



## Standard Operating Procedures - Major Trauma Services **USE of CIRCUMFERENTIAL PELVIC BINDER** **for ADULTS and CHILDREN**

### INTRODUCTION

Pelvic injuries are some of the most common injuries seen in major trauma patients and tend to be most often caused by high energy falls or road traffic collisions.

A high energy pelvic fracture should be used as an indicator of multiple associated injuries, as well as an indicator of a severely injured patient.

Early stabilisation of the pelvic ring – even with temporary measures– i.e. application of a circumferential pelvic binder or a crossed pelvic sheet - can limit internal haemorrhage, facilitate effective resuscitation, and prevent further trauma. These binders are non-invasive, simple to apply, inexpensive and nowadays widely used from the prehospital stage.

Much as the cervical spine collar is used to protect the cervical spine from further injury prior to definitive identification and characterization of an injury, the pelvic binder should be used where a pelvic injury is suspected before definitive imaging is available.

The pelvis does not fill with blood like a bucket. Pelvic haemorrhage spreads through the disrupted tissue planes, extending into the retroperitoneal cavity from the pelvis through the abdomen up into the thorax, and anteriorly around the bladder and the anterior abdominal wall. 'Closing the pelvis' does not prevent this, and the binder is not just used to reduce the volume of the pelvis or achieve perfect anatomical alignment.

The pelvic binder is used to splint the bony pelvis. The binder splints the bony fracture, approximating bone ends and reducing low-pressure bleeding from bone ends and disrupted veins.

As the fracture pattern is often unknown at this stage, it is possible to exacerbate certain injury patterns if excessive force is applied. This is particularly true of severe lateral compression or vertical shear injuries.

The sling should be tightened to 180 Newtons which is equivalent to lifting 18 kg of weight. Application of a binder can increase pelvic stability; rotational stress by 61% and flexion-extension by 55%.

The binder should be placed over the greater trochanters, not over the iliac crests. This provides the best mechanical stability of the pelvic ring. A misplaced binder may exacerbate a pelvic fracture if there is an injury through the iliac crest. When placed too high it will also obstruct access for damage control surgery - laparotomy. The binder should also allow easy access to the groins or abdomen without having to remove or reposition the belt.

The binder should be of such material and construction that it does not induce pressure necrosis and allows for ease of nursing.

Emergency external fixation offers limited if any benefit over the pelvic binder. Nowadays, there is a very limited role, if any, for the external fixator as a stand-alone emergency stabilization device. The external fixator may compromise the approaches for definitive stabilization and should not be used lightly.



The addition of axial skeletal traction can provide further stability to the rotationally and axially unstable pelvic fractures.

A pelvic C – clamp can offer more symmetrical temporary stabilisation of the pelvic ring, and in most of the unstable pelvic ring fractures can effectively replace the pelvic binder, as an interim solution until definitive reduction and stabilisation.

There are a few different versions of the pelvic binder, none of which have proved to be more effective than another. The aims of using circumferential compression devices are:

1. To splint the bony pelvis to reduce haemorrhage from bone ends and venous disruption.
2. To reduce pain and movement during transfers.
3. To provide some integrity to the pelvis when operative packing of the pelvis is necessary.
4. To provide stabilization of the pelvis until definitive stabilization can be achieved.

The Yorkshire Ambulance Service (YAS) currently uses the SAM, T-POD, PROMETHEUS splints.



