

Trauma Service Guidelines

Title: Pelvic Binder Guideline
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Background Pelvic Trauma

Pelvic fractures result from high velocity mechanisms. They cause life threatening blood loss, are amongst the most devastating musculoskeletal injuries and are associated with a high incidence of mortality 19%¹.

Survival rates have increased over recent years and patients usually die as a result of concomitant injuries rather than isolated pelvic fractures^{2,3}.

Pelvis Anatomy

Pelvic fractures, especially with ring disruption allow an increased volume of blood to accumulate in the pelvic cavity before tamponading². Bleeding in pelvic ring fractures is usually venous from the pelvic veins and from the pre sacral venous plexus in 80% of cases or the marrow of the broken pelvic bones. Arterial bleeding is a direct result of damage to the vessel close to a bony injury. Injured vessels are typically branches of the internal iliac artery^{1,2,4}.

Other organs that can be affected in pelvic ring injuries include the genitourinary and gastrointestinal systems, vagina and prostate and also the lumbar and sacral plexuses which run posteriorly^{1,2,4}.

Mechanism of Injury and Classification of Pelvic Ring Injuries

The most common causes of pelvic fractures, listed in order of frequency are MVA, pedestrian hit by motor vehicle, motor bike accidents, falls, crush injuries and sport or recreational accidents^{4,5}.

The pelvis is relatively immobile due to the SI joints, hence displacement of the pelvic ring requires a break in two places to become unstable.

Young and Burgess describe three forces involved in pelvic ring⁶

◆ **LC (Lateral Compression)**

This is the most common force and usually occurs in association with abdominal thoracic and cervical spine injuries. LC results from side impact and causes inward rotation of the hemi pelvis and rotational instability i.e. pedestrian struck by motor vehicle, motor vehicle accidents with side impact. If the force is not strong enough to open the pelvis, there can be organ damage from the bony fragment. Caution with binder use in LC fractures, use should be confirmed with orthopaedic team.

◆ **APC (Anterior Posterior Compression)**

This compression force is directed either anterior posterior or posterior anterior such as motor vehicle or motorbike accidents. Injuries are mostly ligamentous with possible pubic rami fractures i.e. open book pelvis. AP injuries associated with severe arterial damage, involving the internal iliac artery and adjacent veins. Lumbosacral plexus injuries also occur. These injuries have the potential to lead to haemodynamic instability VS (Vertical Shear)

VS injuries transmit energy through the femurs and produce varying injury patterns i.e. someone jumping from a great height and landing on an extended lower limb causing ipsilateral disruption of all ligaments restraining the hemi pelvis. This mechanism does not usually involve major arterial injuries.

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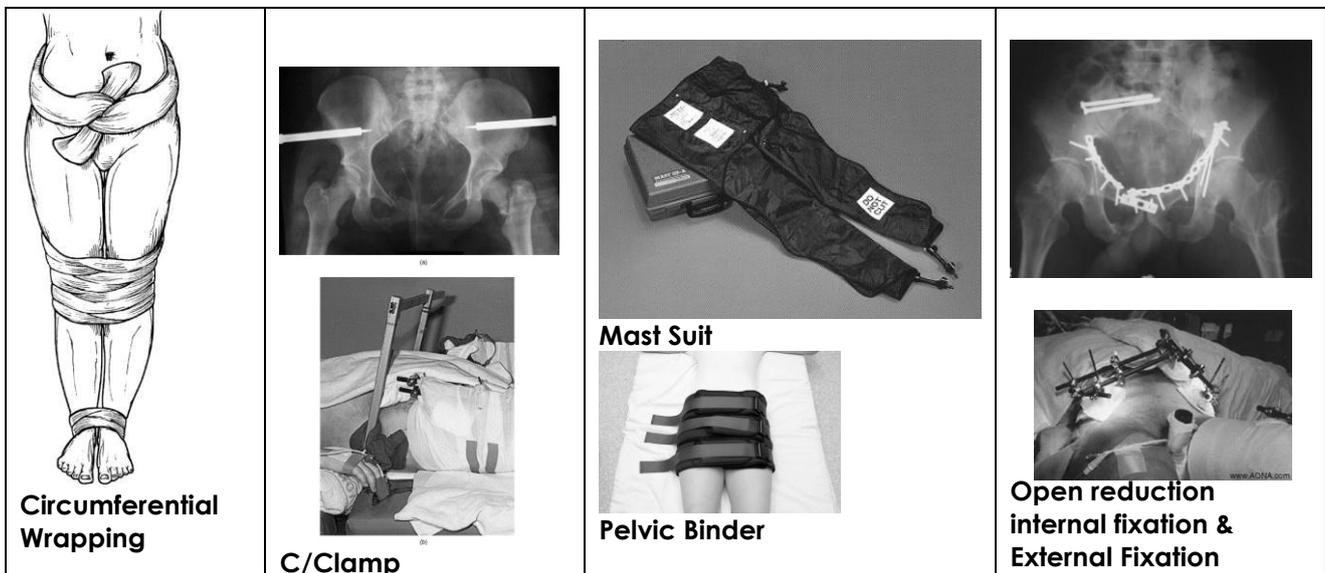
Treatment

