

## Summary of recommendations

Recommendations are newly drafted by the Complex Orthopedic SAG, unless indicated otherwise.

### I. RESUSCITATION AND STABILIZATION

- A. When there is suspected active bleeding from a pelvic ring injury, apply a pelvic binder in the correct position. This should be applied pre-hospital. [Adopted from BOA]
- B. Patients with suspected pelvic ring injuries with signs of hemodynamic instability should be transported directly to a regional centre with orthopedic expertise in the surgical management of complex pelvic ring injuries. If the patient is received into a hospital with general orthopedic capabilities, then resuscitation should be commenced followed by immediate transfer to a centre with orthopedic expertise in the surgical management of complex pelvic ring injuries for definitive treatment of active bleeding when advisable and feasible. [Adopted from BOA with modification]
- C. All patients require IV Tranexamic Acid as soon as possible and ideally within an hour of injury. In the presence of hemodynamic instability, patients should be urgently resuscitated using blood products according to Massive Transfusion Protocols. [Adopted from BOA]
- D. Patients with suspected pelvic ring injuries from high-energy trauma should have a CT scan with IV contrast of the pelvis on admission. Given the energy required to cause pelvic ring injury, other injuries should be expected, and investigations should also include CT of the head and C-spine without contrast and CT of the chest and abdomen with contrast. [Adopted from BOA with modification]
- E. All patients with blunt polytrauma undergoing damage control laparotomy should have imaging of the pelvis before surgery (X-ray or CT). All patients should have a pelvic binder in-situ during surgery, and this should not be removed for a post binder pelvic X-ray until the patient is hemodynamically stable. [Adopted from BOA]
- F. Active bleeding from the pelvis in patients who do not respond to resuscitation can be managed by surgical packing of the pelvis or interventional radiology with selective embolization of active arterial bleeding vessels. Any hospital receiving trauma patients must have, based on its resources and facilities, clear protocols in place for managing patients with pelvic ring injury and hemodynamic instability. [Adopted from BOA with modification]
- G. In a patient in extremis, where resuscitation is failing, Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) can be a first measure to temporarily control hemorrhage in conjunction with pelvic packing as a bridge to definitive care. REBOA should only be attempted in institutions with protocols and expertise in place and in the context of local discussions and surgeon discretion. This novel technology requires further assessment regarding efficacy and safety in the setting of pelvic ring injury with hemodynamic instability.
- H. In patients with a pelvic ring injury presenting with hypovolemic shock to centers with REBOA capabilities, early femoral arterial access with an 18 gauge or larger should be achieved to allow for a “step up” approach, allowing rapid introduction of REBOA. Most commonly, this can be achieved with a femoral arterial line.

**II. TEMPORARY PELVIC RING INJURY IMMOBILIZATION**

- A.** To immobilize the mechanically unstable fractured pelvis, apply a pelvic binder in the correct position as initial means of immobilization. This should be applied pre-hospital. If the patient becomes clinically stable, proceed to early definitive surgery. [Adopted from BOA with modification]
- B.** If early definitive surgery cannot be performed, conduct external fixation in the early provisional care:
  - a.** if the patient is brought to the operating room (OR) for pelvic packing, or
  - b.** if the patient is brought to the OR for another procedure and time and patient condition allow. A binder could also be kept in place.[Adapted from BOA with modification]
- C.** In displaced vertical shear fractures, traction should be considered along with a binder when early definitive surgery cannot be performed. [Adopted from BOA with modification]
- D.** Pelvic binders should be positioned cautiously in pregnant and elderly patients. [Adopted from WSES]
- E.** Reassess regularly (i.e. twice daily and as needed if patient is moved) to ensure binder position is appropriate and reapply binder if pressure skin sores develop or binder had not been applied properly.
- F.** Each trauma centre must have a clear protocol for binder removal. Ideally, it should be removed within 24 hours of injury. [Adopted from BOA with modification]
- G.** In a patient with pelvic binder, an early transfer from the spine board whenever possible significantly reduces skin pressure lesion. [Adopted from WSES]
- H.** All polytraumatized patients require a post-binder X-ray after resuscitation, even in the presence of a negative CT scan because a well-applied pelvic binder can mask a catastrophic pelvic ring injury. [Adopted from BOA]
- I.** With the ready access to commercially available binders and sheeting techniques, there is little need for C-clamps and similar devices.
- J.** In patients requiring ongoing resuscitative efforts with a posterior pelvic ring injury that is inadequately reduced resulting in enlarged internal pelvic volume, an antishock iliosacral screw can be considered as a resuscitation adjunct to aid in temporizing reduction and stabilization of the pelvic ring.

