



ROLE OF CT SCAN IN MANAGEMENT OF ACETABULAR FRACTURES

Radiology

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KEYWORDS

Introduction

Increasing morbidity and mortality of mankind can be attributed to increasing trauma in past few decades. Most of the accidents are associated with polytrauma and pelvis is often involved along with injuries of other organs. In pelvic injuries acetabular fractures and fracture dislocation of the hip joint are common.² CT or MRI can help in accurate diagnosis and speed up the surgical management.¹

X-ray is an initial investigation in traumatic injuries in the emergency rooms especially to know presence or absence of fracture. The radiological assessment of hip and acetabulum has been revolutionized with development of CT because of its fine definition of sectional anatomy and accurate evaluation of pelvic trauma. Computed tomography examination is necessary to evaluate the traumatized pelvis properly, especially true for acetabular trauma because a three dimensional picture of the fracture is vital for diagnosis and management of such injuries.³ Important advantage of CT examination is that it can be completed without moving or turning the patients, which is not possible with conventional radiographic lateral and oblique views.⁵

Material & methods

The present prospective study included 30 patients who presented in orthopaedics department and referred to Department of Radio-Diagnosis, of our tertiary care hospital with clinically suspected or known pelvic fractures.

A detailed history regarding the mode of trauma and other site of injuries besides pelvis was noted. Basic haematological investigations – Hb, TLC, DLC, were done in all patients. Utmost care was taken in positioning of patient to prevent inadvertent motion and to include an area extending from iliac crest to the lesser trochanter of femur including both hip joints and sacroiliac joints. X ray were obtained. The plain radiographs were studied in detail, observations were recorded in the proforma in all cases. CT scan was performed on multidetector spiral CT Ingenuity (Philips medical system, USA). Patient was made to lie in the supine position on the couch. Scout image of pelvis was taken. Areas to be scanned were selected on tomogram which was from L4-5 level superiorly and inferiorly till lesser trochanter to include both hip joints and femoral neck so as to include all segments of acetabulum. Axial images were done with pitch 0.765, collimation 64 x 0.625, thickness 5 mm, 5 mm increment at 120 KV and 300 MAS. Axial images were reconstructed at 0.625 mm increment in both soft tissue and bone window. Then sagittal and coronal multiplanar reconstruction (MPR) were formed from axial image. 3D reconstructions (SSD) was done from axial images using surface imaging technique utilizing the scanner's computer. Fractures thus detected were classified according to Judet and Letournel classification. Findings of CT scan were analyzed in a prospective manner to evaluate its use as diagnostic modality as well as to determine its contribution in patient management.

Results

Table 1: Distribution of acetabular fractures on x ray

Fracture (N=30)	N	%
Anterior column	8	26.7%
Posterior column	5	16.7%
Anterior wall	0	0.0%
Posterior wall	9	30.0%
Transverse	0	0.0%

Table 2: Distribution of elementary acetabular fractures on Computed Tomography according to Judet and Letournel classification

Fracture (N=30)	N	%
Anterior column	13	43.3%
Posterior column	13	43.3%
Anterior wall	3	10.0%
Posterior wall	18	60.0%
Transverse	3	10.0%

Table 3: Consistency of x ray and Computer tomography in detecting anterior column fracture

Anterior column fracture	Computer tomography		Total	
	Present	Absent		
X ray	Present	6	2	8
	Absent	7	15	22
Total	13	17	30	

Table 4: Consistency of x ray and Computer tomography in detecting posterior column fracture

Posterior column fracture	Computer tomography		Total	
	Present	Absent		
X ray	Present	5	0	5
	Absent	8	17	25
Total	13	17	30	

Table 5: Consistency of x ray and Computer tomography in detecting posterior wall fracture

Posterior wall fracture	Computer tomography		Total	
	Present	Absent		
X ray	Present	9	0	9
	Absent	9	12	21
Total	18	12	30	

Table 6: Distribution of associated acetabular fractures on Computed Tomography according to Judet and Letournel classification

