

## 56 Pelvic injury

### 56.1 Introduction

Direct force transmitted via the iliac wing, or through the femur may crush the pelvis. These are common injuries, especially with increasing numbers of road traffic accidents in the low- and middle-income countries. Alternatively, the pelvis may break in a fall from a height. In general, pelvic injuries are of 2 kinds:

**(a) Acetabular fractures**, with fractures lines entering the hip joint. (66.5)

**(b) Pelvic ring fractures** with at least 2 fracture lines: one in the anterior and one in the posterior pelvic ring or a combination of one fracture with a sacro-iliac joint or pubic symphysis disruption.

After a fall from a height, vertebro-pelvic dissociation (separation of the spine from the pelvis) with a vertical fracture line through both transalar regions including horizontal fracture components through S1 or S2 vertebrae are seen.

*N.B.* If you see a fracture line in an antero-posterior pelvic radiograph, look for additional fracture lines or joint disruptions!

Special fracture types with retained stability of the pelvic ring are these:

- (1) iliac wing (56-1A),
- (2) avulsion type (56-1H),
- (3) transverse sacral or coccygeal (56-1D),
- (4) those below S2.

The outcome from these fractures depend on:

- (1) the stability of the pelvic ring or hip joint,
- (2) whether they are open fractures,
- (3) associated bleeding, nerve damage, bladder rupture, urethral or bowel damage.

*N.B.* These complex pelvic fractures bleed profusely! Be prepared to transfuse blood!

Typically, you can expect the following types of pelvic fracture in these circumstances:

- (1) Iliac wing fractures (56-1A) from direct crush injuries or pull from a seat-belt in vehicle accidents.
- (2) lateral compression or acetabular fracture from falls to the side or hip contusion (56-1B),
- (3) comminuted fractures of the anterior pelvic ring (including the butterfly fracture (56-1E) or 'open book' fractures (56-1G) from direct contusion of the pubic symphysis in a motorcycle head-on-collision.
- (4) acetabular fractures with or without hip dislocation from Indirect hip contusion from a flexed femur (as when sitting and being pushed against the dashboard).
- (5) unstable vertical sheer fractures or vertebropelvic dissociation from fall from a height when the extended femur (as in a straight leg) is pushed up into the pelvis (56-1F).
- (6) avulsion fractures of the anterior superior (56-1H) & inferior iliac spines, and of the ischial tubercle from excessively high muscle strain especially in athletes.

