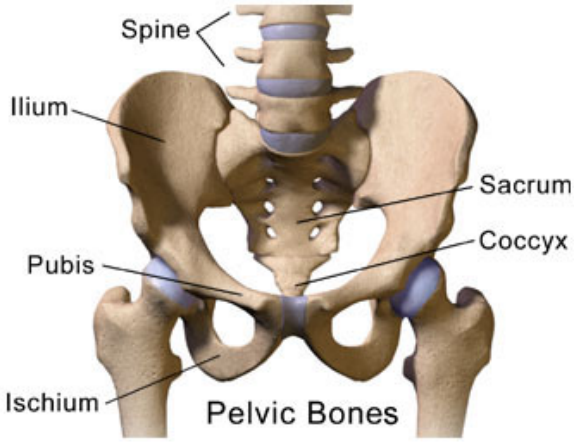
McHenry Western Lake County EMS System
Paramedic, EMT-B and PHRN
Optional Continuing Education
Pelvic Fractures
2019 #6

Patients with unstable pelvic fractures from high-energy mechanisms like pedestrian versus motor vehicle or a fall from a great height are at high risk of fatality from major blood loss. Understanding the anatomy of the pelvis and surrounding structures and the types of pelvic fractures that can occur can help EMS providers recognize and provide in-field stabilization of a pelvic fracture. There are several methods to stabilize a fractured pelvis, but all share the goal of stabilization and reduction.1

Anatomy and Function

The function of the pelvis is to bear weight. The weight of the upper body is borne by the pelvis and distributed to the legs when a person is standing or to the ischium when a person is sitting. The pelvis also protects major blood vessels and organs in the lower abdominal cavity, including parts of the digestive, urinary and reproductive systems. The pelvis is the attachment point for numerous muscles that connect the legs to the body. The actions of walking, running, standing and many other functions involve movement of an intact and stable pelvis.



The pelvis is a ring of paired bones that is the attachment point between the upper and lower skeleton. The pelvic ring is formed by pairs of fused bones. The pelvis includes the sacral section of the spinal cord in the posterior. Attached to each side of the sacrum is an ilium, the top of which is known as the iliac crest. On the anterior portion of the pelvis are the pubis and the ischium. The two pubis bones are connected by the symphysis pubis.

Many organs and blood vessels pass through or near the bones of the pelvis, including the bladder, urethra, end of the large intestine and internal reproductive organs. Large blood vessels located in the pelvic ring can be the source of severe bleeding, and large amounts of blood from uncontrolled hemorrhage can accumulate in the free space around the pelvis. The right and left iliac arteries descending from the aorta are located in the pelvis. Blood returns from the lower extremities via the right and left iliac veins. Major blood vessels also supply the tissue, bones and

organs in the pelvic ring. Blood loss can also originate from bony fracture surfaces and surrounding soft tissue injuries. Uncontrolled bleeding is the leading cause of death for patients with a complex pelvic fracture.

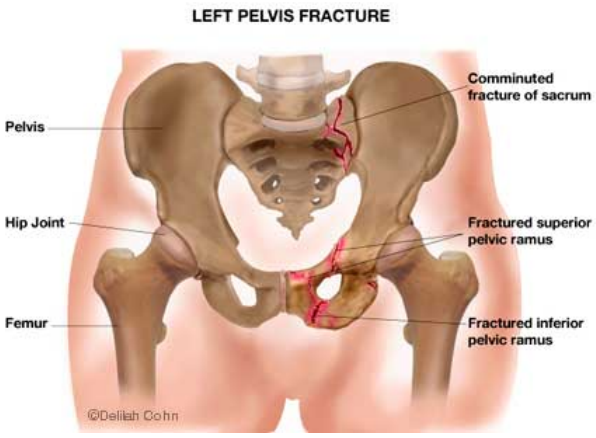
Mechanisms of Injury

Primary mechanisms of injury for pelvic fracture often involve large amounts of energy and/or mass. A motor-vehicle collision, motorcycle crash or even a downhill skiing accident are examples of high-force and high-speed collisions. Pelvic fractures are reported to be the third leading cause of mortality from motor-vehicle collisions. Falls from height, such as a construction worker falling from a roof or a rock climber falling from a cliff, may result in pelvic fracture. Crushing injuries can also apply sufficient force to the body to cause a pelvic fracture.

Pelvic ring fractures can be caused by different types of forces, such as lateral or anteroposterior compression and vertical shear forcing. Vertical shearing is likely from a fall; lateral compression is the most common type of force that can cause a pelvic fracture, since force is applied to the body from the side, as in a side-impact motor-vehicle accident. With anteroposterior compression, force is applied from front to back, which is typical in a head-on motor-vehicle collision.