Key points in treating pelvic fractures are ^{2-5, 7, 8}

- reduction in intraperitoneal volume
- reduction in bleeding
- splinting of fractures
- pain reduction
- definitive pelvic stabilisation and resuscitation.

Early reduction and stabilisation of pelvic fractures can be lifesaving; application of external compression devices such as the pelvic binder is quick, safe, and easy. It can assist in stabilising the disrupted pelvic ring, reducing the volume and assisting with tamponade and clot formation, decrease mobility and can have an effect on bleeding and pain ^{2, 3}.

- Circumferential compression via wrapping or a commercially available external compression device such as Sam Sling, RMH Pelvic Binder
- External Fixation or C/clamp
- Open reduction internal fixation (ORIF) – invasive, requires theatre, and delays angiography.



Stabilisation of the Pelvis (please refer to the guideline for the management of haemodynamically unstable patient with a pelvic fracture) ^{1-5, 7-9}.

1. Rotationally unstable fractures benefit most from pelvic stabilisation. Vertical instability requires accompanying ipsilateral skeletal traction
2. The optimal external pelvic stabilisation device is non-invasive. Placement should allow both laparotomy access and bilateral femoral artery access.
3. Invasive anterior external fixation devices should be applied when venous bleeding is ongoing or if more time is needed until definitive internal fixation.

Caution should be taken as any motion between the torso and lower limbs can cause a shifting of the pelvic ring fracture and jeopardise the coagulation and blood clot formation ¹⁰.

Pelvic Circumferential Compressive Devices

Pelvic Circumferential Compression Devices (PCCD's) are most commonly used in pelvic fractures where there has been separation of the pelvic ring, particularly the symphysis pubis. PCCD's can be used for cases where operative intervention is unsuitable or patient's haemodynamic status is labile. The PCCD's are easy to apply, provide controlled pressure delivery and do not hinder ongoing resuscitation efforts ^{2,3,11-13}.

The most effective application site is the greater trochanters and symphysis pubis regions (see figure). The sling should be tightened to 180 Newton which is equivalent to lifting an eighteen kilo weight ^{3,13,14}.

PCCD's are not without complications which include pressure sores and skin abrasions ^{2,3}.

Complication risk factors include ^{2,3}

- immobilisation on a spine board
- moistness between the sling and skin
- hypotension
- BMI/ waist size
- age and gender.

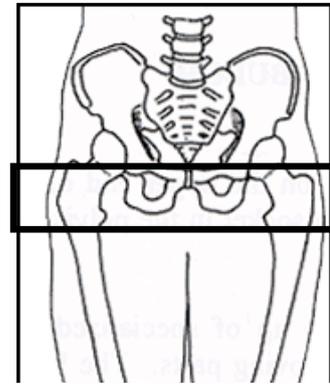


Figure Greater trochanters and symphysis pubic region

It's recommended that patients are removed early from spine boards, intermitted skin checks when stable, and early removal of sling when definition management decisions made.

The Royal Melbourne Hospital Pelvic Binder Guideline

Best practice guidelines and The Royal Melbourne Hospital [Haemodynamically Unstable Pelvic Fracture Guideline](#) dictates that the following patients are fitted with a Pelvic Binder ^{5,15}

- suspected pelvic fracture
- fall from a height
- haemodynamic instability.

The Royal Melbourne Hospital Pelvic Binder Application



Figure 11 Three-Strap Pelvic Binder Closed



Figure 12 Three Strap Pelvic Binder Opened

Figure 15: Straps rolled up ready for application

Correct application of the pelvic binder should ensure that the flat square portion is under the patient's buttocks (see figure 14), and that the middle strap is overlapping the patients greater trochanteric and symphysis pubis region (see figure 15).



Figure 13: Velcro straps removed



Figure 14: Square flat portion placed under patients buttocks

Application by log rolling:

Step 1: Ensure the patient is lying supine

Step 2: Prepare the Pelvic Binder for application: undo the clips and remove the velcro straps to enable the long straps to be rolled small enough to pass under the patient (see figure 13 & 15).