**III. HEMORRHAGE CONTROL – ANGIOEMBOLIZATION**

- A.** After pelvic stabilization, initiation of Massive Transfusion Protocol, exclusion of non-pelvic sources of blood loss, and pelvic packing, patients with pelvic ring injuries and ongoing hemodynamic instability or signs of ongoing bleeding should be considered for pelvic angiography/embolization. [Adopted from EAST and WSES with modification]
- B.** Patients with “blush” on CT and hemodynamic stability should be monitored closely and considered for angioembolization depending on their condition. [Adopted from WSES with modification]
- C.** If resources, protocols and skill set are in place, REBOA and/or pelvic packing should precede angiography/embolization in the hemodynamically unstable patient.
- D.** Trauma centres with interventional radiology (IR) need to have a clear protocol in place for angiography/embolization in patients with pelvic ring injury and hemodynamic instability. [Adopted from BOA with modification]
- E.** Trauma centres without IR should have a clear local protocol in place for managing hemodynamically unstable pelvic ring injuries, which may involve pelvic packing on site (if skillset is available) and/or transfer for angiography/embolization.
- F.** Irrespective of type of resources available, every trauma centre must have a protocol in place for managing hemodynamically unstable patients with pelvic ring injuries. [Adopted from BOA with modification]
- G.** If angiography is performed, selective angioembolization is preferred in acute management of blunt pelvic ring injury to minimize the risk of soft tissue/organ necrosis following mass embolization.
- H.** Non-selective angioembolization is not desired in acute management of blunt pelvic ring injury. If selective angioembolization is not possible, preferred options include pre-peritoneal pelvic packing or REBOA in conjunction with packing (if protocols are in place and surgeon has experience in REBOA or packing).

#### IV. HEMORRHAGE CONTROL – PELVIC PACKING

- A. Active bleeding from the pelvis in patients who do not respond to resuscitation can be managed by surgical packing of the pelvis or interventional radiology with selective embolization of active arterial bleeding vessels. Trauma centres with orthopedic surgery (general or expertise in the surgical management of complex pelvic ring injuries) must have a clear protocol in place for managing hemodynamically unstable patients with pelvic ring injuries. [Adopted from BOA with modification]
- B. If resources, protocols and skill set are in place, REBOA and/or pelvic packing should precede angiography/embolization in patients with hemodynamic instability.
- C. Trauma centres without interventional radiology (IR) should have a clear local protocol in place for transfer for angiography/embolization in patients with pelvic ring injuries and hemodynamic instability. In such centres, pelvic packing (if skillset is unavailable on site) should be considered.
- D. Pelvic packing should be performed in conjunction with pelvic stabilization (binder or external pelvic fixation) to maximize the effectiveness of bleeding control. [Adopted from WSES]
- E. Indications for pre-peritoneal pelvic packing include:
  - Pelvic ring injury-related hemodynamic instability (after pelvic stabilization), or
  - Pelvic ring injury-related hemodynamic instability with persistent bleeding after angiography. [Adapted from WSES]
- F. Hospitals with expertise should develop local protocols for pelvic packing in unstable pelvic ring injuries.
- G. If indications are appropriate and local team has updated skillset and is willing, rural/remote/community hospitals should perform pre-peritoneal pelvic packing.