An iliac crest fracture, which is a fracture to the upper wing of the ilium, may present with localized pain, tenderness and bruising, but it is a relatively stable injury that is less likely to threaten adjacent organs or blood vessels. While this might be painful and show instability during a physical exam, the pelvic ring is intact. This type of pelvic fracture is isolated and stable, and the life threat is low.

A pelvic ring fracture, which can occur in any of the locations where the separate bones fuse together, is a very serious injury that could involve significant blood loss and internal organ damage. For example, a separation could occur between the ilium and sacrum, or between the two pubis bones, or multiple separations could occur. The pelvic ring is more likely to separate in two or more places than in just one.



Any fracture of the pelvic ring is much more complex because of the amount of free space for internal bleeding and the damage that separated bone ends can cause to blood vessels and organs. A pelvic ring fracture is sometimes called an open book fracture, due to the now open appearance of the previously closed and stable pelvic ring.

Associated injuries — Pelvis injuries from high energy trauma frequently cause concomitant internal injuries, which may include the following:

Hemorrhage – Life-threatening hemorrhage can occur. Venous bleeding is the source in 80 to 90 percent of cases. In one case series, 38.5 percent of hospitalized trauma patients with pelvic fractures required transfusion. In another series, 34 percent of trauma patients with isolated pelvis and acetabulum fractures required blood transfusions.

Although complex pelvic injuries with major ligament disruption more often require transfusion, hemorrhage can accompany any pelvic fracture pattern. Factors associated with hemorrhage requiring treatment with angiographic embolization include sacroiliac joint disruption, prolonged hypotension (defined as systolic blood pressure <100 mmHg), and female gender.

Intraabdominal injury – Such injury occurs in 16.5 percent of patients with pelvic trauma. Both visceral organs (eg, liver, spleen) and bowel may be involved.

Bladder and urethra – The bladder is injured in approximately 5.8 percent and the urethra in 6.6 percent of pelvic trauma cases.

Neurologic – Nerve deficits associated with pelvic ring disruptions occur in 10 to 15 percent of pelvic trauma cases, with higher rates (up to 50 percent) in zone 3 sacral fractures.

Thoracic aorta rupture – Dissection of the thoracic aorta occurs in 1.4 percent of blunt trauma patients with a pelvic fracture, compared with 0.3 percent of all blunt trauma patients.

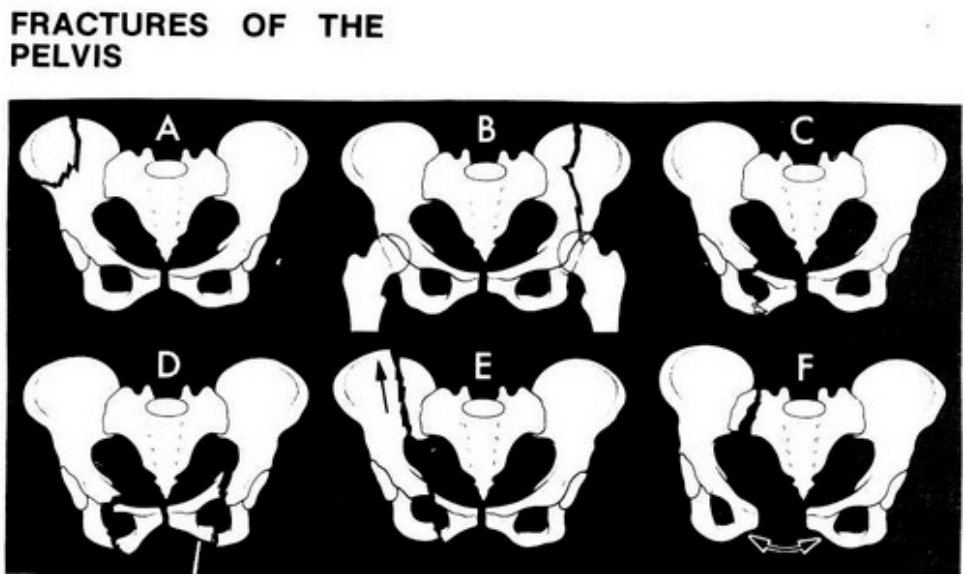
Field Assessment

Field assessment of a pelvic fracture begins during the scene size-up when EMS personnel consider the mechanism of injury and likelihood for pelvic injury. Assessment continues with determining the patient's chief complaint and completing a rapid trauma assessment. When the mechanism of injury was sufficient for a pelvic fracture, you need to consider other problems, like spinal cord injury, other musculoskeletal trauma and hypovolemia.

