Case 7

Diagnosis of Splenic Rupture in an 11-year-old Girl using a Sliding Gantry System

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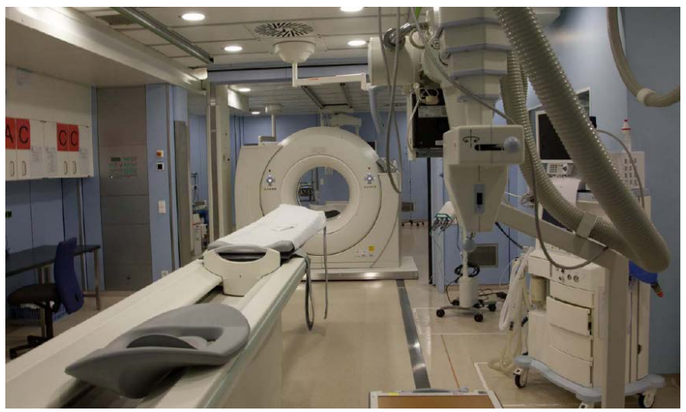
History

An 11-year-old girl had fallen off a horse and had been hit by the horse's hoof. The paramedics found her complaining of abdominal pain and with a tense abdominal wall. She was transferred to our hospital's trauma room. Here an interdisciplinary team of pediatricians, anesthesiologists, trauma and abdominal surgeons as well as radiologists examined the young patient according to standardized algorithms, based on the ATLS (advanced trauma life support) guidelines. An early abdominal ultrasound revealed free abdominal fluid especially in the Koller's and Morrison's pouch. This led to the decision to conduct a thoraco-abdominal contrast-enhanced trauma CT.

Diagnosis

The examination was performed on a SOMATOM Definition AS 64 sliding gantry system, equipped with CARE kV. The images were acquired at 100 kV, as suggested by the scanner, resulting in a total DLP of only 329 mGy cm (4.6 mSv). Image quality was excellent in all anatomical areas, with a high level of enhancement in all parenchymal organs and vessels. Hereby, the diagnosis of a splenic rupture with free abdominal fluid was reliably made. Injuries of other parenchymal organs, vessels, the lungs and the spine were as well confidently excluded. The patient was immediately transferred to the operating room.



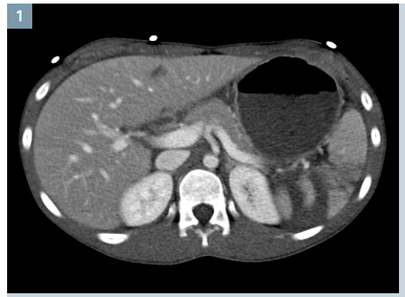
View of our trauma room with a sliding gantry solution. In the back, the sliding gantry is in its normal position in the standard CT examination room. The CT suite and the trauma room are separated by a sliding X-ray-proof (background) door. If CT is required for a trauma patient, the door opens and the gantry slides over. The patient is scanned without the need for any further relocation.

Comments

Blunt abdominal trauma can lead to life-threatening injuries. Integrating whole body CT early in the management of polytrauma patients results in improved survival and facilitates early triage for adequate therapy.[1] In our previous trauma room solution, with a stationary SOMATOM Sensation 16, the patient needed to be relocated from the trauma room to the CT suite and back. This caused delay in diagnosis and treatment and bore the risk of dislocating tubes and lines and aggravating spine injuries. The current two-room sliding gantry solution elegantly overcomes these drawbacks. The trauma patient remains stationary on the examination table and the gantry slides over if required. Another benefit of this solution is that the down time of the standard CT suite and subsequent delays for regularly scheduled in- and outpatients can be reduced to a minimum and daily throughput increases. Together with the state-of-the-art dose reduction strategies, such as CARE kV and SAFIRE, image quality improves while dose exposure is effectively reduced. The precision of the system is equivalent to a conventional CT with stationary gantry and moving table, facilitating sub-millimeter high-resolution imaging e.g. of the temporal bone as well as the coronary arteries with a temporal resolution of 150 ms.

