Journal reading

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Are “Normal” Multidetector Computed Tomographic Scans Sufficient to Allow Collar Removal in the Trauma Patient?

(*J Trauma.* 2010;68: 103–108)

Back ground

- C-spine clearance: definitively rule out any injury that could put the spinal cord at risk once the collar is removed and the patient is mobilized.
- No universally accepted guidelines was done.

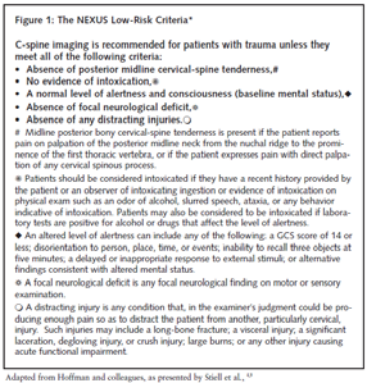


Figure 1: The NEXUS Low-Risk Criteria*

C-spine imaging is recommended for patients with trauma unless they meet all of the following criteria:

- **Absence of posterior midline cervical-spine tenderness,#**
- **No evidence of intoxication,❋**
- **A normal level of alertness and consciousness (baseline mental status),◆**
- **Absence of focal neurological deficit,⊕**
- **Absence of any distracting injuries.❍**

Midline posterior bony cervical-spine tenderness is present if the patient reports pain on palpation of the posterior midline neck from the nuchal ridge to the prominence of the first thoracic vertebra, or if the patient expresses pain with direct palpation of any cervical spinous process.

❋ Patients should be considered intoxicated if they have a recent history provided by the patient or an observer of intoxicating ingestion or evidence of intoxication on physical exam such as an odor of alcohol, slurred speech, ataxia, or any behavior indicative of intoxication. Patients may also be considered to be intoxicated if laboratory tests are positive for alcohol or drugs that affect the level of alertness.

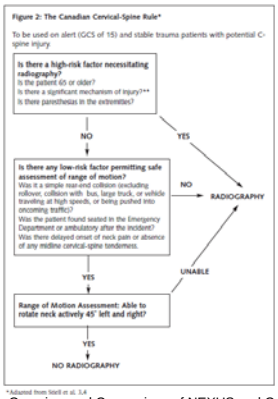
◆ An altered level of alertness can include any of the following: a GCS score of 14 or less; disorientation to person, place, time, or events; inability to recall three objects at five minutes; a delayed or inappropriate response to external stimuli, or alternative findings consistent with altered mental status.

⊕ A focal neurological deficit is any focal neurological finding on motor or sensory examination.

❍ A distracting injury is any condition that, in the examiner's judgment could be producing enough pain so as to distract the patient from another, particularly cervical, injury. Such injuries may include a long-bone fracture, a visceral injury; a significant laceration, degloving injury, or crush injury; large burns; or any other injury causing acute functional impairment.

Adapted from Hoffman and colleagues, as presented by Stiell et al., [43]

Overview and Comparison of NEXUS and Canadian C-Spine Rules
American Journal of Clinical Medicine Volume 3, No. 4, Fall 2006



Overview and Comparison of NEXUS and Canadian C-Spine Rules
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Back ground

- MDCT alone: Sensitivity of detection of unstable C-spine injuries is 98-100%.
- MRI: detect 20.7% soft tissue injury that is not detected on plain films or CT.
- Retrospectively to review the C-spine CT scan to see how often the initially negative results interpreted by radiology was sufficient to clear the C-spine by spine surgeons

Patient and methods

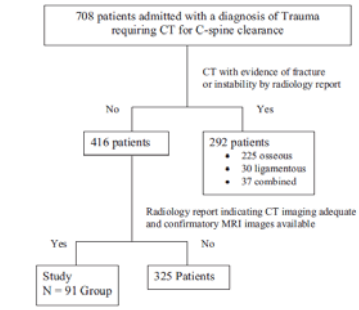

Figure 1. Study outline.

- June, 2001- July, 2006
- Brigham and Women's Hospital, an ACS verified Level I Trauma Center

Four questions

- Whether the study was adequate
- Whether the study had abnormal findings
- Whether there was evidence or suspicion of C-spine instability
- Whether the study alone would allow for discontinued use of the cervical collar.

Results

TABLE 1. Percent Disagreement With Official Radiology MDCT Reports (N = 91)

	Adequate Study			CT Positive			Stable Spine		
	n	%	95% CI	n	%	95% CI	n	%	95 CI
Reader A and B	7	7.7	2.3–13.1	3	3.3	0–7.0	3	3.3	0–7.0
Reader A	8	8.8	3.2–14.8	8	8.8	3.2–14.8	11	12.1	5.4–18.8
Reader B	14	15.4	8.0–22.8	19	20.8	12.5–29.1	15	16.5	8.9–24.1
Both readers agree with Radiology*	76	83.5	71.9–91.1	67	73.6	64.5–82.7	68	74.7	65.8–83.6

* Both reader A and reader B agree with official Radiology report.

