DISCUSSION

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Pelvic fracture accounts for 1-3 % of all skeletal fractures.[56] Most pelvic fractures results from motor vehicle accidents, but severe complex pelvic fractures may also result from falls from buildings.[57]

The routine radiographic assessment of the pelvis always begins with a standard anteroposterior (AP) view and can be augmented with a variety of oblique views. Inlet and outlet views, obtained by angling the tube caudally and cranially respectively, can help in visualizing the obturator rings and assessing the integrity of the pelvic ring. CT is a more precise method of evaluating the acutely injured pelvis, allowing detection and characterization of subtle fractures and fragments in areas of complex anatomy. In addition, it provides detailed information about the soft tissues in and around the pelvis, such as hematomas. With post-processing techniques, three-dimensional reconstructions of the traumatized pelvis can be created and manipulated to provide the orthopedic surgeon with information useful in planning treatment.[58]

Although pelvic x-ray is a routine part of the primary survey of poly traumatized patients according to advanced trauma life support guidelines, it cannot provide soft tissue injuries .So pelvic CT scan is the gold standard imaging technique in the diagnosis of pelvic fractures.[59]

The higher spatial resolution permits acquisition of sub millimeter near-isotropic voxels that can be reformatted in any plane with spatial resolution equivalent to that of axial images.[60] Multi-planar reformatted (MPR) images in the standard sagittal and coronal planes are readily generated with no additional time or labor required on the part of the radiologist. In certain circumstances, additional oblique or curved planar MPR images may also be generated.[61]

All these are achieved following a single data acquisition without the need for gantry angulation.[62]

For years the role of CT has been re-evaluated because of the technological advance of spiral CT and, moreover, the recently introduced multi-detector scanners that make study scan times 2–5 times faster.[63]

The advent of multi-detector-row technology combined with sub second rotation and sub millimeter collimation resolved the long-lasting trade-off between scan volume and slice thickness, now allowing for an acquisition of large scan volumes in very small slice thicknesses.[64] The combination of high in-plane and z-resolution provides near isotropic image reconstruction, thus rendering possible high quality multi-planar image reformation in each spatial orientation[64]. This is particularly useful in patients admitted after severe trauma, where one whole body scan in principle suffices to screen for both soft tissue damage and injuries of the pelvis.[65] Such an approach would not only significantly reduce the duration of the diagnostic procedure,[66] but also save costs, minimize radiation dose and avoid harmful patient manipulation.[67]

High-quality multi-planar reformation (MPR) and three-dimensional (3-D) images can be created at the workstation using the volumetric data. The MPR images give excellent structural detail, and the 3-D images help in understanding the spatial relations, which is important for fracture classification and for preoperative planning. Pelvic and acetabular trauma is where 3-D imaging first made a significant clinical impact, and it is

now a standard requisite for surgical planning, being a valuable complement to axial and MPR images.[68]

The present prospective work included 30 patients with pelvic fracture. All the patients were examined by MDCT. They were 21 males (70%) and 9 females (30%) with male to female ratio of 2.3:1. Their ages ranged between 13 and 85 years with a mean age of 36 years.

Wade Smith et al [69] state that the causes of pelvic fracture composed as follows road traffic accidents (RTA) 78% , Fall from Height 10% and Blunt trauma 12%.

While **Shelly Gurevitz et al** [70] state that traffic accidents (RTA) 59% , Fall From Height 17% and blunt trauma 24%.

And **Christopher J. Dente** [71] state that traffic accidents (RTA) 72% , Fall From Height 7% and blunt trauma 21%.

In our study the RTA (road traffic accidents) in 20 patients (66.67%), Fall from Height in 3 patients (10%), and Blunt trauma in 7 patients (23.34%).

Scott F. Gylling et al [72] state in his study that the stable fractured is 61% and the unstable fractured 39%,**C. Herzog et al** [73] state that the ratio of stable fractures I s 39.5% and the unstable fracture is 60.5%.

While **A. Glnsslen et al** [74] state that the stable percentage is 54.8% and the unstapled fractured is 45.2 %.

In this study the stable fracture were counted with 18 patients (60%) were it is more common than unstable with 12 (40%).

