RESEARCH ARTICLE

Is pelvis x-ray essential in stable trauma patients? Step towards lowering the treatment cost.

Muhammad Asad Moosa, Roger Christopher Gill, Iqra Jangda, Raza Hasnain Sayyed, Hasnain Zafar

Abstract

Objective: To determine the diagnostic accuracy of clinical examination in detecting pelvic fractures in patients with blunt trauma.

Methods: The cross-sectional prospective study was conducted at Aga Khan University Hospital, Karachi, from January to June 2015, and comprised alert, awake blunt-trauma patients. Pelvis examination findings were compared to routine pelvic X-rays. SPSS 19 was used for data analysis.

Results: Of the 133 patients, 122 (92%) were males. Overall mean age was 37 ±14.2 years. There were 14 (10%) patients who were true positives with pelvic fracture diagnosis on both clinical examination and pelvic X-ray, while 14 (10%) were false negative on examination. Clinical examination missed 2 patients with evidence of fracture on X-ray and were considered false positive. Besides, 103 (77.4%) patients were true negative as both clinical exam and X-ray showed no evidence of fracture.

Conclusion: Omitting pelvic X-ray in the recommended protocol can avoid unnecessary financial burden and reduce undesirable radiation exposure.

Keywords: Blunt trauma, Stable patients, Pelvic fractures, Clinical examination. (JPMA 69: S-33; 2019)

Introduction

Globally trauma teams associated with various levels of trauma centres receive pelvic fracture patients which present a major challenge. These carry a high morbidity and mortality and most of these are a result of major impact blunt trauma. Road Traffic Accidents (RTAs) constitute the major chunk of these injuries followed by falls.[1] Motor vehicle collisions account for 1.3 million deaths in a year, making it the ninth leading cause of disability as per the World Health Organisation (WHO) with expected exponential rise with predicted third leading cause of disability by the year 2030.[2] Pelvic fractures comprise around 3% of skeletal trauma.[3] These carry a very high overall mortality ranging 5-16% with unstable variety approaching around 8%.[3] In the elderly over 65 years of age, this death rate approaches 20%.[4] In a nutshell, pelvic trauma is accountable for a significant numbers of deaths encountered in trauma patients.[5]

The conventional norm of diagnosis has relied on positive finding of fracture on anterior-posterior (AP) pelvic radiographs which has been taught in Advance Trauma Life Support (ATLS) workshops and it is universally being followed by various trauma centres in the world. However, a significant proportion of these injuries may still be missed on X-rays which needs to be highlighted and addressed.[6] The value of routine pelvic X-rays has been questioned in patients who are haemodynamically stable, neurologically intact with no distracting injuries. This makes sense just the way clinical clearance of cervical spine (c-spine) has replaced the need for c-spine X-rays for awake, alert patients with no distracting injuries in the ATLS protocol.

Routine screening radiographs are blamed for not just delaying the assessment of other injuries in major traumas in which time is of the essence, and not to forget the un-necessary radiation exposure risk and additional cost which adds significant burden to the resource-poor patients belonging to low income countries.[7] In a country like Pakistan where cost of treatment plays a pivotal part in decision-making, management and treatment of patients, omitting inessential investigations always helps

Department of Surgery, Aga Khan University, Karachi, Pakistan.
Correspondence: Muhammad Asad Moosa. e-mail: asad.moosa@aku.edu

without compromising the quality of patient care. It is imperative to realise that most emergency departments (EDs) are busy and have limited personnel and resources which consume valuable time when invested on obtaining radiographs. Although the radiograph itself only takes seconds, the positioning of a film under the patient and interruption of the team during the primary survey makes it a procedure that may take several minutes.

Since ages, clinical examination of the pelvis has remained a routine when evaluating blunt trauma patients.[8] This consists of the establishment of pelvic stability. Manual compression of the iliac crests is performed to assess abnormal movement or bony pain. If the pelvis seems to be stable, cautious manual distraction of the iliac crests is performed, also evaluating for abnormal movement or bony pain. It takes very little time and, especially in alert patients, might be adequate to detect pelvic fractures. Only if the evaluating clinician is able to identify relevant fracture with high sensitivity, the routine use of radiography can be safely reduced in alert and awake patients with no distracting injuries. This would reduce pelvic X-ray-associated radiation exposure, cut down costs for resource use, and, most importantly, save valuable time in the work-up after blunt trauma.

