

A national survey of United Kingdom trauma units on the use of pelvic binders

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Abstract

Purpose Major pelvic injuries resulting from high-energy trauma require emergency hospital treatment, and part of the initial management includes mechanical stabilisation of the pelvis. Controversies include binder position, use in lateral compression injuries and application during radiological assessment. We present the results of a survey of both emergency department and orthopaedic specialties.

Methods A telephone survey of all 144 trauma units in the UK accepting adult pelvic trauma patients was carried out in July 2012. The duty registrar for the emergency and orthopaedic departments was contacted and asked to complete a questionnaire.

Results A response rate of 100 % was achieved. Pelvic binders were available for use in approximately three quarters of the trauma units surveyed. Eight-five emergency department (59 %) and 79 orthopaedic (54.9 %) registrars had been given training on pelvic binder application. Fifty-six emergency department (38.9 %) and 114 orthopaedic (79.1 %) registrars identified the level of the greater trochanters as the most suitable position for the binder. Forty-five emergency department (31.3 %) and 58 orthopaedic (40.3 %) registrars used pelvic binders in suspected lateral compression injuries. One hundred and twenty-six emergency department (87.5 %) and 113 orthopaedic (78.5 %) registrars would not release the binder during radiological assessment of the pelvis in a haemodynamically stable patient.

Conclusion There is great variability in practice amongst trauma units in the UK. Training must be formalised and provided as a mandatory part of departmental induction. The use of standardised treatment algorithms in trauma units and the Advanced Trauma and Life Support (ATLS) framework may help decision making and improve patient survival rates.

Introduction

Pelvic fractures are usually the result of high-energy trauma, such as road-traffic accidents, falls from a height and crush injuries. They represent up to 6 % of all fractures in adults and occur in one fifth of all polytrauma cases [1]. Unstable pelvic fractures occur in up to 20 % of pelvic fractures [2], and in this group of patients, haemorrhage is the main cause of death. A recent study showed that 23 % of deaths due to haemorrhage following trauma were due to bleeding from pelvic fractures [3]. Bleeding occurs from cancellous bone surfaces, the presacral venous plexus and iliac vessels. The initial management of these patients is based on Advanced Trauma and Life Support (ATLS) guidelines of the American College of Surgeons Committee on Trauma [4]. Once the initial airway and breathing resuscitation procedures have commenced, attention must then be given to circulation and haemorrhage control through mechanical stabilisation of the pelvic injury, along with fluid resuscitation and transfusion of blood products.

In recent years, commercially available pelvic binders or pelvic circumferential compression devices have been shown to reduce bleeding, transfusion requirements and length of hospital stay [5]. There is controversy whether this occurs due to tamponade or through a fracture-splinting mechanism [6]. They also provide excellent exposure to the

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abdomen in case of laparotomy, and whereas there are numerous devices available, there is no evidence to suggest that any one is superior. Although their use is becoming more prevalent, some controversies exist. Application of the pelvic binder at the level of the greater trochanters (GT) has been shown to be the most effective position [7], but post-application radiographs with the binder in a high position e.g. around the iliac crests, are commonly required. Binder use in lateral compression injuries is also debatable due to the risk of secondary displacement or overreduction [8]. Also, if the binder has adequately reduced the fracture, there is a risk of missing radiographic signs of diastasis during primary survey imaging, e.g. in anterior–posterior compression injuries [9]. This raises the question as to whether they should be released for radiographs or computed tomography (CT) scans.

The aim of this survey was to investigate current practice in the availability and application of pelvic binders in trauma units in the UK with regard to the above-mentioned controversial topics. In particular, differences in practice between emergency department (ED) and orthopaedic staff are presented.

Methods

A telephone survey was conducted between 16 and 31 July 2012. All National Health Service (NHS) trusts accepting adult trauma patients with both an ED and an orthopaedic department were eligible for the survey. A list of these trusts was obtained via the NHS website [10]. Trusts that had no ED or acute orthopaedic service were excluded, including paediatric units, cancer hospitals and women's hospitals. One hundred and forty-four trusts were identified and contacted. The duty registrar for emergency and orthopaedic departments was contacted through the hospital switchboard and asked to complete our survey. We chose to perform this survey at the end of July as registrar doctors would have been in post for at least six months and would have had enough departmental experience to answer the questions based on local protocol. The following five questions were asked relating to different aspects of the use and application

of pelvic binders as per their departmental protocol. Responses were tabulated through use of a standard pro forma.

