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 April 27, 2009

P: In multi-trauma patients with a normal mental status
I: Does the use of Pan-CT-Scanning (CT Head-C-spine-Chest-Abdomen-Pelvis)
C: Compared to diagnostic CT scanning based on clinical exam
O: Result in better diagnostic accuracy and clinical outcomes

Various Trauma-related Assessment Tools:

RTS: Revised Trauma Score: calculated from 1st set of pt's vitals, $RTS = 0.9368 \text{ GCS} + 0.7326 \text{ SBP} + 0.2908 \text{ RR}$

ISS: Injury Severity Score: anatomical scoring system, assign AIS (abbrev, injury scale, 0-6) to each of 6 major body areas, top 3 AIS scores are squared then added together to produce an ISS

TRISS: Trauma and Injury Severity Score: The TRISS calculator determines the probability of survival after blunt trauma from the ISS, RTS and patient's age

RISC: Revised Injury Severity Classification: determines probability of death after blunt trauma

SMR: Standardized Mortality Ratio: ratio of recorded to expected mortality from ISS and a multitude of physiologic parameters

VOMIT: Victims of Modern Imaging Technology

Article	Study Type	Patient Population	Results	Conclusions	Weaknesses
Author: Huger-Wagner et al Title: <i>Effect of Whole Body CT During Trauma Resuscitation on Survival</i> 2009 Lancet	Retrospective, multi-center study (review of data from the trauma registry of the German Trauma Society from 2002-2004)	4621 patients Inclusions: blunt trauma, injury-severity score of at least 16, available information about whole-body CT during trauma-room treatment To ED directly from scene	1494 (32%) got WBCT 3127 (68%) no WBCT 2430 of 3127 got selective organ CTs Mean ISS: 29.7 Based on TRISS (2259) WBCT SMR: 0.745 (95% CI 0.633-0.859) No WBCT SMR: 1.023 (0.909-1.137) (p<0.001)	Integration of whole-body CT into early trauma care significantly increased the probability of survival in patients with polytrauma. Whole-body CT is recommended as a standard diagnostic method during the early resuscitation phase for patients with	Not a prospective study Results need to be confirmed in RCT Impractical scoring systems Due to missing data in the trauma registry, calculations of TRISS could be done in only 2259 (49%) and RISC score in 4113 (89%) of

			<p>*RRM: 25%</p> <p>*NNTS: 17</p> <p>Based on RISC (4113) WBCT SMR: 0.865 (0.774–0.956)</p> <p>No WBCT SMR: 1.034 (0.959–1.109) (p=0.017)</p> <p>*RRM: 13%</p> <p>*NNTS: 32</p> <p>Multivariate adjustment for hospital level, year of trauma, and potential center effects confirmed that whole-body CT is an independent predictor for survival (p≤0.002)</p>	polytrauma.	<p>4621 patients.</p> <p>Indications for or against whole-body CT were not clearly defined.</p> <p>No information about CT protocols, type of contrast enhancement, or any data about radiation doses for the hospitals.</p> <p>No info about each hospital's use of ATLS principles</p> <p>No standardization of grading injuries among hospitals</p>
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*RRM: relative reduction in mortality

*NNTS: number needed to scan

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<p>Author: Deunk et al</p> <p>Title: <i>Routine vs. selective CT of the Abdomen, Pelvis and Lumbar Spine in Blunt Traum: A Prospective Evaluation</i></p> <p>2009 Journal of Trauma</p>	<p>Prospective Observational Study</p>	<p>465 blunt trauma patients</p> <p>161 selective CT group</p> <p>304 routine CT group</p>	<p>Compared with the algorithm with selective CT, routine CT revealed additional traumatic injuries in 15% of the patients in the abdomen, in 2.4% in the pelvis and in 8.2% in the lumbar spine.</p> <p>This resulted in an overall change of treatment in 6.4% (95% confidence interval, 3.7-9.0) of the patients who would not have received CT in a selective CT algorithm.</p>	<p>Compared with the algorithm for selective CT, the algorithm with routine CT finds substantially more clinically relevant diagnoses, even in patients with unsuspecting clinical examination, normal XRs, and normal FAST</p>	<p>Abstract only</p>

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Author: Salim et al Title: <i>Whole Body Imaging in Blunt Multi-system Trauma Patients Without Obvious Signs of Injury</i> 2006 Archives of Surgery	Prospective Observational Study	1000 blunt trauma pts in a single academic level I trauma center Inclusion: no visible evidence of chest or abdominal injury hemodynamically stable, normal abdominal examination in a neurologically intact patient or unevaluable abdominal examination results secondary to a depressed level of consciousness significant mechanisms of injury	All 1000 pts underwent panscan 592 of 1000 were evaluable patients with no obvious signs of abdominal injury. Clinically significant abnormalities were found in 3.5% of head CT scans, 5.1% of cervical spine CT scans, 19.6% of chest CT scans, and 7.1% of abdominal CT scans. Overall treatment was changed in 18.9% of patients based on abnormal CT scan findings.	The use of pan scan based on mechanism in awake, evaluable patients is warranted. Clinically significant abnormalities are not uncommon, resulting in a change in treatment in nearly 19% of patients.	No comparison group No cost analysis No comparison of outcomes Pts were not actually evaluated by healthcare provider prior to imaging, decision to scan based on mechanism only No quantification of "significant abnormalities" found on CTs

But what about all of that radiation?

There appears to be evidence that CT radiation may be associated with an increased risk of cancer over ones lifetime as the effective dose of radiation is accumulated.

The effective radiation dose is assumed to be 10–20 mSv for a whole-body CT, 5–16 mSv for a selective-organ CT compared to 2 mSv for a conventional radiography series (chest, vertebral column, pelvis).

There is credible evidence that survivors of the atomic bomb whose radiation dose ranged from 5 to 100 mSv were found to have a statistically significant increase in solid cancer risk. Even the lowest dose in the exposed atomic-bomb survivor population (range, 5-50 mSv; mean, 20 mSv) is associated with an increased cancer mortality risk.

Overall, the risks associated with 1 scan are relatively modest, with the estimated lifetime cancer mortality for a 45-year-old adult approximately 1 in 1250, or 0.08%.

The National Academies seventh report on biologic effects of ionizing radiation states that of 100,000 people exposed to a dose of 100 mSv, there would be an additional 800 cases of cancer.

This risk is linear, suggesting that the median dose of 40.2 mSv observed in this study would contribute to an additional 322 cancer cases per 100,000 subjects exposed.

Age is an additional variable because the younger the person, the greater the chance that radiation exposure could lead to malignancies.

Article	Study Type	Patient Population	Results	Conclusions	Weaknesses
Author: Winslow et al Title: <i>Quantitative Assessment of Diagnostic Radiation Doses in Adult Blunt Trauma Patients</i> 2008 Annals of Emergency Medicine	Nonconcurrent Case Series	86 Level II (Bravo) adult blunt trauma patients	Median ISS: 14 Median # CT scans: 3 The median effective total dose of ionized radiation was 40.2 mSv A dose of 40.2 mSv is the equivalent of approximately 1,005 chest radiographs.	Trauma patients meeting the less acute major triage criteria are exposed to clinically important radiation doses from diagnostic radiographic imaging during the first 24 hours of their care.	Retrospective study Small study group Data from single trauma center using one type of CT scanner, difficult to extrapolate findings to other centers Needs external validation

Clinical Bottom Line:

Mechanism + pain or unreliable exam = Pan scan

Mechanism + A & O, not intoxicated, with normal exam = selective scanning appears to be warranted