

The diagnosis of pelvic fractures by 'springing'

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SUMMARY

Thirty-six patients were studied prospectively to assess the benefit of 'springing' the pelvis in traumatized patients, to confirm or refute a fracture of the pelvis. None of the patients was multiply injured and half of those with fractures were elderly, sustaining their injuries in simple falls. Springing the pelvis was a poor predictor of the presence or absence of a pelvic fracture, at best it yielded a specificity of 71% and sensitivity of 59%. Its routine use in clinical examination should be abandoned.

INTRODUCTION

Fractures of the pelvis are commonly seen injuries in our Accident and Emergency departments, and are associated with significant morbidity and mortality. Therefore, accurate diagnosis is essential but this can be difficult in a clinical situation: one must have a high index of suspicion of injury especially in the multiply injured patient.

The manoeuvre of 'springing' the pelvis, i.e. applying an alternate compressing and distracting force to the ilia is traditionally taught as the most useful method of detecting such fractures, (Harding *et al.*, 1984; Clain, 1986) and therefore is frequently used in Accident and Emergency departments. It was decided to look at this sign more closely, in the form of a prospective trial in an attempt to assess its value as a discriminator for the presence or absence of a fractured pelvis.

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METHODS

The study was conducted in two Accident and Emergency departments over a 4-month period. The attending doctor, who in most cases was a Senior House Officer was asked to complete a brief proforma on any patient he/she intended to X-ray for a possible fracture of the pelvis. Basic patient details were recorded (name, address, date of birth) the cause of the injury (e.g. road traffic accident) and their clinical state on admission, including their Glasgow Coma Scale (GCS) and Trauma Score (TS). All medical staff in both departments were instructed in the standard method of 'springing' the pelvis which is as follows:

(1) Compression: the examiner's hands are placed on either side of the pelvis, just posterior to the anterior superior iliac spine and a medially directed compressing force applied.

(2) Distraction: the hands are placed around and inferior to the anterior superior iliac spine and a postero-lateral synchronous force applied.

The results of each of these manoeuvres were recorded as either positive or negative. The sign was considered positive if the patient produced a painful response verbally, grimaced or via a withdrawal type of movement. Finally the results of pelvic X-ray were recorded and subsequently compared with a formal radiologist's report.

RESULTS

A total of 49 patients were studied and completed details were available on 36 (73.4%). There were 17 males and 19 females, with an age range of 9–95 years. The mean age was 46 years. Of the 36 patients, 22(61%) were found to have a fractured pelvis radiologically (X-ray positive) and 14(39%) did not (X-ray negative), although two of this latter group were subsequently shown to have a fractured neck of femur. Of the 22 patients who sustained a pelvic fracture 11 were involved in a road traffic accident and the other half (mainly elderly) fell at home. All but two of the 36 patients had a Glasgow Coma Scale of 14 or better and Trauma Scores were similarly 15 or 16 in 33 patients. Table 1 gives the results of 'springing' in the 14 X-ray negative patients and Table 2 does similarly for the 22 X-ray positive patients. Table 3 shows the results of predicting a pelvic fracture when both compression *and* distraction yield a positive response. As can be seen this gave a high false negative rate (16 out of 22) resulting in a sensitivity of only 27%. If we then consider the diagnostic accuracy of predicting a fracture in the presence of a positive response to compression *or* distraction (Table 4) there is some improvement of the false negative rate to a sensitivity of 59%, while specificity has, not surprisingly, decreased from 79% to 71%.

The net effect of these results can be more clearly seen by considering the Youden index or 'J' value (Youden, 1950), which is a measure of the efficiency of a diagnostic test. The nearer 'J' is to 1, the better the test. The highest 'J' value

Table 1. Patient data. X-ray negative.

Patient No.	Age	Cause	GCS	TS	Compression	Distraction
1	47	RTA(D)	15	16	Negative	Negative.
2	20	RTA(D)	15	16	Negative	Negative.
3	84	Fall(H)	15	16	Negative	Negative.
4	23	RTA(D)	15	16	Positive	Positive.
5	74	RTA(D)	15	16	Negative	Negative.
6	12	RTA(Pas)	4	15	Negative	Negative.
7	9	RTA(Pas)	15	16	Negative	Negative.
8	39	RTA(Pas)	15	16	Negative	Negative.
9	12	RTA(Pas)	15	13	Negative	Negative.
10	40	RTA(D)	15	16	Positive	Negative.
11	32	Fall(W)	15	16	Negative	Negative.
12	27	RTA(Pas)	15	16	Negative	Negative.
13	23	RTA(Ped)	15	16	Positive	Positive.
14	17	Fall(S)	15	16	Positive	Positive.

