



Complex Polytrauma Imaging in the ER with Revolution EVO

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The need for emergency departments to assess polytrauma cases is an increasing trend worldwide. In South Africa, most trauma center physicians order what is commonly known as a whole-body scan in patients with blunt trauma. A whole-body scan typically consists of a non-contrast head and cervical spine; non-contrast or contrast-enhanced chest, abdomen and pelvis; and reconstructions of the cervical, thoracic and lumbar spine. Acquiring a whole-body scan should be fast and thorough to minimize the time a patient spends in the CT room. A robust CT system, such as Revolution™ EVO, is ideal for diagnosis and treatment planning decisions following traumatic injuries.

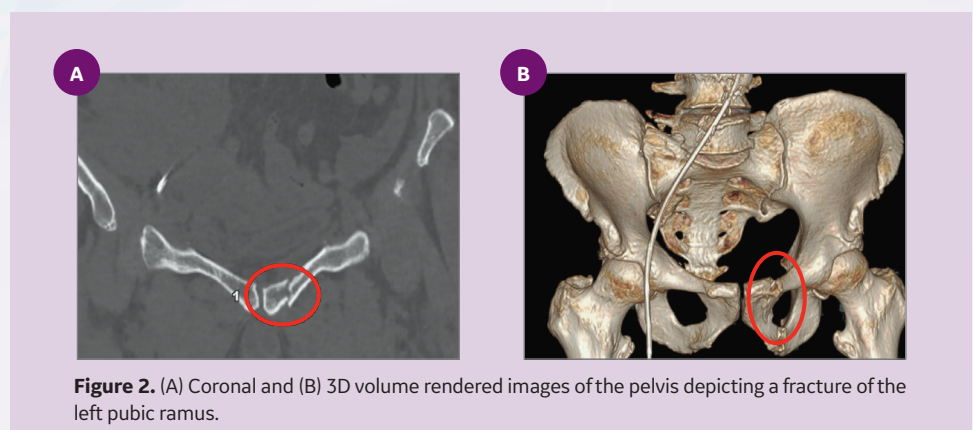
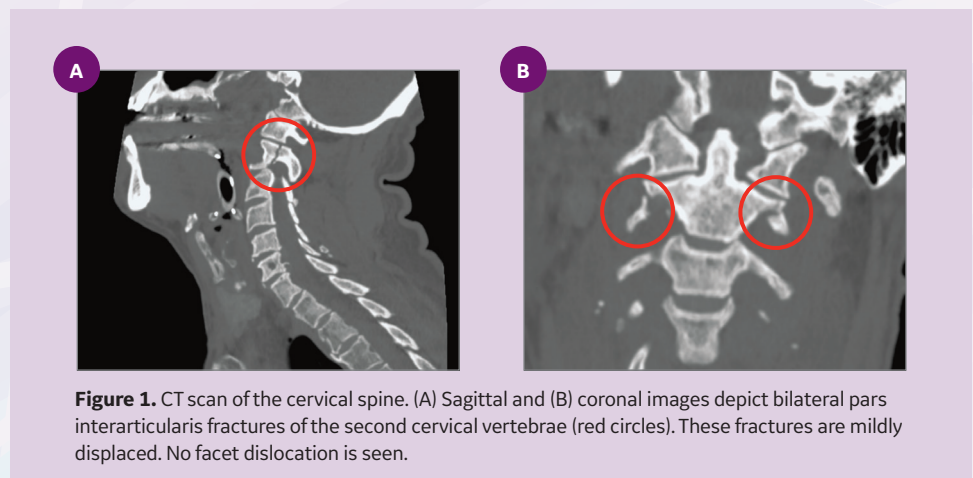
While rapid scanning is expected for all trauma patients, challenges such as iodine allergies, patient habitus and the extent of injuries must be considered. With the implementation of Revolution EVO, a 5 minute turn-around-time for a highly critical patient (P1) from patient in to patient out has been achieved. The system speed and capabilities have improved workflow and patient throughput. Additionally the gantry display allows users to select the patient worklist, choose the protocol and confirm scout settings, which further improves workflow.

As part of a P1 trauma hospital, nearly half of the approximately

30 patients receiving CT studies each day are trauma related. Since installing Revolution EVO in October 2015, over 11,000 patients have been scanned. With ASiR-V™, our patient dose has decreased dramatically by about 40%.

Patient history

A 70-year-old male weighing about 80 kg (176 lbs.) was brought into the resuscitation unit. He was involved in a motor vehicle accident, was intubated and showed signs of hypotension.





Before sending the patient for a whole-body CT scan, his blood pressure kept dropping prompting the trauma surgeon to insert a balloon catheter using a technique called Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA). This technique is used in trauma patients who are rapidly bleeding from injuries to their chest, abdomen or pelvis. It involves placing a flexible catheter into the femoral artery, directing it into the aorta and inflating a balloon at its tip. This stops blood flow beyond the balloon, essentially halting any bleeding while also stopping all blood flow distally to the balloon. The technique is a temporary measure merely to get the patient on the CT scanner as quickly as possible, then to the operating room or angiographic suite. In this patient case, the balloon catheter was inflated above the renal arteries and the patient's blood pressure stabilized.

Acquisition: whole-body (polytrauma)

Scan type: Helical

Rotation speed, sec:

Head and c-spine: 0.8

Chest, abdomen, pelvis: 0.6 or 0.35

Pitch:

Head and c-spine: 0.516:1

Chest, abdomen, pelvis: 0.1.375:1

Slice thickness (varied), mm: 5 and 1.25

kv: 120

mA: Modulated (Auto mA)

Min: 100 - Max: 500

Noise Index: 18

Kernel (Algorithm): Standard and Bone

ASIR-V: 40% and 50%

CTDI_{vol} (mGy): 8.42

DLP (mGy-cm): 639.07

Findings

Right-sided perinephric hematoma. Multiple rib fractures. Multiple transverse process fractures. Sacrum and left pubic ramus fracture. Subarachnoid and left sided subdural bleed. The patient was in systemic shock and his lacerated right kidney, clearly visualized on the CT abdomen pelvis acquisition, required urgent surgery. The patient was rushed to emergency surgery.

Discussion

Quick management of this trauma patient was possible with the speed and resolution of Revolution EVO.

The CT technologists had not previously acquired a whole-body scan on a patient after REBOA was performed. Therefore, it was imperative to further reduce the patient's time spent in the CT room. We are able to use a rotation time of 0.35 seconds, acquire faster acquisitions by using a high pitch, apply ASiR-V for dose reduction and image quality, and most importantly, rely on Image Check to make a swift decision to end the exam without being concerned about under coverage, which could lead to a repeat exam.

Image Check is a workflow improvement feature. Images generated from Image Check use a faster reconstruction time of 50 fps that displays the images in near real time after data acquisition to quickly confirm scan range and/or contrast enhancement. The user-friendly software interface also assists us in faster patient scanning.

The speed and Smart workflow features of Revolution EVO—Pitch Booster, IQ Enhance, Image Check and Xstream display monitor—help increase our patient throughput and efficiency. The information derived from the system helps the radiologists and physicians to make a quicker and more confident diagnosis. ■



Figure 2. Non-IV contrast CT images (A) demonstrating REBOA and (B, C) axial images of the abdomen. There is a right sided perinephric hematoma and the right kidney is displaced anteriorly.