#### V. OPEN PELVIC RING INJURIES AND ASSOCIATED GASTROINTESTINAL OR GENITOURINARY INJURIES

- A. Patients with pelvic ring injury require physical examination to rule out open pelvic ring injury and urological injury. This includes vaginal speculum exam and rectal exam. Temporarily remove the binder if needed to conduct examinations. [Adapted from WSES]
- B. In the setting of gastrointestinal/genitourinary (GI/GU) injury, general surgery and/or urology consultation is recommended. [Adapted from BOA] See **GI/GU injuries** below.
- C. If general surgery/urology procedure is considered, the position of the stoma/incision/drains should be determined, whenever possible, in conjunction with the orthopedic surgical team. It should usually be sited in the upper abdomen, to ensure that it is sufficiently remote from the site of potential definitive pelvic surgical fixation. [Adopted from BOA with modification]

**BLADDER INJURIES**

- A. Patients with pelvic ring injury and hematuria should receive CT cystogram for potential bladder injury. [Adopted from EAST 2019 with modification]
- B. In patients sustaining pelvic ring injury with intraperitoneal bladder rupture, we recommend operative management over non-operative management to decrease complications from the bladder injury. [Adopted from EAST 2019]
- C. Patients with pelvic ring injury and simple extraperitoneal bladder injury can be managed non-operatively, with conservative management and drainage, if no fracture repair is planned. See recommendation below. [Adopted from EAST 2019 with modification]
- D. Patients with pelvic ring injury and a urine leak from either the bladder or urethra should receive operative repair of the bladder/urethra and simultaneous pelvic fixation. The pelvic fracture should be treated like an open long-bone fracture with appropriate antibiotics for 72 hours and early fracture fixation if the patient's physiology allows. [Adopted from EAST 2019 and BOA 2016]
- E. Patients with a pelvic ring injury who have undergone surgical repair of a bladder injury should receive urethral catheter drainage without suprapubic (SP) cystostomy unless SP drainage is specifically indicated. [Adopted from AUA guidelines 2020 amendment]
- F. All patients with a positive cystogram or at risk of bladder rupture should receive follow-up cystography. [Adopted from EAST 2019 with modification]

**URETHRAL INJURIES**

- A. Clinicians should perform retrograde urethrography in patients with blood at the urethral meatus after pelvic trauma. [Adopted from AUA]
- B. A single, gentle attempt at catheterization, by an experienced doctor, is permissible, even if the clinical or CT findings suggest urethral injury. A 16F soft, silicone catheter should be used. The procedure and the presence of clear or blood stained urine must be recorded in the medical records. [Adopted from BOA 2016]
- C. If the catheter will not pass or passes and drains only blood, do **not** inflate balloon. Withdraw catheter and perform a retrograde urethrogram. [Adopted from BOA 2016]
- D. Clinicians may perform primary realignment in hemodynamically stable patients with pelvic fracture associated urethral injury. Clinicians should not perform prolonged attempts at endoscopic realignment in patients with pelvic fracture associated urethral injury. [Adopted from AUA]
- E. In hemodynamically unstable patients:
  - Clinicians should establish prompt urinary drainage in patients with pelvic fracture associated urethral injury. [Adopted from AUA]
  - Surgeons may place suprapubic tubes (SPTs) in patients undergoing open reduction internal fixation (ORIF) for pelvic fracture. [Adopted from AUA]
  - The placement of a suprapubic catheter may alter the timing of pelvic fracture surgery and so the pelvic fracture service should be involved at an early stage. [Adopted from BOA 2016]

## VI. DIAGNOSTIC IMAGING

- A. Patients with proven or suspected major pelvic fractures should be diagnostically imaged via an initial plain X-ray in the trauma bay. They should then undergo an intravenous contrast enhanced CT scan of the abdomen and pelvis when stable. X-ray views which reflect intraoperative imaging (inlet/outlet and judet views) may be done at the discretion of the surgeon when the patient is stable and surgery is planned.
- B. Volume rendered 3D images of the bony pelvis based on CT acquisition data should be conducted at the original site where imaging is conducted prior to surgery, as these images provide additional information for surgical planning.
- C. All polytraumatised patients require a post-binder removal X-ray after resuscitation, even in the presence of a negative CT scan because a well-applied pelvic binder can mask a catastrophic pelvic ring injury. [Adopted from BOA]
- D. In the setting of gastrointestinal/genitourinary (GI/GU), general surgery and/or urology consultation is recommended. Refer to [B.C. Imaging Guidelines for Major Trauma Trauma](#) for recommendations regarding imaging of bladder/urethral injury.