In addition to checking for ABCs and life threats, also ask the patient for his/her chief complaint. If you have an awake patient who complains of lower abdomen pain, lower back pain, hip or pelvic pain, lower extremity numbness and tingling, be suspicious of a pelvic fracture and investigate that complaint during the rapid trauma assessment.

During the rapid trauma assessment, look, listen and feel for pelvis stability by compressing the ring of bones, feeling for instability or deformity, looking for abrasions or bruising, comparing limb length, and listening to your patient for the sound of crepitus, which is the noise of bone ends scraping together. Aggressive palpation or manipulation is not necessary and could make the problem worse. If, during the exam, there is instability, crepitus, movement of the normally stable bones of the pelvis, or if the patient complains of pain when pressure is applied, suspect a pelvic fracture and consider applying one of the stabilizing treatments we will discuss later.

When conducting the physical examination, use the palms of your hands to apply gentle medial pressure by pressing inward on the iliac crest.



Fractures of the pelvis. Only the ilium of pelvis A is fractured; in B, the fracture extends into the acetabulum. The ischio-pubic rami are fractured on one side in pelvis C, and the pubic symphysis slightly displaced. Pelvis D, has a compression butterfly fracture' of both ischio-pubic rami. Pelvis E has a vertical fracture with upward displacement of its right half. Pelvis F has a hinge fracture. http://ps.cnis.ca/wiki/index.php/76._Pelvis

Next, assuming the patient is supine, apply gentle posterior or downward pressure with the palms of your hands to the iliac crests of the patient's pelvis. Finally, apply gentle downward pressure on the pubis to check for pelvic ring stability.

Any patient with exam findings of a pelvic fracture warrants a high-priority transport due to concern about severe internal bleeding and hypovolemia. BLS services should request ALS intercept. Local protocols may indicate aeromedical transport to a nearby trauma center if the patient has a suspected pelvic fracture. High-priority transport and additional resources are especially important if the patient has unstable vital signs.

In addition to physical exam findings, EMS personnel should be vigilant for other signs and symptoms of hypovolemia, including increasing pulse and respiratory rate as the body attempts to compensate for internal blood loss in the pelvic cavity. Diminishing mental status is another sign EMS may observe. If the patient is awake, he may become anxious, disoriented or confused, and his skin may become pale, cool and clammy. Impaired distal circulation, sensation and movement (CSM) in the extremities could be indicative of major vessel damage around the pelvis, although other injuries like spinal cord injury or femur fracture could be the cause of impaired CSM.

If the mechanism of injury is sufficient to fracture a pelvis, you must anticipate and begin treatment of many other potential problems until they can be ruled out. Other problems might include spinal cord injury that is hand-stabilized until the patient is immobilized on a long spinal immobilization board and numerous musculoskeletal injuries. A thorough head-to-toe examination should reveal other injuries. Also consider the high likelihood that internal organ damage and blood vessel rupture will lead to hypovolemic shock. High-flow O2 and IV fluids should be a part of the treatment plan for any patient with suspected pelvic fracture.

Stabilization of a suspected pelvic fracture is an important treatment that can be applied in the field. Continued movement of an unstable pelvic fracture can cause further injury, damage and blood loss. Early control of life-threatening bleeding is the primary goal of on-scene emergency treatment. In this section, we will discuss the reasons for EMTs to apply a pelvic stabilization device in the field and techniques for stabilizing a pelvic fracture.

Our treatment goal is to reduce and stabilize a fractured pelvis. It is theorized that a circumferential pelvic sheet wrap or mechanical device: applies compression so there is less potential space for blood to accumulate in the pelvic cavity; puts pressure against, or tamponades, bleeding sources, such as fractured bony surfaces or ruptured vessels; reduces instability of the injured pelvis that could cause further damage to tissue, organs, bony surfaces and blood vessels; and reduces the patient's pain by limiting movement of the pelvis.

Researchers note that pelvic stabilization with a pelvic sheet wrap or mechanical device is indicated for any patient with pelvic instability with unstable or stable vital signs. Stabilization can provide comfort and easier transport. If possible, apply pelvic compression before extrication. If there is a high- energy mechanism of injury, pre-place the sheet wrap on the backboard before transferring the patient to the backboard.