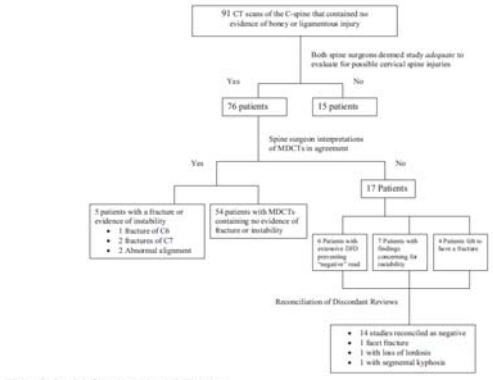

Figure 2. Results of spine surgeon MDCT review.

MRI reviews

- 22/91 have abnormalities on CT by at least one spine surgeon.
- 17/22 (77%) have abnormalities on MRI.

Discussion

- MRI is the gold standard for cervical clearance in the obtunded patient.
  - Mechanical ventilation
  - Risk of leaving of the ICU
  - the need for nursing staff to accompany the patient during the study
- Discrepancy of reading images

Discussion

- 8% (7/91) have inadequate studies.
- 3% (3/91) have unstable spine.
- 18% (17/91) have injuries on MRI.

Conclusion

- MDCT scans obtained on trauma patients may need to be evaluated by both the primary team and a spine consultant.
- Good communication between primary trauma team, radiologists, and spine surgeons.

Any questions ?

Just One Drop: The Significance of a Single Hypotensive Blood Pressure Reading During Trauma Resuscitations

J Trauma. 2010;68: 1289–1295

Back ground

- Tachycardia in trauma patients may be an unreliable indicator of injury.
- Persistent hypotension is often a late manifestation of shock.
- Isolated hypotensive BP measurements should alert the clinician to the presence of injuries that require immediate operative or endovascular treatment.
- A single hypotensive BP “cutpoint” value

Methods

- Prospective observational study
- June 2008 - January 2009
- Temple University Hospital

Methods

- Inclusion:
  - Patients between 18 - 88 years old, regardless of injury mechanism.
  - Single measurement of BP < 110 mmHg
- Exclusion:
  - Transferred from outside hospitals
  - Injured 2 hours before ED arrival
  - Manage by ED staff
  - only isolated prehospital hypotension
  - >= 2 hypotensive episode

Results

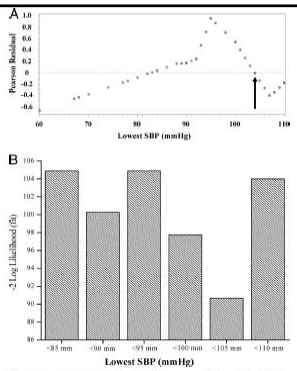

Figure 1. Cutpoint analysis of the range of lowest isolated SBP established the SBP value most predictive of the need for immediate operation. Locally weighted regression was used to determine inflection points in the lowest SBP measurement to immediate operative intervention relationship based on the Pearson residuals (*A*). Results of different lowest SBP cutpoint values on fit of regression model; smallest value indicates best fit (*B*).

TABLE 1. Demographics and Clinical Characteristics by Lowest Isolated SBP Measurement

Characteristic	SBP <105 mm Hg (n = 97)	SBP ≥105 mm Hg (n = 48)	*p*
Age (yr)	34.4 ± 15.2	36.6 ± 15.6	0.413
Gender (male)	78 (80.4%)	34 (70.8%)	0.212
Antihypertension medications	6 (6.2%)	3 (6.3%)	1.000
Prehospital hypotension (<90 mm Hg)	7 (7.2%)	0	0.039
Prehospital IVF	21 (21.7%)	11 (22.9%)	1.000
Prehospital IVF (mL)	423 ± 240	518 ± 371	0.389
Injury mechanism			
Gunshot wound	37 (38.1%)	10 (20.8%)	
Stab wound	18 (18.6%)	2 (4.2%)	
Fall	17 (17.5%)	14 (29.2%)	
Motor vehicle collision	9 (9.3%)	10 (20.8%)	0.025
Assault	9 (9.3%)	7 (14.6%)	
Motorcycle collision	2 (2.1%)	2 (4.2%)	
Pedestrian struck by automobile	5 (5.2%)	3 (6.3%)	

TABLE 1. Demographics and Clinical Characteristics by Lowest Isolated SBP Measurement