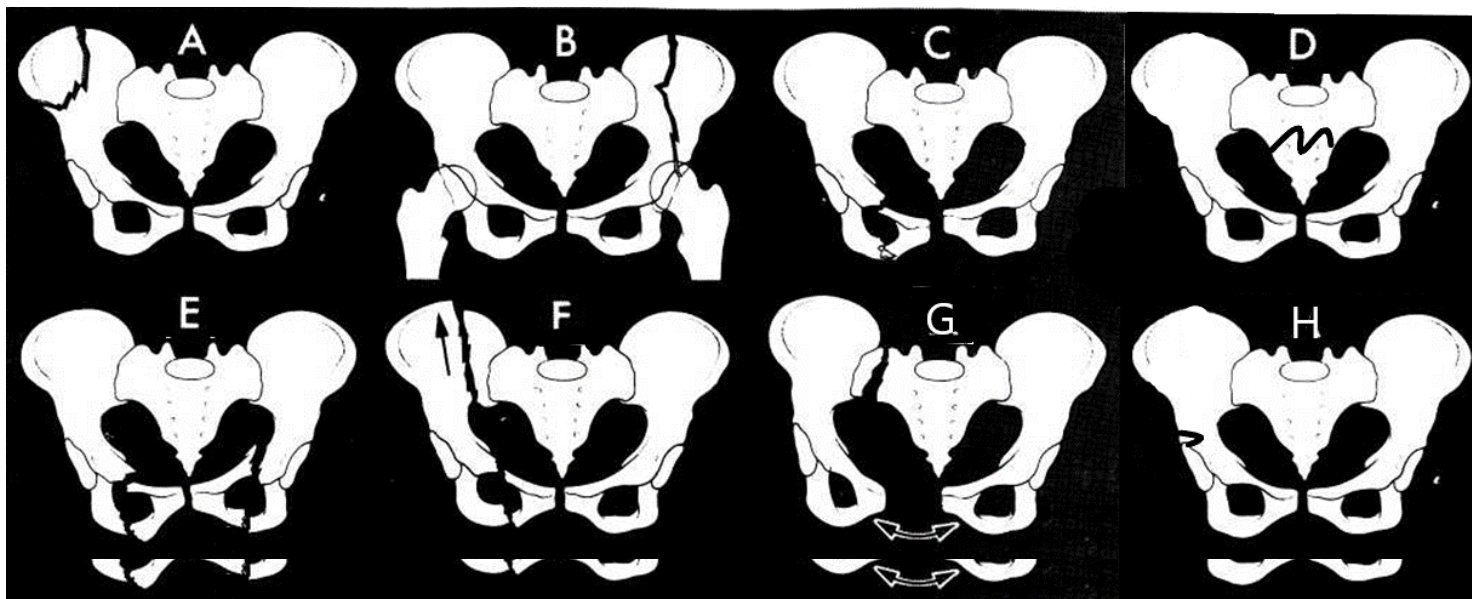


Fig. 56-1 PELVIC FRACTURES. A, fracture only of the iliac wing. B, fracture extending into the acetabulum. C, fracture of the ischiopubic rami on one side & the pubic symphysis distracted. D, transverse sacral

fracture. E, butterfly fracture of both ischiopubic rami. F, vertical fracture with upward displacement of the right half. G, hinge fracture with an 'open book'. H, avulsion fracture.

## INSPECTION

Look for: seat belt bruising, skid marks, open wounds, & haematomas in the pubic region, all of which are warnings of severe pelvic injury. Look for a foot drop (in sciatic nerve injury). Look for blood at the urethral meatus (57.1).

*N.B.* A perineal haematoma in the labia or scrotum is almost pathognomonic of a pelvic fracture; frank haematuria or rectorrhagia are indirect signs for a fragment piercing bladder or rectum (thus an open fracture).

Look also for leg length discrepancy in unstable or severe dislocated pelvic ring injuries; typically the hip is flexed, adducted & internally rotated (as in femoral neck fractures) in cases of acetabular fractures with hip dislocation.

**If you find an unstable pelvic ring or 'open book' fracture, immediately wrap a bed sheet or pelvic binder round the pelvis (56-2):** this may considerably reduce bleeding.

**If you find a dislocated hip, reduce it and test it for stability.**

## PALPATION

Try to compress the pelvis from both sides by pressing your hands laterally on both iliac crests in the region of the anterior superior iliac spines. If you feel instability or this causes pain, suspect a pelvic fracture.

If you find no instability, try to distract both iliac wings horizontally and vertically.

Additionally, palpate and press the pubic symphysis. Pain or a gap may indicate an anterior pelvic ring fracture or pubic symphysis disruption.

*N.B.* Compression or distraction tests for patients with diminished consciousness are very unreliable.

Perform a digital rectal (& vaginal) examination & check if: (a) sphincter tone is impaired, (b) the prostate is no longer easily palpable ('riding high'), & (c) any bony fragments are palpable?

## FUNCTIONAL TESTS

*An alert patient who can raise the straight leg without pain has no severe pelvic fracture!*

A leg fixed in flexion, adduction & internal rotation is pathognomonic of a hip dislocation.

Passive and active hip motion is painful in *all* acetabular and most pelvic ring fractures. Check for neurological deficit especially in the L4-S2 nerve roots and the sciatic nerve.

## RADIOGRAPHS:

For pelvic ring fractures, get antero-posterior, inlet and outlet views and for acetabular fractures, antero-posterior, iliac-oblique and obturator-oblique views. Use a table with the least number of metal parts.

*N.B.* If contrast is used for examination of a bowel injury, this may completely obscure the pelvic bones

## TREATMENT

**For all pelvic fractures with an intact pelvic ring** (*i.e.* iliac wing fractures, transverse sacral fractures below S3 vertebra & avulsion-fractures) treat conservatively; adapt weight bearing on crutches over 4-6wks.

**For lateral compression fractures with isolated horizontal instability,** treat conservatively, too. After some days of bed rest, start mobilization with no weight bearing on the injured side by use of crutches over 6wks.

**For horizontally unstable 'open book' fractures,** apply an external fixator or fix by open reduction and internal plating, which is ideal for the symphysis disruption.

**For other horizontal and vertically unstable pelvic ring and unstable acetabular fractures** you will need to apply primary emergency intervention and only later proceed to definitive surgical treatment using different fixation techniques and implants.

## EMERGENCY INTERVENTION

**If there is any type of severe pelvic fracture, especially if complex,** start blood transfusion. Bleeding from the pelvis will usually cause some sort of retroperitoneal haematoma.

*Don't attempt to open the posterior peritoneum.*

**If there is intraperitoneal bleeding,** after you have stabilized the pelvic ring with an X-fix, pack the pelvis (55.2) as 90% of blood loss is venous. Ligate the internal iliac arteries only if this fails.