Fracture (N=30)	N	%
# PW+ PC	4	13.3%
#AC OR AW +HT #	0	0.0%
# BC	5	16.7%
T- type #	1	3.3%
Transverse #+ posterior wall #	2	6.7%

Table 7: Detection of Intra-articular bony fragments on x ray

Fracture	N	%
Present	3	10.0%
Absent	27	90.0%

Table 8: Detection of Intra-articular bony fragments on Computer tomography

Fracture	N	%
Present	13	43.3%
Absent	17	56.7%

Discussion:

Conventional radiographic examination of pelvis as shown by Judet et al⁴, remained the standard for detecting and diagnosing fractures of pelvis. Recent literature has suggested that CT scan is superior to conventional radiography in evaluating acetabular fractures and associated injuries.

We have seen in our study that actual fractures detected on x ray were only in 9 patients, and suspected fractures were in 11, in rest of the 10 patients fractures were not visualized, while computed tomography confirmed fractures in all these patients. The missed fracture incidence on X rays was comparable to a study done by Mahvash which showed that x ray missed fractures in 4 patients out of 38 which were confirmed by computed tomography.⁴

We have seen that in our study that most common type of fracture is posterior wall fractures on CT as well as on plain radiography. X-ray could detect posterior wall fracture in 50% of such patients.

X- Ray could not detect any transverse fracture while CT could diagnose transverse fractures in 3(10%) patients. This is comparable to the previous studies which are showing that transverse fracture is prevalent in up to 10% of the patients. As transverse course of these fracture patterns makes them most difficult to diagnose, so multiple plain radiographs are needed in these types of fractures and also 3D reconstruction is very helpful in appreciating the orientation of these fractures.⁴

X- Ray could not detect any anterior wall fracture while CT showed the same in 3 patients. X- ray could detect anterior column fractures in 6 patients while CT confirmed presence of anterior column fracture in 13 patients in our study.

Most common type of associated fractures on computed tomography are both column fractures, posterior wall + posterior column fractures and transverse + posterior wall fractures. This finding is comparable to a previous study in literature.⁶

In our study we found that X- ray could detect intra articular bony fragments in just 3 patients while Computed tomography confirmed presence of intra articular bony fragments in 13 patients.

In all the cases axial sections were superior to the reconstructed images in the detection of acetabular fractures. 3 D CT did not alter the initial radiological diagnosis, but it did provide the best and most easily interpretable overall assessment of the fractures. It is also claimed that reconstructions of affected hemi pelvis in addition to reconstructing the whole pelvis gives greater detail and enables the better visualization of inner surface of acetabulum.⁷

The comparison between CT and plain radiograph shows that CT is more sensitive than conventional radiography in detecting linear, displaced fractures of acetabulum, pattern of fracture and associated fractures and other bony fractures. In addition abnormalities of hip joint space principally loose bony fragments were detected more often by CT. Hence CT is advocated as an adjuvant to conventional radiography in the evaluation of acetabular fractures and associated injuries of the pelvic bone.

Table 1-Classification of Acetabular fractures on CT scan according to Judet and Letournel

ELEMENTARY FRACTURES	Number of fractures	Percentage
Anterior column #	13	43.3 %
Posterior column #	13	43.3 %

Anterior wall #	3	10.0 %
Posterior wall #	18	60.0 %
Transverse #	3	10.0 %
ASSOCIATED FRACTURES		
Posterior column+		
Posterior wall #	4	13.3%
Anterior column OR		
Anterior wall +Hemi transverse#	0	0.0%
Both column #	5	16.7%
T- type #	1	3.3%
Transverse + posterior wall #	2	6.7%

Conclusion:

Computed tomography is superior than Conventional Radiography in detecting acetabular fractures and helps in classification of fracture patterns so that there is an ease in categorizing the fracture for management accordingly. Also Computed Tomography is much better than Conventional radiography in detecting intra articular bony fragments as well as in detecting fractures of bones other than present in Judet and Letournel classification. 3D reconstruction definitely helps in improving the image quality, but it cannot replace conventional radiography and computed tomography, rather it augments their findings.

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