Note RTA (D) = driver, road traffic accident
 RTA (Pas) = passenger, road traffic accident
 RTA (Ped) = pedestrian, road traffic accident
 H = fall at home
 W = fall at work
 S = fall during a sporting activity

obtained was only 0.3 which clearly shows the poor diagnostic accuracy of pelvic springing in relation to presence or absence of a pelvic fracture.

DISCUSSION

Early diagnosis of pelvic fracture is vital to the subsequent outcome of the patient. In one study (Rothenberger *et al.*, 1978) of 26 patients who died primarily of pelvic fracture 18 died of exsanguination in the first 9 h. Morbidity can also be considerable with such long term complications as urethral stricture and chronic hip pain. It is now considered standard practice to obtain a pelvic film as part of the routine 'work-up' of the multiply injured patient (Jordan, 1983) since clinical diagnosis of pelvic fracture can be so difficult in such patients; but as can be seen from this study half of our patients were elderly and fell at home and indeed of all our patients only two had a trauma score of 13 (i.e. an approximate mortality rate of 10%, see Champion, 1981).

Our patients in this study therefore, were not in the multiply injured category and yet the accuracy of pelvic 'springing' was still poor. It has been suggested (Carter, 1981) that a fractured hip or pelvis may be detected by tapping each patella in turn and auscultating at the symphysis pubis in an attempt to detect a difference in sound transmission between the two sides, but this is unreliable especially in the presence of, for example, a knee joint effusion, or fracture around the symphysis itself (Sotos, 1983).

Table 2. Patient Data X-ray positive.

Patient No.	Age	Cause	GCS	TS	Compression	Distraction	Fracture
15	79	Fall(H)	15	16	Negative.	Negative.	I.P.R.
16	95	Fall(H)	15	16	Negative.	Positive.	I.P.R./N. of F
17	83	Fall(H)	15	16	Negative.	Positive.	S.P.R.
18	30	RTA(D)	15	13	Negative.	Negative.	Ilium.
19	81	Fall(H)	15	16	Positive.	Negative.	I.P.R.
20	21	RTA(Ped)	15	16	Negative.	Negative.	I.P.R./N. of F
21	87	RTA(Ped)	14	16	Negative.	Negative.	S.P.R.
22	83	Fall(H)	15	16	Positive.	Negative.	S.P.R.
23	12	RTA(Ped)	14	16	Negative.	Negative.	I.P.R.
24	86	Fall(H)	15	16	Positive.	Positive.	S.P.R.
25	82	Fall(H)	15	16	Positive.	Positive.	S./I.P.R.
26	38	RTA(D)	15	16	Negative.	Negative.	Diast.P.Sym.
27	20	RTA(Pas)	15	16	Positive.	Negative.	S./I.P.R.
28	17	RTA(Ped)	5	13	Negative.	Negative.	S.P.R.
29	69	Fall(H)	15	16	Negative.	Negative.	Acetab./I.P.R.
30	88	Fall(H)	14	16	Negative.	Positive.	S.P.R.
31	20	RTA(Ped)	15	15	Positive.	Positive.	S.P.R.
32	43	RTA(D)	15	16	Positive.	Positive.	S/I.P.R./S.I.
33	64	Fall(H)	15	16	Positive.	Positive.	I.P.R./N. of F
34	77	Fall(H)	13	16	Negative.	Positive.	I.P.R.
35	12	RTA(Ped)	13	15	Positive.	Positive.	I.P.R.
36	16	RTA(Pas)	15	16	Negative.	Negative.	I.P.R.

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I.P.R. = Inferior pubic ramus
 S.P.R. = Superior pubic ramus
 N. of F. = Neck of femur
 S.I.J. = Sacro-clial joint
 Acetab. = Acetabunum
 Diast.P.Sym. = Diastasis of pubis symphysis

Table 3. Criterion for a fracture: both compression and distraction positive.

	Both positive	Other result	Total
X-ray +ve	6	16	22
X-ray -ve	3	11	14

Probability of false positive = 0.21 = Specificity 79%.
 Probability of false negative = 0.73 = Sensitivity 27% 'J' point 0.0584.

Table 4. Criterion for a fracture: either compression or distraction positive.

	One positive	Other result	Total
X-ray +ve	13	9	22
X-ray	4	10	14

Probability of a false positive 0.29 = specificity 71%.
 Probability of a false negative 0.41 = sensitivity 59% 'J' point 0.305

I would suggest that there is no easy answer to the best method of detecting these fractures clinically and one must resort to the use of X-rays liberally, not just in major injury but also in the more minor, especially elderly patient who may only have vague groin discomfort or a mild limp following relatively trivial trauma. I feel that 'springing' the pelvis should no longer be taught to medical students and junior doctors alike, and should be completely discarded from our clinical practice.

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