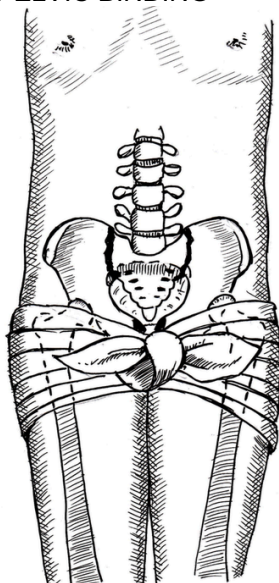
**If there is an unstable pelvic ring,** support the pelvis with a bed sheet of length >1m and width >0.5m and place it under the pelvis by first gently elevating the legs and then the pelvis. Wrap the sheet over the pelvis with the greater trochanter positioned centrally (56-2).

*N.B.* Wrapping the sheet more cranially over the iliac crest will further distract instead of compress the true pelvis, and cause more bleeding.

**For the 'open book' injury,** tie the knees together using a gauze bandage with a wedge between the ankles. Apply an external fixator as soon as possible.

*N.B. The pelvic sling or binder is not a reduction tool! It will cause skin necrosis if you leave it in place >24h.*

#### PELVIC BINDING



**Fig. 56-2 PELVIC BINDING** for unstable pelvic ring fractures. *N.B. Put the binding over the trochanters not the sacral promontories!*

**If there is a posterior hip dislocation**, reduce it by applying axial traction on the femur with the hip & knee in 90° flexion. It is very difficult clinically to distinguish between a dislocation & a fracture of the femoral neck.

**If there is (a) vertical femoral displacement, (b) acetabular instability, or (c) still instability of the hip after reduction**, apply traction on the straight leg (59.4).

*N.B.* Where the femoral head is dislocated centrally (a 'protrusio' acetabular fracture), you may need additional weights for lateral traction.

#### APPLYING SUPRACONDYLAR FEMORAL TRACTION (GRADE 2.1)

Instil LA in the medial and lateral supracondylar regions 3cm superior to the cephalic rim of the patella, and insert a 3mm percutaneous Steinmann pin from medial to lateral. Apply  $\frac{1}{10}$ – $\frac{1}{7}$  body weight for constant traction. For this to be adequate, support the contralateral leg with a rigid block at the end of the bed, *but leave the foot on the injured side free for movement* (59.4).

*N.B.* Don't apply a Thomas splint, which may cause severe skin abrasion under traction (59.4): use a Böhler frame instead.

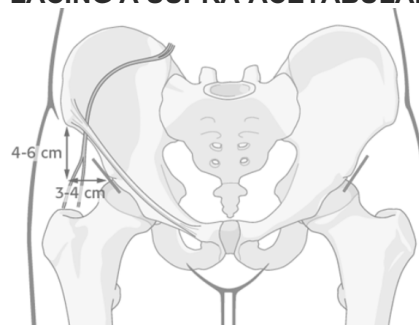
Traction on the leg may not prove adequate for some femoral neck fractures, or 'protrusio' acetabular fractures. You cannot manage an unstable pelvis for long with a sling, and the ex-fix is ideal in this case

It's best to put insert a urinary catheter in a female before attaching the external fixator.

#### APPLYING AN EXTERNAL FIXATOR (GRADE 2.3)

Apply an external fixator in the operating theatre under fluoroscopic control (if available, and you have a radiolucent table). *This is difficult in an obese person!*

#### PLACING A SUPRA-ACETABULAR SCREW



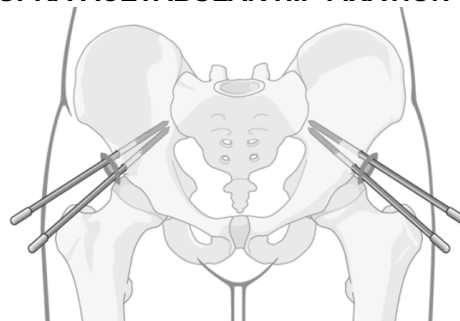
**Fig. 56-3 PLACING A SUPRA-ACETABULAR SCREW.** Note the position of the lateral femoral cutaneous nerve

Make an oblique 4-5cm incision 4-6cm below and 3-4cm medial to the anterior superior iliac spine, on both sides. Avoid the lateral femoral cutaneous nerve. Palpate the bone through the incision.

Place the drill sleeve on the upper border of the anterior superior iliac spine, and direct it 10-20° cranially & 20-30° medially towards the sacroiliac joint. Perforate only the outer cortex of the bone.