1. Is a pelvic binder available at your unit?
2. Have you had training on how to apply it?
3. What level on the pelvis should it be placed at?
4. Do you apply it in suspected lateral compression injuries?
5. In a haemodynamically stable patient, do you release it before imaging?

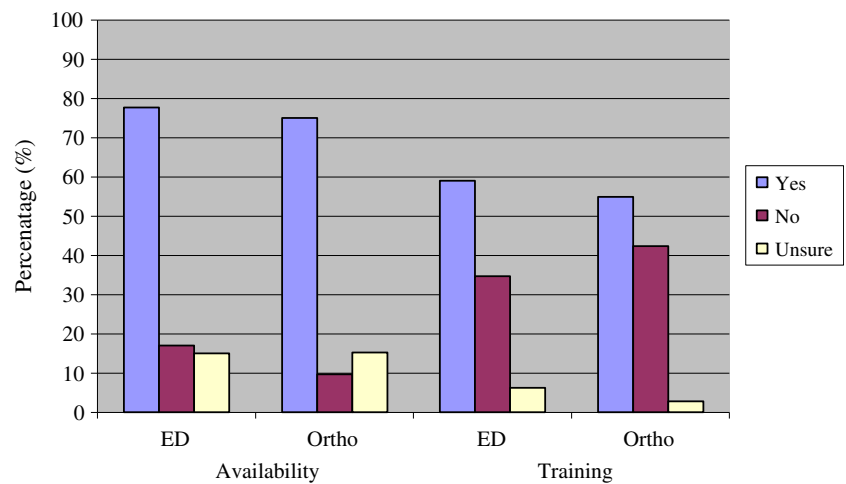
Results

All doctors contacted from each of the 144 trusts agreed to participate in the survey, which gave a response rate of 100 %. Occasionally, this required calling back at an agreed time if the departments were busy and were unable to offer time to answer our questions. Pelvic binders were used in 112 EDs (77.7 %) according to their registrars, whereas 108 orthopaedic registrars (75 %) reported availability. Seventeen ED registrars (11.8 %) and 14 orthopaedic registrars (9.7 %) reported that pelvic binders were not available to them. Trusts that did not have access to a pelvic binder used bed sheets tied around the pelvis and secured with cable ties, tape or artery clips. Fifteen ED (10.4 %) and 22 orthopaedic (15.2 %) registrars were unsure if they were available. Eighty five ED (59 %) and 79 orthopaedic (54.9 %) registrars had been given training on pelvic binder application, whereas 50 ED (34.7 %) and 61 orthopaedic (42.4 %) registrars had not. These results are shown in Table 1 and Fig. 1.

When asked at what anatomical position the pelvic binder should be placed, 56 ED (38.9 %) and 114 orthopaedic (79.1 %) registrars identified the level of the GT, 88 (61.1 %) and 30 (20.9 %), respectively, identified other anatomical landmarks on the pelvis (anterior superior iliac spines, iliac crests, pubic symphysis) or were unsure. Forty-five ED (31.3 %) and 58 orthopaedic (40.3 %) registrars used pelvic binders in suspected lateral compression injuries, 63 (43.8 %) and 72 (50 %), respectively, did not and 36 (25 %) and 14 (9.7 %), respectively, were unsure. The

Table 1 Results of availability and training questions

	Emergency department (<i>n</i> 144)		Orthopaedic department (<i>n</i> 144)	
Is a pelvic binder available at your unit?	Yes	112 (77.7 %)	Yes	108 (75 %)
	No	17 (11.8 %)	No	14 (9.7 %)
	Unsure	15 (10.4 %)	Unsure	22 (15.2 %)
Have you had training on how to apply it?	Yes	85 (59 %)	Yes	79 (54.9 %)
	No	50 (34.7 %)	No	61 (42.4 %)
	Unsure	9 (6.25 %)	Unsure	4 (2.8 %)

Fig. 1 Results of availability and training questions

majority of both ED and orthopaedic registrars stated that they would not routinely release the pelvic binder for imaging even if the patient was haemodynamically stable. One hundred and twenty-six ED middle grades (87.5 %) and 113 orthopaedic middle grades (78.5 %) stated that they would leave the binder in place during radiological assessment. These results are shown in Table 2 and Fig. 2.

