

# The Pre-hospital Management of Pelvic Fractures: Initial Consensus Statement

I Scott, K Porter, C Laird, M Bloch, I Greaves

## Abstract

**Pelvic injuries remain a significant cause of morbidity and mortality within the United Kingdom even with advances in hospital care. Massive haemorrhage associated with unstable pelvic fractures continues to be one of the leading causes of death. Pelvic binding devices now allow early stabilisation in the pre-hospital environment.**

**This consensus statement aims to provide guidance on the early management of pelvic injuries and the use of these devices.**

Key Words: Pelvic fractures; Pelvic binders; S.A.M Pelvic sling; T-POD;

## Introduction

Serious pelvic injuries are associated with a high mortality rate. (1,2) which has remained persistently high even with advances in hospital care. Hypovolaemia is often a significant contributing factor to these deaths (1,3) If haemorrhage from pelvic injuries could be controlled or reduced in the pre-hospital environment, then survival rates might increase.

Improved mortality has been seen with catastrophic haemorrhage from limb injuries, after the introduction of the battlefield tourniquet. (4) However compared to bleeding from pelvic injuries, external haemorrhage is simple to recognise and the success of intervention easier to observe.

Pelvic binding devices provide a simple alternative to surgical fixators. These devices can be applied in the pre-hospital environment, potentially allowing control of unseen major haemorrhage.(2)

This paper reports the finding of a consensus meeting on the pre-hospital management of pelvic injuries held in March 2012 and examines the evidence associated with pelvic binding devices and their application.

## Method of literature search

A review of the literature was undertaken prior to the consensus meeting. The Medline database was searched using PubMed and Google Scholar was also used. The search terms were: *Pre-hospital management of pelvic injuries; Pelvic circumferential compression devices; pelvic binders, SAM pelvic sling, T-POD, PelvicBinder, Geneva belt, London pelvic sling.* Further articles were identified from the references of retrieved articles.

Manufacturers' websites were reviewed for further information regarding specific products.

**Consensus Outcomes:**

1.A Pelvic Binder is a treatment intervention and should be applied early

The initial management of any patient with a suspected pelvic injury must include the usual safety precautions. During scene assessment visual clues to the mechanism of injury will help determine the likelihood of a pelvic injury.

The primary survey should deal with external catastrophic haemorrhage then any significant airway and/or breathing issues prior to circulatory assessment. If the patient is haemodynamically compromised with a significant mechanism suggestive of a pelvic injury, a pelvic binder should be applied.

Applying a pelvic binder early provides stability and allows clot formation. This may prevent ongoing haemorrhage and the often-lethal trauma induced coagulopathy.

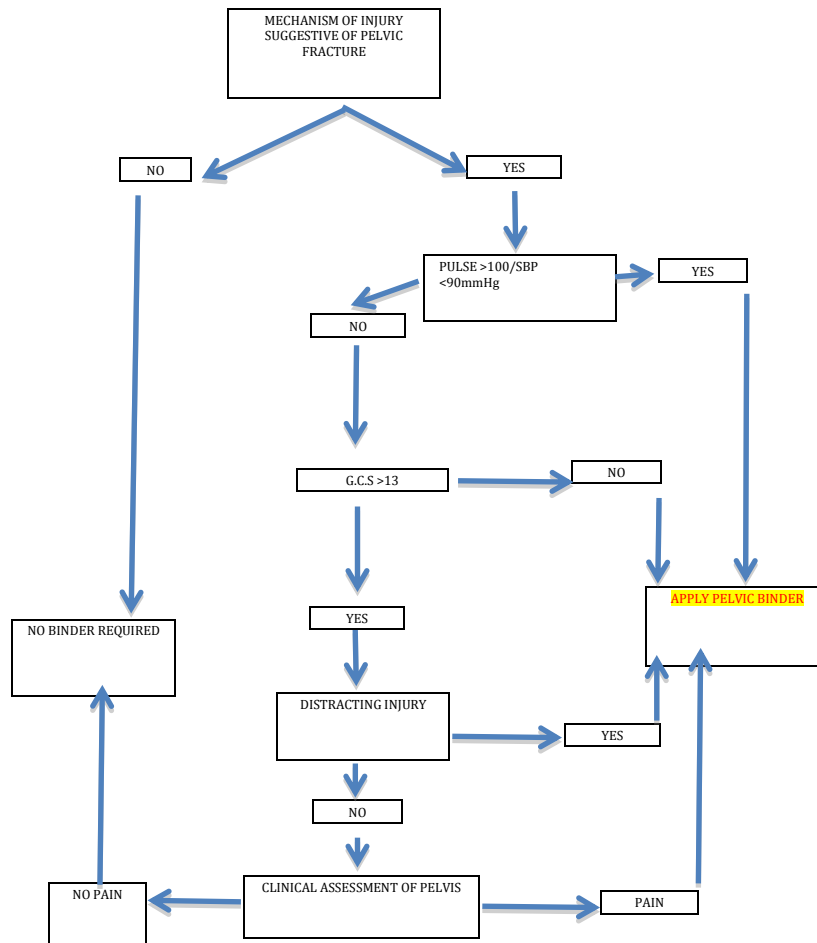
The consensus group emphasised that the pelvic binder is a treatment intervention rather than a packaging device and if the device is thought of as a haemorrhage control device this should promote early application.