Advance two 5x240mm Schanz screws parallel or slightly converging into the posterior ilium to gain good fixation (especially on osteoporotic bone). Try to put one screw along the outer table of the iliac wing, and the other along the inner table.

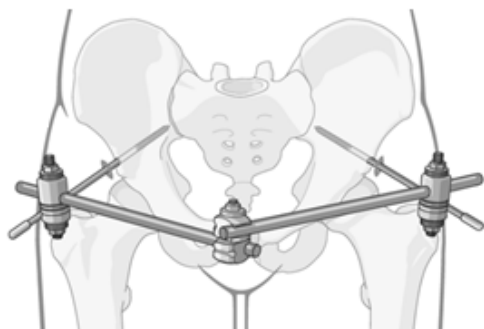
#### SUPRA-ACETABULAR HIP FIXATION



**Fig.56-4 SUPRA-ACETABULAR HIP FIXATION.** Place two screws on both sides into the iliac bone

Connect the screws to a bar on each side, & connect these with 2 other connecting bars (56-5). Then reduce the fracture by pressing on the iliac crests & greater trochanters; then tighten the connecting rods in place. Close the incision only partially without tension.

## EXTERNAL FIXATION OF THE HIP



**Fig. 56-5 EXTERNAL HIP FIXATION.** You can use double bars for increased rigidity.

### DEFINITIVE TREATMENT

Ideally, try to arrange definitive treatment for severe pelvic injuries after 4-7 days, when inflammation has subsided and before an immunological response has commenced.

Earlier surgical intervention may result in a 'second hit'; delayed operative intervention makes fracture reduction more demanding and open procedures are then usually necessary.

Consequently, the external fixator or should be in place for at least 6wks with the patient remaining on bed rest. During this period, you *must ensure passive mobilization of the joints* to prevent stiffness. *Don't forget thrombosis prophylaxis* (44.7).

Most patients will need a urinary catheter at least in the first few days. You may need this to interpret radiographs of the posterior pelvic ring. Make sure the care of the perineal skin and sacral area is fastidious.

*N.B. A retroperitoneal haematoma may cause an ileus.*

## 56.2 Bladder injury

A blunt impact on a child's full bladder may rupture it; likewise, the drunk emerging from a beer hall who falls or is hit by a vehicle is similarly at risk.

The dome of the bladder, which is intraperitoneal, is its weakest part, and allows urine to pour into the peritoneal cavity where it can appear as ascites. This may occasionally present as an acute filling of the scrotum if the victim has an inguinal hernia (18.2), with a patent *processus vaginalis*.

However, a pelvic injury usually causes a bladder injury outside the peritoneum in the prevesical space and under the *transversalis* fascia.

Urine may here be mixed with a pelvic haematoma, and such a mixture is rife for infection! Once this happens, Fournier's gangrene (6.23) or septicaemia quickly follow.

*N.B. Any surgery in the pelvis may injure the bladder!*

**If a penetrating object (including a pelvic bone fragment) perforates the bladder, make sure you look for a second hole in its wall!** Think also of damage to the bladder in penetrating injuries of the rectum or vagina.

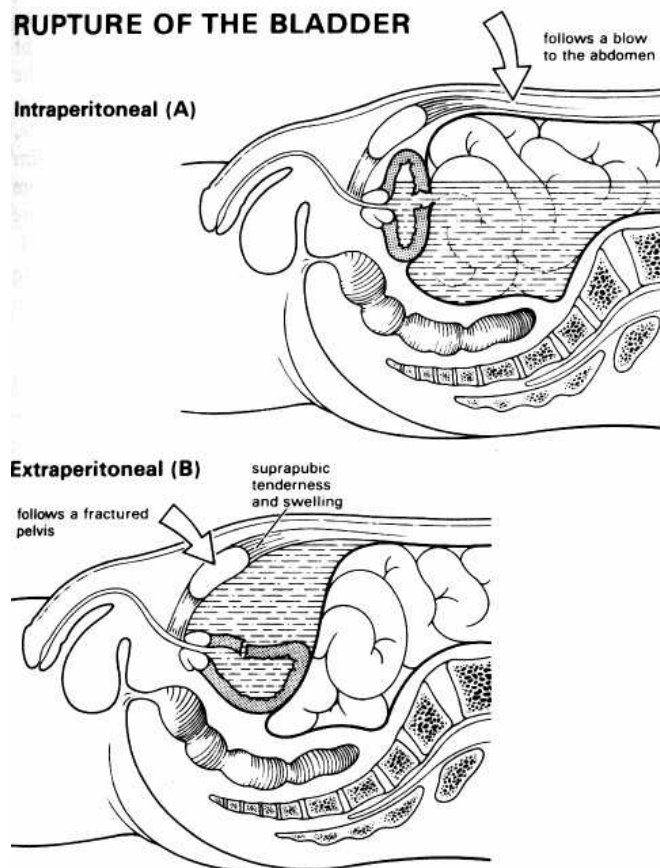
The patient often has a great desire to empty the bladder but nothing comes out via the urethra except frank blood.