**SAM PELVIC SLING™ II**



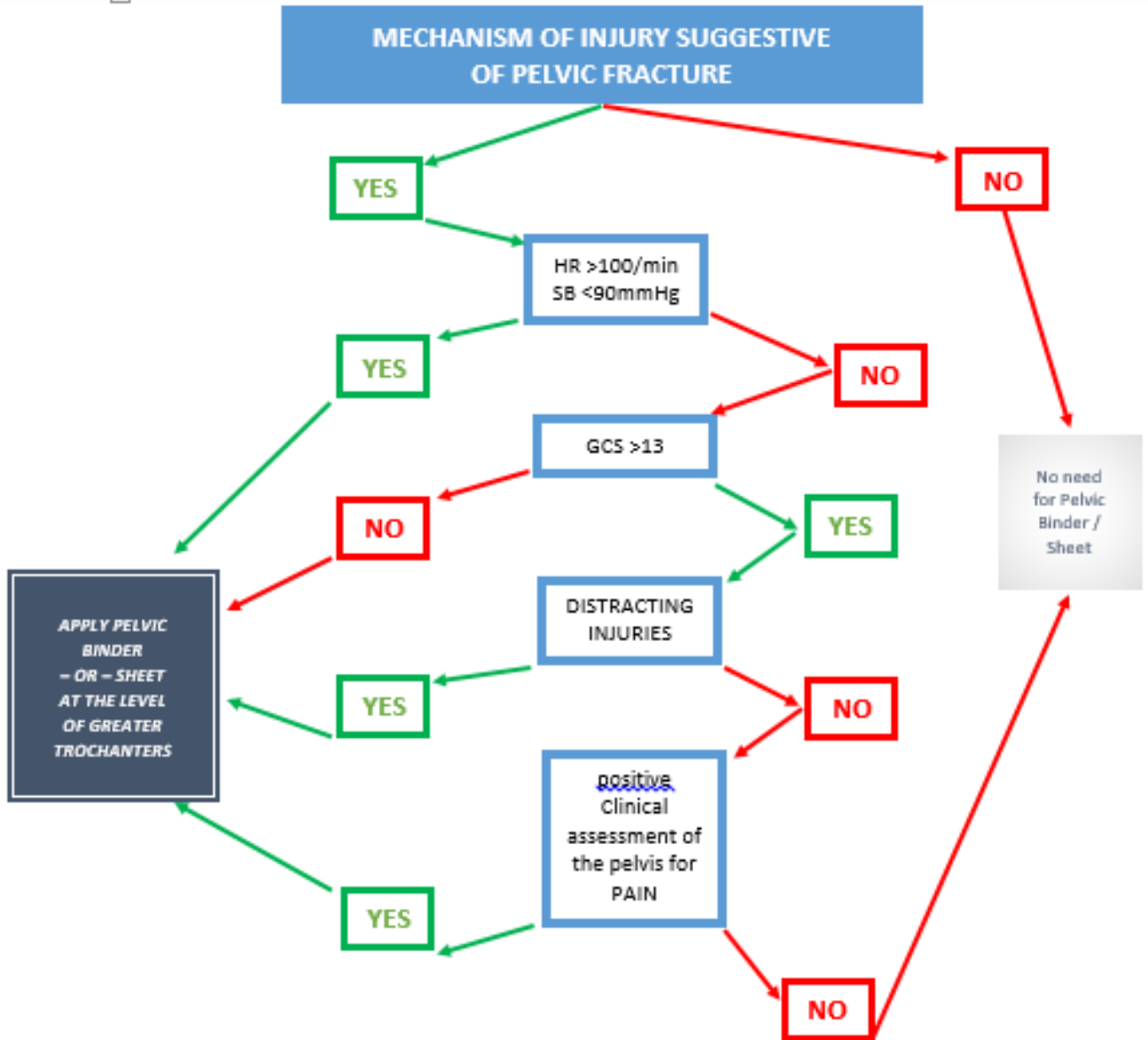
**T-POD PELVIC BINDER**



**PROMETHEUS BINDER**



## INDICATION FLOWCHART





## APPLICATION of a CIRCUMFERENTIAL BINDER

**Step 1:** Ensure the patient is lying supine.

**Step 2:** If feasible, get the 2 legs together with wool/crepe at the levels of the knees and internal rotation of the feet.

**Step 3:** Prepare the Pelvic binder for application centred at the level of the greater trochanters.

**Step 4:** Log roll the patient. Insert the Pelvic binder by pushing the rolled straps through as far as possible.

**Step 5:** Log roll the patient back onto their back and ensure that the flat square portion is under the patients buttocks.

**Step 6:** Tighten the binder following the manufacturer's instructions.

**Step 7:** After each pelvic binder application, re-tensioning or replacement it is important that neurovascular observations are performed and their findings recorded.

## COMPLICATIONS

- Potential complications include skin necrosis if left in place too long or applied too tightly.
- In lateral compression injuries with transforaminal sacral fractures, possible visceral or neural injury may occur if applied too vigorously.
- In vertically unstable pelvic fractures, a supracondylar skeletal traction pin should be introduced; note also that to bring the affected hemipelvis level before applying a pelvic binder, some 25–30 pounds (about 11–14 kg) of longitudinal traction is required.



## REMOVAL and TIMING OF REMOVAL of the PELVIC BINDER

- The circumferential binder should be removed as soon as possible, but not before the fracture has been fully characterized and/or the patient is able to tolerate operative fixation.
- The circumferential binder should be optimally released every 12hrs to check for skin integrity and provide wound care, as necessary.
- 48 hrs are considered an acceptable period of time to maintain a patient under the continuous compression effect of a pelvic binder / crossed pelvic sheet, before the risk for development of skin necrosis / pressure sores.
- If the **initial diagnostic imaging has been negative** for a displaced pelvic injury, AND **if there remains any clinical suspicion of a pelvic fracture** please **REPEAT/ACQUIRE a plain AP pelvic x-ray post removal of the circumferential binder.**

(An AP compression – open book – injury can be perfectly reduced by the binder so that the initial plain x-ray or even the initial trauma CT scan can be completely normal. A check x-ray after removal of the binder will identify this problem).

- If there is haemodynamic instability, post removal of the circumferential binder replace the binder and request for CT scan with iv contrast.



## REFERENCES

- Routt ML Jr, Falicov A, Woodhouse E, Schildhauer TA. Circumferential pelvic antishock sheeting: a temporary resuscitation aid. *J Orthop Trauma* 2002;16(1):45-8
- Bottlang M, Krieg JC. Introducing the pelvic sling: pelvic fracture stabilization made simple. *JEMS: J Emerg Med Serv.* 2003; 28(9): 84-86.
- Bottlang M, Krieg JC. Simple Solutions for Life-Threatening Injuries: stabilizing pelvic fracture at the scene with a pelvic sling. *Emerg F/R Police Product R/W.* 2003: 17-24.
- Mohanty K, Musso D, Powell J, Kortbeek J, Kirkpatrick A. Emergent management of pelvic ring injuries: an update. *Can J Surg.* 2005; 48(1): 49-56.
- Krieg JC, Mohr M, Ellis TJ, Simpson TS, Madey SM, Bottlang M. Emergent stabilization of pelvic ring injuries by controlled circumferential compression: a clinical trial. *J Trauma.* 2005 Sep;59(3):659-64.
- Papadopoulos IN, Kanakaris N, Bonovas S, et al. Auditing 655 fatalities with pelvic fractures by autopsy as a basis to evaluate trauma care. *J Amer Coll Surg.* 2006;203:30-43.
- Jowett AJ, Bowyer GW. Pressure characteristics of pelvic binders. *Injury.* 2007;38:118–121.
- Papakostidis C, Kanakaris NK, Kontakis G, et al. Pelvic ring disruptions: treatment modalities and analysis of outcomes. *Int Orthop.* 2009;33:329-338.
- Jain S, Bleibleh S, Marciniak J, et al. A national survey of United Kingdom trauma units on the use of pelvic binders. *Int Orthop.* 2013;37:1335-1339