A variety of methods are available to stabilize an injured pelvis. One of the remaining accepted uses for MAST trousers or pneumatic antishock garments has been for pelvic fracture stabilization. Other methods that are becoming more popular include use of a standard hospital draw sheet to create a pelvic sheet wrap; the SAM Sling from The Seaberg Company; the Traumatic Pelvic Orthotic Device, or T-POD, from Cybertech; and the PelvicBinder device. All of these methods apply circumferential compression to "close the book." Anecdotal evidence and research underway point to the potential for all of the above devices to reduce and stabilize a pelvis fracture.

Advanced Trauma Life Support recommends circumferential application of a pelvic sheet wrap. A common hospital draw sheet can be applied quickly at the scene by EMS providers and may meet our goal of temporary stabilization and reduction of a pelvic ring fracture, and, in turn, may reduce severe bleeding. The pelvic sheet wrap can remain in place during transport and emergency department evaluation.

Following are the recommended steps for applying a pelvic sheet wrap. After completing the rapid trauma exam and identifying an unstable pelvis, fold the sheet smoothly (do not roll the sheet); place the sheet under the patient's pelvis so it is centered over the greater trochanters, where the head of the femur attaches to the pelvis. On exam, you can palpate the bony prominence of the femur. In the supine position, the patient's greater trochanter is often even with the space between his distal wrist and the base of the thumb.

Wrap and twist the two running ends of the sheet around the patient's pelvis. Once tightened, cross the running ends and tie or clamp them to maintain tension. EMTs need to use their judgment regarding the correct amount of pressure.

It is likely that any patient with a mechanism of injury for an unstable pelvic fracture also has a positive mechanism of injury for spinal cord injury. Follow local protocols for spinal immobilization during transport. As stated earlier, apply the pelvic sheet wrap or mechanical immobilization device before securing the patient to the spine board.

Follow local protocols for trauma patient fluid administration. Due to the high likelihood of hypovolemia, it may be necessary to infuse large amounts of fluid. One paramedic text recommends the following:5

• Hang two 1L bags of normal saline

• Start two large-bore IVs

• Set up trauma tubing and pressure infusion sets

• Be prepared to administer 1,000 ml of IV fluid to maintain systolic blood pressure of 90 (map 60-65) mmHg.

• After the initial fluid bolus, run IV lines at TKO, unless there are additional signs of hypovolemia or blood pressure drops

• Continue to monitor vital signs. This patient is a high-priority transport.

Pelvic fractures are likely to be painful. Follow local protocols for indications, contraindications, delivery methods and dosage amounts for pain medications. Be sure to obtain at least one set of vitals and the patient's own pain rating, assess the patient's mental status and observe for signs of hypotension before administering pain medication. Depending on the patient's condition, consider a narcotic analgesic like morphine sulfate or fentanyl. Deliver 2–4 mg of morphine sulfate slow IV push; titrate to effect up to 10 mg or amount set by local protocol. Use morphine with caution in patients who are already hypotensive because of its vasodilatory effects.

For fentanyl, deliver 50–100 micrograms slow IV push to prevent chest tightness; titrate to effect. Three to five minutes after narcotic administration, reassess vital signs, mental status and patient's own pain rating.

Summary

Pelvic ring fractures resulting from high- energy and/or mass mechanisms can cause life-threatening severe bleeding; however, devices can be applied by EMS at the emergency scene to help slow or reduce that possibility. Circumferential compression is an effective and safe method to stabilize open book pelvic fractures.

Materials:

Article from www.Emsworld.com

Other materials from www.Uptodate.com

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Quiz

NAME_____ DEPT_____ DATE_____

1) The function of the pelvis is to _____.

2) Attached to each side of the sacrum is the _____.

3) Many organs and blood vessels pass through or near the bones of the pelvis, including the _____ _____ , _____ and _____.

4) The _____ descending from the aorta are located in the pelvis.

5) _____ can also apply sufficient force to the body to cause a pelvic fracture.

6) The _____ is more likely to separate in two or more places than in just one.

7) Pelvic ring fractures are sometimes called _____.

8) What percentage of pelvic fractures requires blood transfusions? _____

9) If applying a pelvic sheet wrap, it should be applied under the pelvis so it is centered over the _____ _____.

10) We need to maintain a SBP of _____.

If you are NOT a member of the McHenry Western Lake County EMS System, Please include your address on each optional quiz turned into our office. Our mailing address is: Northwestern Medicine – McHenry Hospital EMS, 4201 Medical Center Drive, McHenry, Illinois 60050. We will forward to your home address verification of your continuing education hours.
If you ARE a member of our EMS System, your credit will be added to your Image Trend record. Please refer to Image Trend to see your current list of continuing education credits. Any questions regarding this can be addressed to Cindy Tabert at 224-654-0160. Please fax your quiz to Cindy Tabert at 224-654-0165.