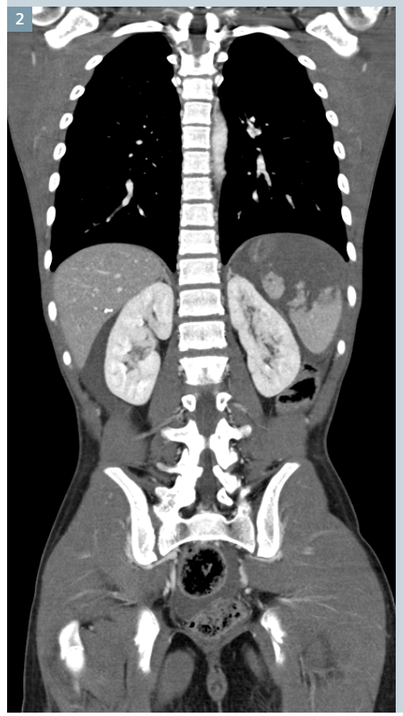
References

[1] Huber-Wagner S, Lefering R, Qvick L-M, et al. Effect of whole-body CT during trauma resuscitation on survival: a retrospective, multicentre study. Lancet. 2009;373:1455–61



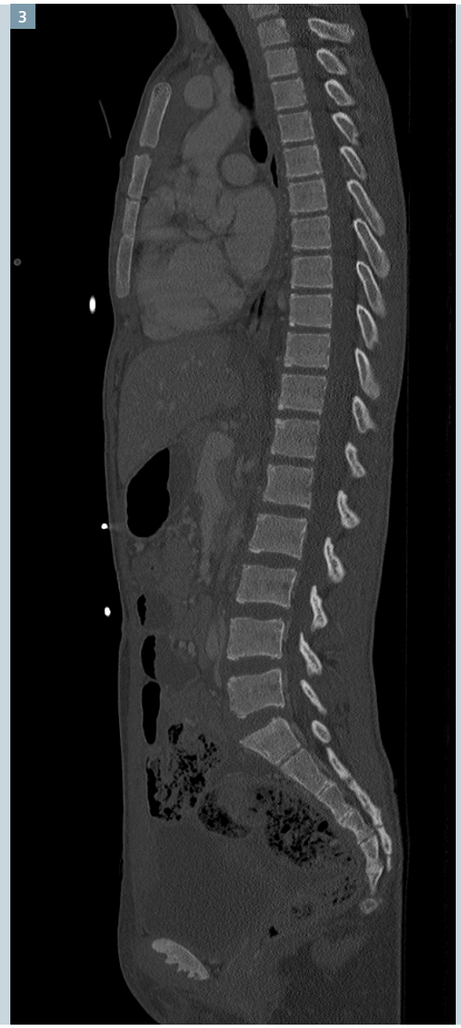
1

Excellent image quality in the upper abdomen with very good iodine enhancement at 100 kV and no artifacts compromising the diagnosis of splenic rupture. Pancreas, kidneys and liver appear normal.



2

Coronal 3 mm MPR shows the ruptured spleen and lots of free abdominal fluid while liver and kidneys appear normal. There is no detectable difference in image quality to a stationary gantry with moving table.



3

Excellent image quality to confirm no spine injury.

Examination Protocol

Scanner	SOMATOM Definition AS 64 Sliding Gantry System		
Scan area	Chest/Abdomen	Rotation time	0.5 s
Scan length	63 cm	Pitch	1.2
Scan direction	Cranio-caudal	Slice collimation	64 x 0.6 mm
Scan time	12 s	Slice width	1.0 / 5.0 mm
Tube voltage	100 kV	Reconstruction increment	0.5 / 5.0 mm
Tube current	261 mAs	Reconstruction kernel	B30f, B60f, B75f
Dose modulation	CARE Dose4D	**Contrast**	
$CTDI_{vol}$	5.75 mGy	Volume	75 mL
DLP	329 mGy cm	Flow rate	2 mL/s
Effective dose	4.6 mSv	Start delay	70 s