2. A select group of patients may not need a binder applied

Pre-hospital diagnosis of a pelvic fracture can be extremely difficult. (3) There is no obvious external bleeding and deformities can be difficult to detect. *Grant 1990* found that 'springing the pelvis' had a poor sensitivity (59%) and specificity (71%).(5) There is also concern that compressing the pelvis can cause further haemorrhage and as a result this technique is no longer recommended. (3,5)

Significant pelvic trauma can be excluded in a small group of patients preventing the unnecessary use of pelvic binders.

These patients must be haemodynamically stable with a normal Glasgow coma scale. (6,7) The following flow diagram is an illustration of how patients can be stratified according to the risk of pelvic injury.



3 No one pelvic binder device can currently be recommended over another.

The ideal pelvic binder should: stabilise the pelvis in order to reduce haemorrhage and pain. It should be easy to apply, not cause further harm and allow radiological and surgical intervention without need for removal. In addition it should not be too expensive to purchase or maintain.

A number of pelvic binding devices currently exist. There is limited evidence regarding their use in the pre-hospital environment. Cadaver and some clinical evidence suggests that pelvic stabilisation can be achieved with these devices. (8-10). A number of case series and reports suggest an improvement in haemodynamic stability and a reduction in blood transfusions after a pelvic binder has been applied. (11-13)

Currently there is insufficient evidence to support one device over another. The two devices with the strongest evidence base are the SAM pelvic sling and T-POD devices.

Manufacturers of new devices should provide evidence that their device provides a similar level of stabilisation to these in cadaver models at least prior to them being made available for clinical use.

4. Adequate training must be provided to avoid misplacement of devices.

There is evidence that misplacement of pelvic binders can reduce the degree of fracture reduction. (10) It is important that pre-hospital providers are trained appropriately to optimise correct placement.(10)

While there is evidence that these devices are often incorrectly placed, this was felt to be a training issue rather than an inherent design fault. Pre-hospital providers must ensure that their members/employees are appropriately trained with clinical governance structures in place to provide constructive feedback.

5. Associated femoral fractures should also be reduced.

Significant pelvic fractures require large energy transfers and are often associated with other lower limb bony injuries. There is no evidence that pelvic binders are harmful when applied to patients with proximal femur or acetabular fracture.(2)

**Consensus View**

Patients that also have clinically obvious femoral fractures should have these stabilised. If the patient is significantly haemodynamically compromised then in this scenario to prevent unnecessary delay, consideration to pulling the legs out to length (with appropriate analgesia as needed), apply a pelvic binder and then binding the legs together at the knees and figure of 8 around the ankles and feet should be made. If applying any traction causes increased pain or further haemodynamic instability then the legs should be strapped together in the position found.

If the patient is haemodynamically stable and there is a low probability of significant pelvic injury or if it is felt that a patient does require a traction splint, for example a patient with an isolated femur fracture, bilateral femur fracture or a patient with severe displaced fracture of a long-bone and possible prolonged transfer time then the clinician could consider the application of traction splint but care must be taken in this approach as counter traction is applied to the pelvis and this could cause further injury. The manufacturers of traction splints do not recommend their use with pelvic fractures however, consideration for a device such as the Kendrick Traction Device (KTD) which allows you to work around the problem of hip and groin trauma and may also be applied more rapidly than older devices whilst still allowing reasonable ease of extrication and packaging.

## 6. Patients should not be log rolled or transported on a spinal board

There is evidence that logrolling patients with significant pelvic fractures can cause clot disruption and further haemodynamic compromise.(3) Patient handling must therefore be approached with care in these patients. Logrolling only has a place in turning a patient onto their back to allow access to their airway. There is no place for routine logrolling in blunt trauma victims. Patients should be moved with the aid of a scoop stretcher. No patient should be logrolled onto or off a spinal board with a pelvic injury.

## 7. The use of pelvic binders is associated with the risk of low pressure necrosis

There is evidence that with a pelvic binder in place, tissue under the binder is at risk of pressure necrosis. (14-16). There are a few case reports in the literature of this complication. (17) A study in healthy volunteers demonstrates that the pressure exerted by some of these devices is close to or even over the level for tissue perfusion. (16) In patients with a low blood pressure this is likely to be even more exaggerated. This problem is compounded if the patient is also on a spinal board.(16)

Using a device that controls the pressure exerted, such as the SAM pelvic sling, might help prevent pressure necrosis but there is limited clinical evidence to support this recommendation. Providers must be aware of this problem and avoid transporting these patients on spinal boards.