Discussion

In a recent review article, Chesser et al. highlighted some controversial issues regarding the use of pelvic binders [11]. These include binder position, use in lateral compression injuries and missing diagnoses of pelvic instability on primary survey radiographs. Pelvic binders, when used correctly, provide significant advantages over other methods of pelvic compression, such as external fixation and C clamps. Whereas external fixators also provide adequate temporary stabilisation, they take longer to apply, require orthopaedic training and can only be performed on anaesthetised patients. A C clamp may be considered for pelvic fractures with severe posterior-ring injury, but again, they require specialist training and are less routinely available. Pelvic

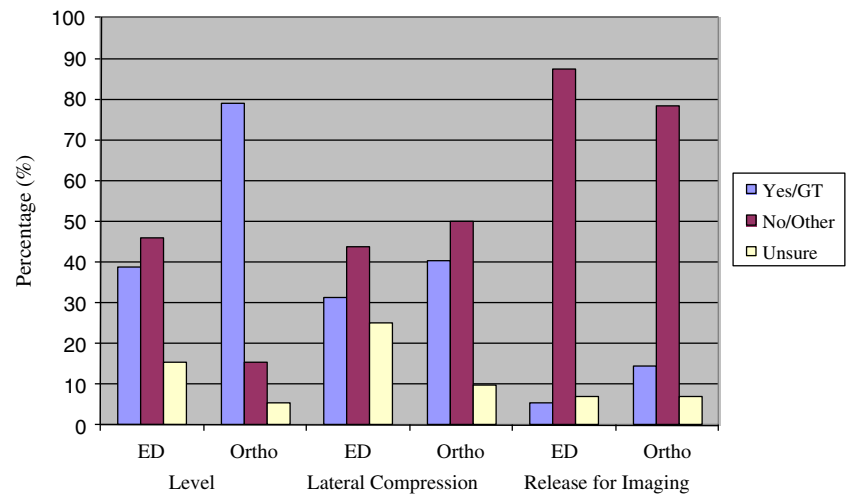
binders are easier to apply, noninvasive, provide controlled pressure delivery and can be used in conscious patients, thus reducing pain and movement during transfers. They also provide better exposure should abdominal surgery or angiography be indicated. It is for these reasons that they are becoming increasingly available in trauma units. Although there are several different types of commercially available binder, there is no evidence to show superiority of one particular model. Although these devices confer many benefits, it is important not to forget that there are complications associated with their use, such as pressure sores, tissue necrosis and nerve palsy [12]. Important limitations of pelvic binders are that they do not control vertical shear fractures and do not stop arterial bleeding, so access to provide embolisation is vital.

Our survey revealed that at least 75 % of acute trusts in the NHS have a pelvic binder available for emergency management of pelvic injury. Staff working in trusts that did not have these available indicated they used bed sheets secured with cable ties, tape or artery clips in order to provide pelvic compression and stability. Whereas this technique has been well described [13], it does not allow the applied reduction force to be controlled to a predetermined level [14] and is less effective in reducing symphyseal

Table 2 Results of pelvic binder application questions

	Emergency department (n 144)		Orthopaedic department (n 144)	
At what level on the pelvis should it be placed?	GT	56 (38.9 %)	GT	114 (79.1 %)
	Other	66 (45.8 %)	Other	22 (15.3 %)
	Unsure	22 (15.3 %)	Unsure	8 (5.6 %)
Do you apply it in suspected lateral compression injuries?	Yes	45 (31.3 %)	Yes	58 (40.3 %)
	No	63 (43.8 %)	No	72 (50 %)
	Unsure	36 (25 %)	Unsure	14 (9.7 %)
If the patient was haemodynamically stable, would you release it before imaging; i.e. X-ray or CT scan?	Yes	8 (5.6 %)	Yes	21 (14.6 %)
	No	126 (87.5 %)	No	113 (78.5 %)
	Unsure	10 (6.9 %)	Unsure	10 (6.9 %)

