# Total Body CT for Trauma Patients

MISERICORDIA UNIVERSITY

**Student Researcher**: Jacqueline Dottor **Faculty Advisor**: Paula Pate-Schloder, MS, RT, (R) (CV) (CT) (VI) FAEIRS

## INTRODUCTION

Patients with traumatic injuries can be evaluated using Total Body Computed Tomography (TBCT). This type of imaging allows for rapid and accurate evaluation and ensures that possible hidden traumas are not missed (Yoong 2018). Trauma is the leading cause of death in those under the age of 45, and the third leading cause of death in those over the age of 45. Polytrauma refers to a traumatic injury to at least two body parts, with one injury being potentially fatal. The time it takes for a trauma patient to receive treatment is a prime factor of mortality. TBCT is especially useful for unconscious patients who are unable to point out specific areas of pain, because many injuries are not visible from the outside. Studies have shown that TBCT scans result in fewer in hospital mortalities (Tsutsumi 2018).

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## THE GOLDEN HOUR AND TRAUMA

The golden hour refers to the single hour following a trauma. During this period of time, patients who receive care have a higher chance of survival. CT scans during the golden hour are extremely valuable, as they allow for quick and accurate imaging. Total body CT scans during the golden hour have contributed to decreased mortality rates (Kearsley 2021). For every three minutes of delayed treatment, the mortality rate increases by 1%. The CT scanner must be located in, or very close to the trauma bay/emergency room in order to rapidly diagnose and treat trauma patients.

## INDICATIONS

A specific criteria must be met in order for a patient to receive a TBCT scan. This is used to reduce patient dose in those who may be less severely injured. Eligibility may vary slightly with hospital sites. A study evaluating data across 5 trauma centers refined the criteria for TBCT scans. Criteria included a systolic blood pressure <100mmHg, estimated blood loss of >500mL, Glasgow Coma Score <13, suspected fractures of at least two long bones or pelvis, and a fall from more than 13 ft (Treskes 2020). Patients who are under the age of 18, are pregnant, are referred from another hospital, are clearly a low trauma case, or have a stab wound to one body region are not eligible.

## PROCEDURE

The most common TBCT procedure includes unenhanced CT scans of the head and neck, followed by enhanced CT scans of the chest, abdomen, and pelvis using IV contrast. Additional procedures may be ordered based on the findings from the TBCT scan. (Treskes 2020).

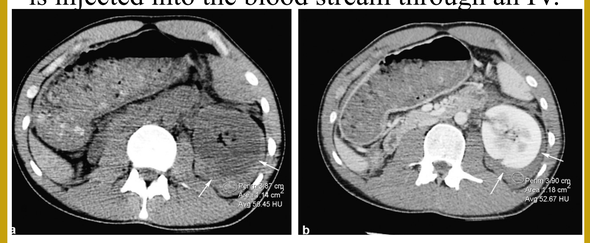

TBCT SCOUT


TBCT CORONAL
showing splenic laceration

(Hickethier 2018)

## IV CONTRAST

In CT, iodinated water soluble contrast media is used to enhance pathological features and is commonly used for trauma patients. This technique is especially useful in ruling out active vascular extravasation (Kearsley 2021). It is injected into the blood stream through an IV.




TBCT performed after trauma a) unenhanced and b) enhanced (Nauleta 2013).

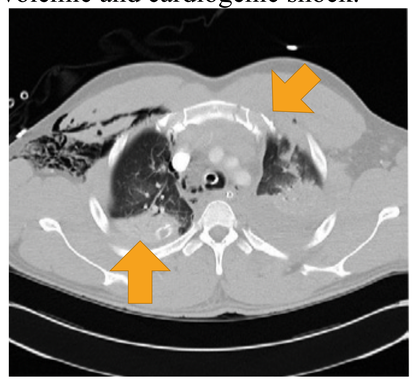
## BLUNT ABDOMINAL TRAUMA

The leading cause of mortality among all age groups is blunt abdominal trauma., and it is experienced most often by men. Common causes of this trauma include falls and accidents, including motor vehicle accidents. Blunt abdominal trauma can also be a result of cardiopulmonary resuscitation (CPR). The most commonly injured organs in the abdomen are the spleen, liver, and small bowel (Kearsley 2021). CT has become an integral component of the assessment of blunt abdominal and chest trauma, with a TBCT scan only taking minutes to complete (Seeram 2016).

Thoracoabdominal trauma resulting in perinephric hematoma and free fluid in patient A (Kearsley 2021).

## BLUNT CHEST TRAUMA

50% of deaths from chest trauma are from blunt chest trauma alone. Causes of blunt chest trauma include motor vehicle accidents, blast injuries, acts of violence, and falls. Cardiac and/or great vessel injuries commonly occur, which result in blood loss and loss of cardiac function (Kearsley 2021). These lead to hypovolemic and cardiogenic shock.



Patient A also suffered a hemothorax and rib/sternal fractures (Kearsley 2021).

## MORTALITY RATES

| Characteristic | Total-body CT (n = 85) | Standard workup (n = 87) | p value |
|---|---|---|---|
| Mortality; n, % (95% CI) | | | |
| In-hospital mortality | n = 11<br>12.9% (7.2–21.9) | n = 21<br>24.1% (16.3–34.2) | 0.059* |
| 24-h mortality | n = 4<br>4.7% (1.5–11.9) | n = 6<br>6.9% (2.9–14.5) | 0.747† |
| Time intervals, minutes (IQR) | | | |
| Time to end of imaging | 30 (18–42) | 38 (28–56) | 0.006 |
| Time to diagnosis | 45 (35–60) | 57 (43–85) | 0.009‡ |
| Time at ED | 59 (44–94) | 79 (57–105) | 0.041‡ |
| Time to intervention | 82 (57–121) | 98 (62–147) | 0.108‡ |
| Complications; n, % (95% CI) | n = 39<br>45.9% (35.7–56.4) | n = 42<br>48.3% (38.1–58.6) | 0.753* |
| Length of stay, days (IQR) | | | |
| Total hospital stay | 23 (12–37) | 20 (10–33) | 0.606‡ |
| ICU stay | 5 (2–12) | 6 (2–12) | 0.909‡ |
| Ventilation days | 3 (1–9) | 3 (1–8) | 0.928‡ |

Data demonstrating reduced mortality rates in patients that received a total body scan, as well as reduced time to end of imaging, diagnosis, ED, and intervention (Treskes 2019).

## CONCLUSION

Total body CT is a valuable diagnostic resource for treating trauma patients. Its speed and accuracy allow for reduced time to diagnosis and intervention, and therefore an increased probability of survival. TBCT eliminates the risk of missed life threatening injuries.

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