In the present study the fractured innominate bones and side of fracture where pubic bone is the most bone fractured in 22 patients 73.34% (23.34% in Right side, 20% in the Left and 20% bilateral), The Ilium where fractured in 18 patients 60% (36.67% in right side and 23.34% in the Left side), followed by the ischium in 3 patients 10% (6.67% in Left side and 3.34% in Bilateral). While **Tian-wu Chen et al** [75] state that pubic fractured 80.84% (20.96% in the right side , 22.16 in the left side, 37.72% bilateral), Ilium 23.96% (6.50% in right side, 7.19% in left side , 10.18% bilateral) and ischium fractures 6% (1.8% right , 1.8% left , 2.4% bilateral).

Li FP et al [76] state in his study that the sensitivity of plain radiography to detect pelvic fractures was 79% where the suspected fractured in plain radiography and confirmed by MDCT were in 21% of the patients and the missed fractured in plain radiography and diagnosed in MDCT were in 14% of the patients,while **Wedegartner U et al** [77] state that the was sensitivity 83% where the suspected were in 26% and the missed fractured were in 17%, and **Li M et al** [78] state that the sensitivity were in 86.7 % with 20% suspected fractured and 13.3% missed fractures, while **Chmelova J et al** [79] state that the sensitivity was 74% with 26% missed fractured.

In this study The suspected fractured in plain radiography and confirmed by MDCT were in 10 patients 33.3% (2 in Ilium, 3 in Ischium, 1 in pubis, 4 in sacrum), and the missed fractured in plain radiography and diagnosed in MDCT were in 6 patients 10% (2 in Ischium, 1 in Pubis, 3 in Sacrum).

Gansslen A et al [74] stated that the soft tissues and internal organs injured were as following the bladder and urethra 62.9%. In 23.1% the large pelvic vessels were injured, in 20.2% there was damage to the pelvic intestine and in 18.1% damage to the pelvic soft tissues. while in **McCormack R et al**[38] study the injury to the bladder and urethra in 63%, 35% had associated head injuries and 20% had intestinal injuries.

In this study the soft tissues and internal organs injured were as following the bladder and urethra 62%, in 20% there was damage to the pelvic intestine and in 25% damage to the pelvic soft tissues.

The **Tile and Young-Burgess** classification systems are the most widely used today. Tile emphasized the concepts of stability and mechanism of injury in this system. Type A injuries are considered stable and may or may not involve the pelvic ring. Type B injuries are rotationally unstable but vertically stable; these include open book (AP compression) and lateral compression injuries. Type C injuries are rotationally and vertically unstable; these injuries may be unilateral or bilateral.

Young expanded **Tile's** classification and created a classification system to predict the mechanism of injury, which patients are more likely to be hemodynamically unstable, and what associated injuries the patient may have sustained. The Young-Burgess classification system divides pelvic ring disruptions into 4 major types: anterior-posterior compression, lateral compression, vertical shear, and combined mechanism injury. Based on radiographic appearance, the authors further subdivided anterior-posterior compression injuries into anterior-posterior compression I, II, and III and lateral compression injuries into lateral compression I, II, and III[28] the third group consisted of the vertical shear injury pattern, and the fourth group was made up of those injuries with combined mechanisms.[80]

Theodore Manson, et al [81] state that the type of the pelvic fracture according to Young-Burgess Classification whereas the following lateral compression (LC) 77.2% (LC1 62.7 %, LC2 8.6 %, LC3 5.9 %), anteroposterior compression (APC) 18.3% (APC1 2.5 %, APC2 11.4 %, APC3 4.4 %), vertical shear (VS) 1.4 % and combined mechanical injury (CMI) 3 %.

While **A. Gansslen et al** state that anteroposterior compression (APC) 37.7% and lateral compression (LC) 41.1%. , vertical shear (VS) 16.9% and combined mechanical injury (CMI) 4.3%.[74]

While **Andrew J. Furey et al** [82] Lateral compression (LC) 59.11% (LC1 34.17%, LC2 16.63%, LC3 8.31%), anteroposterior (APC) 33.26% (APC1 7.87%, APC2 18.65%, APC3 6.75%), vertical shear (VS) 2.02% and combined mechanical (CMI) 5.61%.

While **Christopher J. Dente et al** [83] study state that the Lateral compression (LC) is 52% (LC1 18% , LC2 18% , LC3 16%) , anteroposterior (APC) 43% (APC1 5% ,APC2 18%, APC3 20%) ,vertical shear (VS) 5%.

In our study lateral compression (LC), anteroposterior compression (APC), vertical shear (VS) and combined mechanical injury(CMI) , and the statistics were as following: Lateral compression (LC) in 19 patients 63.36% (LC1 13,34% , LC2 30% , LC3 20%) , anteroposterior (APC) in 7 patients 23.34% (APC1 13.34% ,APC2 6.67%, APC3 3.34%) ,vertical shear (VS) in 2 patients (6.67%) and combined mechanical(CMI) in 2 patients (6.67%).