## VII. TRANSFER TO HIGHER LEVEL OF CARE

- A. A hemodynamically unstable patient with major pelvic trauma should be transported to a centre with orthopedic expertise in the surgical management of complex pelvic ring injuries as early as possible. Trauma/general surgery at the referral centre should be the primary point of contact. Local orthopedic surgeon and referral centre orthopedic surgeon should be involved in the Patient Transfer Network (PTN) call where time permits. [Adopted from BOA with modification]
- B. A stable patient major pelvic trauma should be transferred to a centre with orthopedic expertise in the surgical management of complex pelvic ring injuries within 24 hours with the goal to operate within 72 hours. Local orthopedic surgeon is the primary point of contact, with involvement of the referral centre orthopedic surgeon. [Adopted from BOA with modification]
- C. When transferring patient to higher level of care, call PTN and involve general surgery, orthopedic surgery and any other specialties as required. Avoid direct calls to surgeons.
- D. Patients who are too unstable to tolerate transfer should be resuscitated by the Emergency Physician and General Surgeon on site and assessed by the local orthopedic surgeon as soon as possible.
- E. Patients with fractures which are minimally displaced and not requiring fixation, and non-operative cases can be managed in a centre with general orthopedic surgery but without orthopedic expertise in the surgical management of complex pelvic ring injuries. Such cases should be assessed by the local orthopedic surgeon in discussion with referral centre.
- F. All hemodynamically stable patients with mechanically unstable pelvic ring injuries must be transferred to a centre with orthopedic expertise in the surgical management of complex pelvic ring injuries, with the exception of patients who cannot tolerate transfer.
- G. A local orthopedic surgeon on-call at the site of initial presentation, who is certified in Orthopedic Surgery by the Royal College of Physicians and Surgeons of Canada, should assess the hemodynamically stable patient in person, inform PTN, and consult an orthopedic surgeon with expertise in the surgical management of complex pelvic ring injuries.

**VIII. HOSPITAL CARE**

- A.** Specialised units must have written local policies for thromboprophylaxis for patients with pelvic ring injuries, which should be followed and documented in the medical records. [Adopted from BOA]
- B.** Orthopedic surgeon must clarify weight-bearing orders, including timeline, and the need for follow-up imaging and timeline, as well as indicating any rehabilitation or transfer restrictions.

**IX. DEFINITIVE SURGICAL CARE**

- A.** Definitive fixation should be done within 72 hours of stabilization of the patient's physiological state. [Adopted from BOA with modification]
- B.** Any bladder rupture with associated contaminated pelvic ring injury and/or trauma to the urethra should involve urology.
- C.** In the setting of gastrointestinal/genitourinary (GI/GU) injury, general surgery and/or urology consultation is recommended.

**X. TRANSFER TO LOWER LEVEL OF CARE (REPATRIATION)**

- A.** Agreement for repatriation should clearly state weight-bearing orders (including timeline), the need and timing for follow-up imaging, as well as indicating any rehabilitation or transfer restrictions. The follow-up plan, including documentations must be provided by the higher level of care site. See Recommendation B for KMQ-21.
- B.** Medically stable patients not requiring complex orthopedic care for their pelvic ring injury should be transferred back to sending facility or a facility close to patients' residence.

**XI. REHABILITATION**

- A.** Patients with major extremity and/or pelvic ring injuries should have access to rehabilitation services to the same extent as patients with other conditions, such as stroke or spinal cord injury. This would include appropriate rehabilitation facilities where needed, including intense, focused rehabilitation therapy.
- B.** Mobilization should include a clarification of weight-bearing and the need for follow-up imaging. See Recommendation B for KMQ-21.
- C.** All patients with major pelvic injuries should receive in-patient rehabilitation.

**XII. FOLLOW-UP**

- A.** Patient follow-up should occur in a specialist pelvic trauma unit or rehabilitation clinic, to ensure full advice is available for the pain, physical, psychological, and urological disabilities, which are common adverse outcomes. Follow-up can be done in-person, remotely or via the family physician. [Adopted from the BOA with modification]
- B.** All patients who may be sexually active should receive written advice on sexual dysfunction in consultation with urology. [Adopted from BOA with modification]