Characteristic	SBP <105 mm Hg (n = 97)	SBP ≥105 mm Hg (n = 48)	*p*
Injury severity score	12.4 ± 10.3	7.2 ± 8.7	0.002
Admission HR (bpm)	98.5 ± 23.2	100.3 ± 23.0	0.669
Admission SBP (mm Hg)	100.7 ± 24.2	121.8 ± 17.3	<0.001
Admission DBP (mm Hg)	66.3 ± 15.7	75.2 ± 13.4	0.001
Admission pulse pressure (mm Hg)	43.8 ± 17.4	47.0 ± 15.8	0.294
Admission GCS	14.1 ± 2.5	13.4 ± 3.8	0.247
Admission lactate (mmol/L)	5.7 ± 4.8	4.0 ± 4.2	0.036
Resuscitation HR >110 bpm	36 (37.1%)	15 (31.3%)	0.649
Resuscitation HR >120 bpm	23 (23.7%)	13 (27.1%)	0.662
Lowest resuscitation SBP (mm Hg)	91.1 ± 10.5	108.9 ± 1.4	<0.001
Resuscitation SBP <90 mm Hg	44 (45.4%)	0	<0.001
Number of recorded BP measurements	6.9 ± 2.5	6.8 ± 2.2	0.816
Total initial resuscitation time (min)	52.9 ± 29.5	55.3 ± 23.0	0.584
ED blood transfusion	11 (11.3%)	1 (2.1%)	0.105
ED IVF (mL)	1494 ± 955	1003 ± 868	0.003

TABLE 1. Demographics and Clinical Characteristics by Lowest Isolated SBP Measurement

Characteristic	SBP <105 mm Hg (n = 97)	SBP ≥105 mm Hg (n = 48)	*p*
Immediate procedure	43 (44.3%)	6 (12.5%)	<0.001
Immediate procedure type			
Abdominal	19 (19.6%)	4 (8.3%)	0.095
Thoracic	10 (10.3%)	1 (2.1%)	0.101
Neck	4 (4.1%)	0	0.302
Vascular	10 (10.3%)	2 (4.2%)	0.338
Orthopedic	3 (3.1%)	1 (2.1%)	1.000
Endovascular	5 (5.2%)	0	0.171
Nontherapeutic operative procedures	4/40 (10.0%)	1/6 (16.7%)	0.520
Nontherapeutic endovascular procedures	3/5 (60.0%)	NA	NA
Operative EBL (mL)	935 ± 1438	560 ± 428	0.217
Operative IVF (mL)	4474 ± 3028	3710 ± 1396	0.352
Operative blood transfusion	16 (16.5%)	3 (6.3%)	0.117
Additional OR during hospitalization	29 (29.9%)	8 (16.7%)	0.106
Surgical intensive care unit admission	52 (53.6%)	12 (25.0%)	0.001
Hospital length of stay (d)	8.3 ± 10.7	4.2 ± 7.5	0.009
Hospital survival	94 (96.9%)	48 (100%)	0.551

TABLE 2. Predictors of Immediate Therapeutic Intervention

	Univariate Analysis			Multivariate Analysis		
Parameter	OR	95% CI	*p*	OR	95% CI	*p*
Age (yr)	0.98	0.96, 1.01	0.188			
Gunshot wound	8.84	3.93, 19.92	<0.001	8.00	2.70, 23.69	<0.001
Stab wound	1.39	0.51, 3.76	0.523			
Fall	0.13	0.03, 0.56	0.007			
Motor vehicle collision	0.42	0.16, 1.52	0.185			
Prehospital hypotension (<90 mm Hg)	2.94	0.58, 14.93	0.194			
Injury severity score	1.05	1.01, 1.08	0.013	1.07	1.02, 1.12	0.003
Admission GCS	1.03	0.90, 1.17	0.674			
Admission SBP (mm Hg)	0.98	0.96, 0.99	0.020			
Admission DBP (mm Hg)	0.97	0.94, 0.99	0.020			
Resuscitation HR >120 bpm	0.96	0.76, 1.20	0.701			
Lowest resuscitation SBP (mm Hg)	0.96	0.94, 0.99	0.014			
Resuscitation SBP <105 mm Hg	2.93	1.26, 6.82	0.012	12.36	2.58, 59.23	0.002
Total initial resuscitation time (min)	0.95	0.93, 0.97	<0.001	0.94	0.92, 0.96	<0.001
ED blood transfusion	1.00	1.00, 1.003	0.029			
ED IVF (mL)	1.00	1.00, 1.001	0.234			

OR, odds ratio; CI, confidence interval; mm Hg, millimeters of mercury; GCS, Glasgow coma scale score; DBP, diastolic blood pressure; HR, heart rate; bpm, beats per minute; IVF, intravenous fluids.

Single and multiple variable logistic regression analyses were used to determine predictors of the primary study endpoint, need for immediate therapeutic intervention.

Discussion

Previous studies

- Hypotension in traumatic patient is best defined by a value of 110 mm Hg rather than 90 mm Hg
- If SBP < 110 mm Hg, every ↓ 10 mm Hg in admission SBP will ↑ 5% mortality
  - maximum mortality rate was at 60 mm Hg.
- Prehospital hypotension were more likely to undergo emergent therapeutic operations.
- ED BP proved to be a better predictor of outcome compared with field BP.

In our study

- Single SBP < 105 mm Hg is an independent clinical outcome predictor.
  - Immediate operation
  - Surgical ICU admission
  - Length of hospital stay
- Warrants early trauma team activation, aggressive utilization of diagnostic adjuncts, and close monitoring in a surgical ICU.