Figure 15: Patient on their backs and Pelvic Binder straps rolled ready for application



Figure 16: Straps rolled up ready for application

Step 3: Line the Pelvic Binder up so that the middle strap will pass under the patient's great trochanteric and pubic region (see figures 10 & 15)

Step 4: Log roll the patient as part of secondary survey. Insert the Pelvic Binder by pushing the rolled straps through as far as possible (see figure 16)

Step 5: Log roll the patient back and ensure that the flat square portion is under the patients buttocks (see figure 14) pull the straps through (see figure 17 & 18)

In the emergency department if a patient is expected who will require a Pelvic Binder, it can be put on the trolley ready for application rather than applying it via a log roll.



Figure 17& 18: Straps being pulled through

Step 6: Reattach the velcro tabs and apply the straps: **the most important strap is the middle strap or the one positioned between the symphysis pubis and the greater trochanteric region**, the other straps are fastened above and below this area *for example:*

Strap 1: positioned between the anterior superior iliac spine and iliac crests (placed above strap 2)

Strap 2: positioned over the symphysis pubis and the greater trochanteric region

Strap 3: positioned strap at the level of the symphysis pubis and ischial tuberosity (placed below strap 2)

In a time critical situation if the middle strap does not align with the greater trochanteric pubic region fasten the straps closest to this region; the Pelvic Binder can be readjusted at a later stage.



Figure 19: Fasten the straps beginning with the middle strap if Pelvic Binder is placed as directed



Figure 20: 3 straps fastened

Figure 21: Strap 1 left unfastened as it is above the iliac crests

At no time should any strap above the iliac crests be applied. If the Pelvic Binder is fitted with a strap in this position it should be left undone (see figure 21.) to prevent increasing abdominal pressure. Fastening this strap will have no effect on pelvic stabilisation.

Ensure that the velcro section is attached and the Pelvic Binder is tightened to approximately 180 newtons which is equivalent to lifting an 18 kilogram weight with manual tension ¹⁰.

If a procedure needs to be attended i.e. femoral vascular access, FAST scan or a catheterisation, the appropriate strap can be loosened and refastened on completion of the procedure.

Application By Sliding the Pelvic Binder Under the Patient's Buttocks

The Pelvic Binder can be applied in emergency situations (i.e. prehospital, patient who cannot log roll), by sliding it under the patient's legs and then buttocks. In this case there will be no need to remove the buckles; the Pelvic Binder can be opened by pulling apart the Velcro.

Nursing Care of a Patient in a Pelvic Binder

The Pelvic Binder is used in the haemodynamically unstable trauma patient with a pelvic fracture. These injuries are treated with PCCD's (Pelvic Binder), angiography +/- external or internal fixation. In the acute phase of care the Pelvic Binder should not be released or re-tensioned until the patient is stabilised evidenced by:

- normothermia
- correction of acidosis
- normal coagulation
- no evidence of ongoing haemorrhage
- adequate resuscitation

Pressure Area Care

Nursing care of the patient with a Pelvic binder requires close monitoring of the patients, haemodynamic status as well as skin integrity.

Rotation of Straps

Rotating the straps may assist in prevention of potential skin break down. Straps can be released 1-2 hourly in ICU and up to 4 hourly on the wards, on a rotational basis (as long as the sling is placed correctly). Only two straps are required to be tensioned at a time to maintain pelvic stability.

For example one strap of the three can be released at any one time. When undoing the straps ensure that the skin is checked for any early signs of skin breakdown (See figure 22 & 23). If the patient demonstrates any signs of haemodynamic compromise when undoing straps they should be refastened ASAP and the patient reassessed.

Replacement of the Pelvic Binder

Replacement of the Pelvic Binder should only be considered in the haemodynamically stable patient as outlined above, or when markedly soiled, wet or offensive (i.e. blood soaked).

If it is anticipated that the Pelvic Binder is going to become soiled (ie ongoing bleeding or incontinence), insert a bluesheet inside the Pelvic Binder to provide some protection. Before removal ensure that there is clear documentation regarding pelvic stability and position restrictions. Pelvic Binder replacement is similar to Pelvic binder application (See figure 24).

Using the Bedpan

If a patient needs to use the bedpan, they can be log rolled and a slipper pan used (See figure 25). For this procedure the bottom strap should be loosened. Ensure that a blue sheet is placed under the bedpan to prevent soiling of the linen and the Pelvic Binder.

Monitoring

Patients should be monitored throughout all of the above procedures. If at any time there are signs of haemodynamic compromise the patient should be immediately returned to the supine position and the Pelvic Binder re-tensioned.