Fig. 2 Results of pelvic binder application questions



diastasis in open-book injuries when compared with pelvic binders [15]. Also, a narrow sheet may increase the risk of developing pressure sores when compared with a commercially available binder. More than one third of both ED and orthopaedic registrars had not had training or were unsure how to correctly apply a pelvic binder. This may be due to a lack of departmental training or to the lack of a clear protocol in ATLS guidelines, which form part of mandatory training for all doctors providing trauma care in the UK. ATLS guidelines recommend placement of pelvic binders by prehospital personnel before transport of these patients, but nevertheless, this remains an essential skill for all trauma clinicians. We recommend that all doctors working in ED and orthopaedic surgery have specific departmental training on how to correctly use the pelvic binder available in their trust. This would be most useful during induction to the department, which occurs at the start of placement.

In terms of position, 38.9 % of ED registrars stated they would place the binder at the level of the GT despite 59 % having had training on pelvic binder application. Most, but not all, orthopaedic registrars (79.1 %) stated that they would place the binder at the level of the GT. These results show that more adequate training is required, as there is clear evidence that compression around the GT is most effective in reducing unstable open-book fractures [8, 16, 17]. Importantly, a misplaced binder may make a pelvic injury worse if there is a fracture through the iliac crests. The use of pelvic binders in lateral compression injuries is more controversial, and this is reflected in our data, as there is no clear consensus of opinion. Although there is no evidence to suggest this is harmful, overreduction of the pelvis can occur. This may then require manipulation under anaesthesia to “unlock” the pubic symphysis. It can, however, be argued that using the binder as a splint may provide temporary stabilisation and pain relief, and provided it is not applied with extreme force, it may be done without the risk of overreduction.

The majority of both ED and orthopaedic registrars would leave the binder in place whilst obtaining appropriate imaging as part of the primary survey. There is a theoretical risk of a correctly applied binder masking open-book fractures resulting from anterior–posterior compression injuries. Whereas there are no reports that removal of the binder can lead to haemodynamic instability, leaving it in place during primary survey radiography is probably the safest approach in order to avoid disturbing initial clot formation. If clinical suspicion continues with regards to pelvic injury, repeat radiographs should be performed with the binder released and when the patient is more stable.

Limitations of this study include those that are inherent to cross-sectional surveys, i.e. that the data provided reflects only the opinions and practices of those surveyed at one particular time. Also, consultants were not targeted, as we felt that training was a vital aspect of managing pelvic trauma. Moreover, registrars are increasingly leading trauma situations, and we felt that this study would be of educational interest to them. However, during the study, we found that in some units, the duty registrar was a locum doctor, and we appreciate that they may not have been aware of the departmental protocol. Whenever possible, we tried to call back at a later time to speak with a registrar who was a regular member of staff. We did not perform a cost analysis on the use of pelvic binders in the UK, and it may be that in some, units this factor has precluded their use.

Conclusion

Commercially available pelvic binders provide stabilisation of pelvic-ring injuries through controlled circumferential pressure and have been shown to reduce haemodynamic compromise due to haemorrhage. They offer a noninvasive and practical adjunct to the primary survey and are becoming increasingly used. Despite most trauma units in the

UK using pelvic binders, adequate training is currently not provided to registrar-grade doctors. This is potentially harmful, as pelvic binders are most effective when applied in the correct position, i.e. over the GT. Whereas there is variation in practice and ongoing controversy with regards to their use in lateral compression injuries, no evidence exists to suggest this is actually harmful. Also, whereas haemodynamic stability is paramount, careful radiographic analysis must be performed, as the pelvis cannot be cleared of injury unless radiographs or CT scans are performed with the binder released. Pelvic binders provide an excellent temporary measure in stabilising unstable pelvic-ring injuries pending more permanent fixation. The use of standardised treatment algorithms in trauma units and the ATLS framework may help decision making and improve patient survival rates.

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Conflicts of interest None.

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