Tian-wu Chen et al [84] state that the type of pelvic fractures according to Tile classification and the statistics were as following: A 18.56% (Type A1 11.38% and Type A2 7.19%), Type B 43.11% (Type B1 10.78%, Type B2 15.58% and Type B3 16.77%), and Type C 38.32%, (Type C1 2.4%, Type C2 11.98% and Type C3 23.95%).

While **A. Gänsslen et al** [74] in his study state that (54.8% type A), (24.7% type B injury), and (20.5% type C).

While **Andrew J. Furey et al** [82] state in his study that (27.64% type A), (53.94% type B injury), (and 18.43% type C).

In our study the classification is composed as following: Type A were in 12 patients 40% (A2 in all 12 patients), Type B in 16 patients 53,43% (B1 in 5 patients 16.67%, B2 in 9 patients 30%, B3 in 2 patients 6.67%) and Type C were in 2 patients 6.66% (C1 in the 2 patients).

Gill K et al [48] mention in his study that the pelvic fracture was treated non-operatively in (48%) of patients, by external fixation alone in (21%), by primary open reduction and internal fixation in (20%), by combined external and internal fixation in (5%) and by initial external fixation with subsequent conversion to internal fixation in 13 (7%), while **Gabbe BJ et al** [85] state that lmost half (47%) were managed through internal fixation, (21%) were using an external fixation, while (27%) received both internal and external fixation.

Kelly A.et al [86] state in his study that (51%) comminuted fractures and 49% non-comminuted fractured, While in our study the percentage of comminuted fracture in the patients where the comminuted fractured was in 24 patients (80%) and non-comminuted fractures in 6 patients (20%).

SUMMARY

SUMMARY

This prospective study included 30 patients known or clinically suspected pelvic fracture referred from Emergency Room and Orthopedic Department of Alexandria Teaching University Hospital to Radiology Department. All the patients were examined by CT evaluation. They were 21 males (70%) and 9 females (30%) with male to female ratio of 2.3:1. Their ages ranged between 13 and 85 years with a mean age of 36 years.

The aim of this work was directed to study the role of Multi-Detector Computed Tomography (MDCT) over Conventional Radiography in evaluation and clearing the diagnosis of osseous injuries of the pelvis.

In the present prospective study, all patients were subjected to the complete history taking, thorough clinical examination, pelvic X-rays (AP, inlet/outlet, Oblique "external / internal" views whenever possible.) and none enhanced MDCT of the pelvis (Multi-planar volume reformation MPR, Three-dimensional VR.).

The examinations were done on Philips MX 16, Philips Healthcare. With volumetric sharp kernel algorithm. The scan parameters 140 kVp and approximately 145 mA per slice, tube rotation 0.5s and slice thickness 1 mm.

Pelvic fracture is a serious injury that is associated with significant morbidity and mortality. This is a result of the high energy transfer to the pelvic region. Fractures of the pelvic ring have been reported to comprise 2% to 8% of all skeletal injuries. Patients are most often young males in their early 30s, and motor vehicle collisions are the most common inciting cause. Because of the high energy involved, patients with pelvic ring disruptions usually have multiple injuries. Morbidity and mortality is also high, with overall mortality rates of 17% for patients with pelvic fractures.

Digital radiography and Computed Tomography are valuable for evaluating pelvic fractures. In most poly trauma patients, the first imaging study today is MDCT. Although axial CT images have a higher diagnostic accuracy in detecting and characterizing pelvic injuries than radiography, evaluation with MPR images has been shown to increase diagnostic accuracy. Pelvic trauma is where 3-D imaging first made a significant clinical impact, and it is now a standard requisite for surgical planning, being a valuable complement to axial and MPR images.

Patients were found according to young classification Lateral compression (LC) in 19 patients (63.36%) anteroposterior (APC) in 7 patients (23.34%),vertical shear (VS) in 2 patients (6.67%) and combined mechanical(CMI) in 2 patients (6.67%)and according to tile classification Type A2 patients in 12 patients (40%), Type B1 in 5 patients (16.67%), B2 in 9 patients (30%), B3 in 2 patients (6.67%), and Type C1 in 2 patients (6.67%).

Multi slice CT considered the modality of choice in evaluation of pelvic fractures and its classification.