The current study was planned to determine the diagnostic accuracy of clinical examination in detecting pelvic fractures in patients with blunt trauma.

Patients and Methods

The cross-sectional prospective study was conducted at Aga Khan University Hospital, Karachi, from January to June 2015, and comprised alert and awake blunt-trauma patients aged 16 years or above who had Glasgow Coma Scale (GCS) score of 15 and had no evidence of haemodynamic instability. Patients who had any other associated injuries, including limb fractures and abdominal tenderness, were excluded. The subjects, enrolled using non-probability consecutive sampling, were assessed by General Surgery residents with a minimum of 3 years of experience. All patients presenting to the ED were evaluated after they had undergone primary examination along with resuscitation, where needed. They were subsequently evaluated for clinical examination findings of tenderness on pubic symphysis, tenderness on iliac bones and painful hip movements and these findings were documented in a pre-designed proforma. Since the subjects were stable patients, they were, therefore, sent to the radiology department for routine trauma series, including the pelvic X-ray (PXR) and chest X-ray (CXR). The X-ray findings after discussion with the radiologist were filled in the study proforma.

Findings of both the clinical examinations and PXR were documented and compared along with patients' demographics using SPSS 19. For calculation of sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV), contingency 2 X 2 tables were used. Values of true positive (TP), false positive (FP), true negative (TN) and false negative (FN) cases were plotted using the 2x2 table.

Results

Of the 221 patients initially evaluated, 133 were included. Of them, 122 (92%) were male. Overall mean age was 37 ±14.2 years.

Clinical examination for pelvic fractures was considered positive based on five main findings, including bruising, haematoma, tenderness at iliac crest, tenderness at pubic symphysis and abnormal range of motion at the hip joint (Figure). Of the total, 14 (10%) patients were positive for pelvic fracture on both clinical examination and PXR, 14 (10%) were positive on clinical exam but negative on PXR, 2 were negative on clinical exam but positive on PXR, and 103 (77.4%) were negative on both clinical exam and PXR (Table).

Sensitivity of people having pelvic fracture on clinic examination compared to PXR was 87.5% (Confidence Interval [CI]: 61.65-98.45%), specificity of people not having pelvic fracture on clinical exam was 88.03% (CI: 80.74-

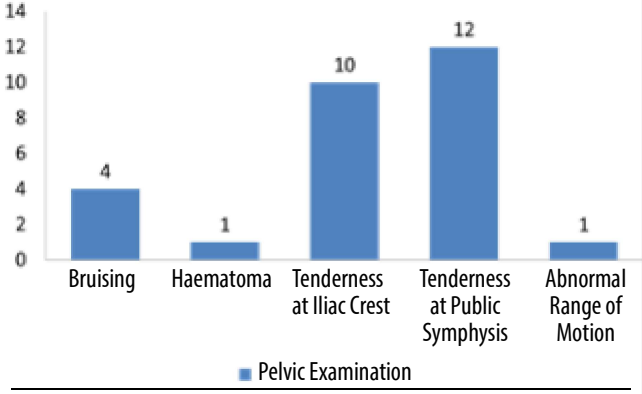

Figure: Findings of clinical examination of pelvis in blunt trauma patients. Showing numbers of patients with positive clinical examination.

Table: Findings of clinical examination and pelvic x-rays in a 2x2 table .

	PXR Positive	PXR Negative	Total
Exam Positive	14 (TP)	14 (FP)	28
Exam Negative	2 (FN)	103 (TN)	105
Total	16	117	133

TP: True positive; FP: False positive; FN: False negative; FP: False positive; PXR: Pelvic X-ray.

93.03%), PPV 50% (CI: 30.65-69.35%) and NPV was 98.09% (CI: 93.29-99.77%).

Discussion

PXRs are routinely performed on trauma patients to exclude pelvic fractures which carry a very high mortality owing to the risk of major bleeding resulting in haemodynamic consequences, thus emphasising the importance of early detection and rapid stabilisation to avoid significant blood loss which can pool into the expanding pelvic cavity. Another potential benefit of the radiograph is to identify simple fractures and hip dislocations. Current data suggests that a thorough clinical examination will detect a relevant fracture of the pelvis if it is present. Civil et al. reported that about half of blunt-trauma patients can forego radiography.[9] However, the fractures which tend to be overlooked are generally minor and/or stable fractures that do not require immediate treatment.