Neurovascular Observations

Neurovascular observations should be attended after Pelvic Binder application, re-tensioning or replacement.

Cleaning and Maintenance of Pelvic Binders

Once Pelvic Binder use is complete they should be placed in the red linen skips for processing by Princess Linen. Once washed and returned, prior to returning to stock it should be checked for quality. Slings that do not pass inspection or are damaged in any way are disposed of.



Figure 22: PAC Strap Rotation



Figure 23: PAC Strap Rotation

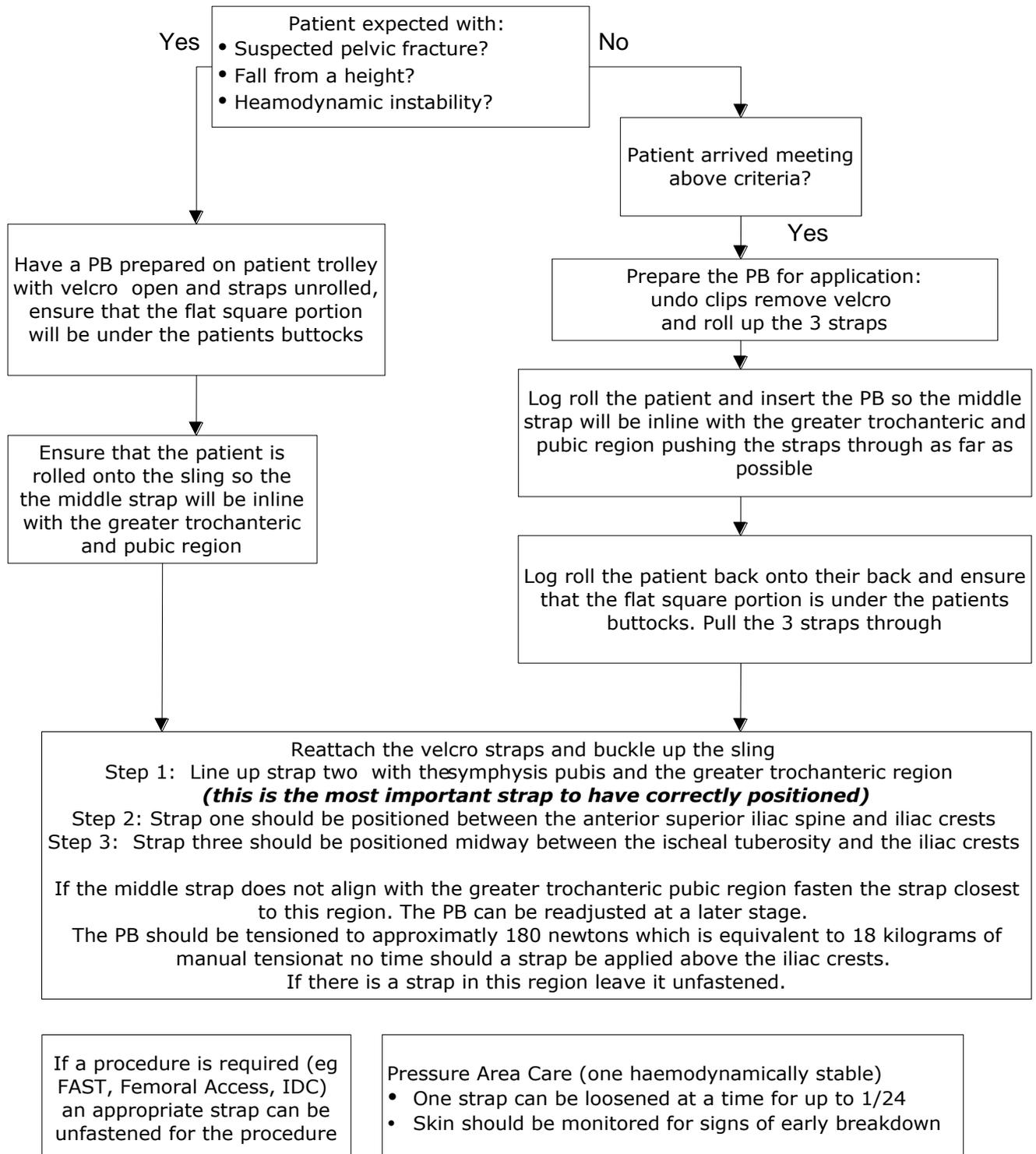


Figure 24: Replacing the binder



Figure 25: Using bedpan

Pelvic Binder (PB) Flow Diagram



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