## 8. The pelvic binder should be placed next to skin.

There is limited information regarding this in the literature. Most of the studies have been performed in accident and emergency departments where clothes were removed. Studies examining the effect of pressure exerted by these devices have been undertaken with only thin undergarments on. There is no evidence that placement over clothes provides the same degree of stabilisation or risk of pressure damage. Ideally pelvic binders should be placed either directly to skin or just over thin underwear. Placement next to skin may allow more accurate positioning of these devices, it will also help prevent the pelvic binder device being removed on arrival at hospital.

In certain scenarios it may be appropriate to place the binder over clothes and the fear of undressing someone should not prevent the use of these devices.

9. A pelvic binder should be applied prior to extrication.

There is no evidence in literature to help guide a recommendation. If early placement controls haemorrhage and movement of an unstable fracture can disrupt clot formation, it would seem logical that placement occurs prior to extrication where possible. This area requires further investigation to find the optimal method for placement of binder. A pragmatic approach is also required as there are likely to be scenarios when place is not practical prior to extrication.

### ***Conclusion***

The consensus statement aims to challenge the view that a pelvic binder is a packaging device. It should be thought of as a treatment option for major haemorrhage.

## References

- (1) Papakostidis C, Giannoudis PV. Pelvic ring injuries with haemodynamic instability: efficacy of pelvic packing, a systematic review. *Injury* 2009 Nov;40 Suppl 4:S53-61.
- (2) Chesser TJ, Cross AM, Ward AJ. The use of pelvic binders in the emergent management of potential pelvic trauma. *Injury* 2012 Jun;43(6):667-669.
- (3) Lee C, Porter K. The prehospital management of pelvic fractures. *Emerg Med J* 2007 Feb;24(2):130-133.
- (4) D'Alleyrand JC, Dutton RP, Pollak AN. Extrapolation of battlefield resuscitative care to the civilian setting. *J Surg Orthop Adv* 2010 Spring;19(1):62-69.
- (5) Grant PT. The diagnosis of pelvic fractures by 'springing'. *Arch Emerg Med* 1990 Sep;7(3):178-182.
- (6) 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 Aug;37(4):373-377.
- (7) Sauerland S, Bouillon B, Rixen D, Raum MR, Koy T, Neugebauer EA. The reliability of clinical examination in detecting pelvic fractures in blunt trauma patients: a meta-analysis. *Arch Orthop Trauma Surg* 2004 Mar;124(2):123-128.
- (8) Bottlang M, Krieg JC, Mohr M, Simpson TS, Madey SM. Emergent management of pelvic ring fractures with use of circumferential compression. *J Bone Joint Surg Am* 2002;84-A Suppl 2:43-47.
- (9) Bottlang M, Simpson T, Sigg J, Krieg JC, Madey SM, Long WB. Noninvasive reduction of open-book pelvic fractures by circumferential compression. *J Orthop Trauma* 2002 Jul;16(6):367-373.
- (10) Bonner TJ, Eardley WG, Newell N, Masouros S, Matthews JJ, Gibb I, et al. Accurate placement of a pelvic binder improves reduction of unstable fractures of the pelvic ring. *J Bone Joint Surg Br* 2011 Nov;93(11):1524-1528.
- (11) Simpson T, Krieg JC, Heuer F, Bottlang M. Stabilization of pelvic ring disruptions with a circumferential sheet. *J Trauma* 2002 Jan;52(1):158-161.
- (12) Tan EC, van Stigt SF, van Vugt AB. Effect of a new pelvic stabilizer (T-POD(R)) on reduction of pelvic volume and haemodynamic stability in unstable pelvic fractures. *Injury* 2010 Dec;41(12):1239-1243.
- (13) Warme WJ, Todd MS. The circumferential antishock sheet. *Mil Med* 2002 May;167(5):438-441.
- (14) Jowett AJ, Bowyer GW. Pressure characteristics of pelvic binders. *Injury* 2007 Jan;38(1):118-121.
- (15) Knops SP, van Riel MP, Goossens RH, van Lieshout EM, Patka P, Schipper IB. Measurements of the exerted pressure by pelvic circumferential compression devices. *Open Orthop J* 2010 Feb 17;4:101-106.
- (16) Knops SP, Van Lieshout EM, Spanjersberg WR, Patka P, Schipper IB. Randomised clinical trial comparing pressure characteristics of pelvic

circumferential compression devices in healthy volunteers. *Injury* 2011 Oct;42(10):1020-1026.

- (17) Krieg JC, Mohr M, Mirza AJ, Bottlang M. Pelvic circumferential compression in the presence of soft-tissue injuries: a case report. *J Trauma* 2005 Aug;59(2):470-472.