There have been studies in the past where good sensitivity of the clinical examination has been predicted, revealed and proven. According to Tein et al., the diagnostic accuracy of clinical examination in detecting pelvic fractures resulted in sensitivity 91%, specificity 92%, PPV 75% and NPV 97.4% .[10] In the current study, sensitivity was 87.5%, and PPV was 50% but we had a good NPV of 98%. Slightly lower sensitivity and PPV can be because of a the smaller sample size compared to international studies. These findings can be used for creating new protocols to investigate pelvic fractures. As mentioned previously, developing newer protocols like these add value to the patient care in our part of the world where the treatment cost is a huge burden for patients and the health sector is suboptimal and in developing stage where lack of proper medical facilities is a point of concern. Our results can also reinforce those from other parts of the world in devising a new protocol. We would like to be a part of new recommendations for pelvic fractures investigations which should be implemented in patients with no impairment of consciousness, no other major distracting injuries, no complaint of pelvic pain, no signs of fracture on inspection, no pain on iliac or pubic symphysis compression, and no pain on hip rotation or flexion. If only one criterion of this rule is not fulfilled or doubtful, imaging studies are recommended. In addition to reducing cost, avoiding PXR will have huge impact on avoiding unnecessary radiation exposure and would decrease hospital stay, and can avoid the hassle in ED which is mostly working at more than its required capacity. The limitations of our study are its single-centre nature, residents examining the patients in ER were not all ATLS-certified and patients were not followed up after their first assessment which means there is always a chance of missed injury which, if that was the case, will alter the results.

Conclusion

Omitting PCR in the current recommended ATLS protocol can avoid unnecessary financial burden for patients in resource-constrained countries like Pakistan, and reduce undesirable radiation exposure. This will reduce ED hassle without compromising on patients' quality of care and wuld also save valuable time in management of a trauma patient.

Disclaimer: None.
Conflict of interest: None.
Source of Funding: None.

References

1. Palanca S, Taylor DM, Bailey M, Cameron PA. Mechanisms of motor vehicle accidents that predict major injury. Emerg Med (Fremantle) 2003;15:423-8.
2. World Health Organization. Health Statistics and Information Systems: Global Health Estimates. [Internet] 2010 [cited 2018 June 18] Available from: www.who.int/healthinfo/global_burden_disease/en/
3. Grotz MR, Allami MK, Harwood P, Pape HC, Krettek C, Giannoudis PV. Open pelvic fractures: epidemiology, current concepts of management and outcome. Injury 2005;36:1-13.
4. Dente CJ, Feliciano DV, Rozycki GS, Wyrzykowski AD, Nicholas JM, Salomone JP, et al. The outcome of open pelvic fractures in the modern era. Am J Surg 2005;190:830-5.
5. Schulman JE, O'Toole RV, Castillo RC, Manson T, Sciadini MF, Whitney A, et al. Pelvic ring fractures are an independent risk factor for death after blunt trauma. J Trauma 2010;68:930-4.
6. Paydar S, Ghaffarpasand F, Foroughi M, Saberi A, Dehghankhalili M, Abbasi H, et al. Role of routine pelvic radiography in initial evaluation of stable, high-energy, blunt trauma patients. Emerg Med J 2013;30:724-7.
7. You JS, Lee HJ, Chung YE, Lee HS, Kim MJ, Chung SP, et al. Diagnostic radiation exposure of injury patients in the emergency department: a cross-sectional large scaled study. PLoS One 2013;8:e84870. doi: 10.1371/journal.pone.0084870.

8. den Boer TA, Geurts M, van Hulsteijn LT, Mubarak A, Slingerland J, Zwart B, et al. The value of clinical examination in diagnosing pelvic fractures in blunt trauma patients: a brief review. Eur J Trauma Emerg Surg 2011;37:373-7.
9. Civil ID, Ross SE, Botehlo G, Schwab CW. Routine pelvic radiography in severe blunt trauma: is it necessary? Ann Emerg Med 1988;17:488-90.
10. Tien IY, Dufel SE. Does ethanol affect the reliability of pelvic bone examination in blunt trauma? Ann Emerg Med 2000;36:451-5.