated Cord Injury	1.60	0.28	Associated Cord Injury	1.99	0.11	Associated Cord Injury	0.45	0.07
Cervical Cord Injury	**4.95**	**0.01**	Cervical Cord Injury	1.79	0.33	Cervical Cord Injury	0.32	0.10
Thoracic Cord Injury	0.65	0.59	Thoracic Cord Injury	4.56	0.06	Thoracic Cord Injury	0.50	0.33
Lumbar Cord Injury	0.45	0.47	Lumbar Cord Injury	1.25	0.78	Lumbar Cord Injury	1.01	0.99
Facial Fx	**2.34**	**0.02**	Facial Fx	0.61	0.18	Facial Fx	0.62	0.18
Skull Fx	**4.07**	**<0.001**	Skull Fx	0.64	0.52	**Skull Fx**	**0.33**	**0.01**
Associated Thoracic Fx (msk)	0.77	0.35	**Associated Thoracic Fx (msk)**	**1.94**	**0.01**	Associated Thoracic Fx (msk)	1.27	0.34
Rib Fx	0.64	0.16	**Rib Fx**	**2.31**	**0.003**	**Rib Fx**	**1.90**	**0.02**
Associated UE Fx	0.87	0.69	Associated UE Fx	1.59	0.14	Associated UE Fx	0.84	0.57
Shoulder Fx	1.05	0.91	Shoulder Fx	1.70	0.16	Shoulder Fx	0.57	0.15
Elbow Fx	-	-	Elbow Fx	0.41	0.44	Elbow Fx	3.09	0.33
Wrist Fx	0.40	0.25	Wrist Fx	1.48	0.49	Wrist Fx	1.66	0.39
Associated Pelvic Fx	0.48	0.09	Associated Pelvic Fx	0.61	0.18	**Associated Pelvic Fx**	**5.45**	**<0.001**
Associated LE Fx	0.82	0.60	Associated LE Fx	0.68	0.27	Associated LE Fx	1.92	0.06
Femur Fx	1.40	0.52	Femur Fx	0.73	0.56	Femur Fx	1.74	0.30
Lower Leg Fx	0.71	0.45	Lower Leg Fx	0.63	0.26	**Lower Leg Fx**	**2.46**	**0.03**
Thoracic Cavity Visceral Injury	0.29	0.006	Thoracic Cavity Visceral Injury	1.37	0.32	**Thoracic Cavity Visceral Injury**	**2.23**	**0.02**
Abdominal Cavity Visceral Injury	0.34	0.09	Abdominal Cavity Visceral Injury	1.27	0.59	Abdominal Cavity Visceral Injury	1.86	0.18
Retroperitoneal Cavity Visceral Injury	0.41	0.11	Retroperitoneal Cavity Visceral Injury	1.17	0.71	**Retroperitoneal Cavity Visceral Injury**	**13.69**	**<0.001**
ISS	1.00	0.53	ISS	1.02	0.10	**ISS**	**1.02**	**0.05**
GCS	0.93	0.07	GCS	0.95	0.21	GCS	0.98	0.63

Tables 1A-C: Logistic regression analyzing all spine fracture patients and the likelihood of concomitant injuries with L-spine, T-spine, and C-spine fractures.

Cox Proportional Hazards Regression	HR	P-value
L-Spine	0.70	0.42
T-Spine	0.52	0.16
C-Spine	**3.70**	**0.004**
GCS	**0.85**	**<0.001**
ISS	**1.05**	**<0.001**

Table 2: Cox proportional hazard regression showing increasing risk of death with c-spine fractures, higher ISS scores, and lower GCS scores

Paralysis		RRR	P-value
C-Spine	Partial	2.01	0.31
	Full	5.03	0.07
T-Spine	Partial	2.52	0.20
	Full	0.63	0.60
L-Spine	Partial	0.28	0.12
	Full	0.98	0.99

Table 3: Regression analysis showing relative risk ratios and risk of paralysis.

Results

- Cervical spine fractures were statistically significantly associated with non-hemorrhagic and hemorrhagic head injuries (OR=2.20, p=0.003 and OR 2.27,p<0.001), facial (OR=2.34, p=0.02) and skull fractures (OR=4.07, p<0.001), and cervical cord injuries (OR= 4.95, p=0.01).

- Thoracic spine fractures demonstrated an association with rib fractures (OR=2.31, p=0.01) and associated thoracic skeleton fractures (OR=1.94, p=0.01).

- Lumbar Spine injuries were most strongly associated with pelvic fractures (OR=5.45, p<0.001), lower leg fractures (OR=2.46, p=0.03), injury to the retroperitoneal viscera (OR=13.69, p<0.001), and rib fractures (OR=1.90, p=0.02). Skull fractures are less likely to occur with lumbar fractures (OR=0.33, p=0.01).

- The only mechanism of injury reaching statistical significance was an association between lumbar spine fractures and falls over 6meters (OR=5.78, p=0.02).

- Full paralysis was most strongly associated with c-spine injuries (RRR=5.03, p=0.07) while partial paralysis was most strongly associated with t-spine injuries (RRR=2.52, p=0.2)

- In hospital death was associated with c-spine fractures (HR=3.70, p=0.004), a lower presenting GCS (HR=0.85, p<0.001), and a higher presenting ISS (HR=1.05, p<0.001)