*N.B. The urethra may also be injured* (57.1), in which case there is a little blood at the meatus and no urine draining at all.

*N.B. Blood clot may cause urinary retention!*

There is always frank haematuria. The signs may be obvious; an ultrasound scan will show minimal fluid in the bladder, with it having an odd shape.

## RUPTURE OF THE BLADDER



**Fig. 56-6 INTRA- & EXTRA-PERITONEAL RUPTURE OF THE BLADDER.** A, the dome of the bladder ruptures, and the abdomen fills with urine. This is irritant at first, but not after a while. If there is an inguinal hernia, the scrotum may fill giving the appearance of a hydrocele. B, urine leaks out into the extra-peritoneal area; there is usually suprapubic tenderness. After Dudley HAF (ed), *Hamilton Bailey's Emergency Surgery*, Wright, 11th ed 1986 with kind permission.



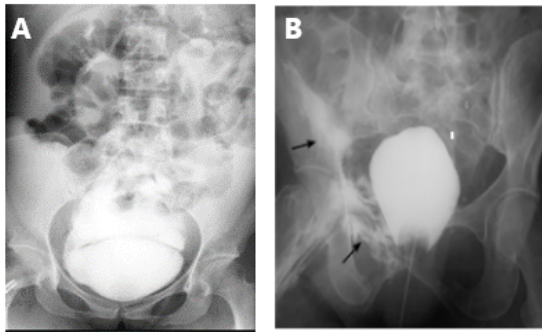
A retrograde cysto-urethrogram (38.1B) is more reliable: *use a very strict aseptic technique!* Place a lubricated Ch12 Foley catheter into the urethra, and inflate the balloon with 2mL in the *fossa navicularis* of a male; or at the introitus in a female. Make sure there is no leak by injecting sterile water. Then introduce 300-400mL of contrast at a pressure of 50-100cm H<sub>2</sub>O pressure, and get films with the bladder filled and after voiding.

*N.B.* An IVU may have inadequate pressure in the bladder to demonstrate a leak.

A bladder rupture will show as contrast outlining bowel loops in an intra-peritoneal injury, and as wispy streaks of contrast infiltrating fascial layers in an extra-peritoneal injury.

*N.B.* Check for urethral injury at the same time!

### CYSTOGRAM IMAGES OF BLADDER RUPTURE



**Fig. 56-7 CYSTOGRAM RADIOGRAPHS SHOWING BLADDER RUPTURE.** A, intra-peritoneal rupture showing a blush of contrast outside the bladder, and outlining bowel. B, extra-peritoneal rupture showing contrast in soft tissues.

#### MANAGEMENT

**If there is a small extra-peritoneal bladder perforation**, this is often difficult to repair. For blunt trauma with a pelvic fracture, gently insert a lubricated Ch16 through the urethra (*if this is not injured*) or suprapubically. A pelvic haematoma may make inserting a suprapubic catheter difficult; use ultrasound to guide you. Then place a prevesical drain. Keep the catheter draining freely for at least 10days.

**For all other bladder wounds**, conservatively debride the edges and then grasp the sides of the perforation with Allis tissue forceps. Clean out the blood clots and wash with saline and then examine the inside of the bladder.

**If you can see or feel another hole posteriorly**, it is best to close this from the inside. Use 2 layers of 2/0 long-acting absorbable suture to make a watertight closure.

Take care around the ureteral orifices; insert retrograde ureteric catheters if the wounds are near-by.

After bladder repair, insert a closed prevesical drain and leave a urethral catheter for 10days. Only add a suprapubic cystostomy if the bladder repair was difficult or you expect long-term catheterization because of other injuries, such as to the urethra. Gently insert a lubricated Ch16 (big enough to irrigate) through the urethra (*if this is not injured*) or suprapubically.

*N.B.* *Overdistension of the bladder post-operatively may destroy your repair!* Make sure your haemostasis is meticulous, and urine draining freely through large-bore catheters. Monitor urine output and if this suddenly decreases, especially in combination with increasing patient discomfort, irrigate the catheter gently with sterile water or saline to remove obstructing blood clots.

In damage control (41.5), this is *all* you should do! *Don't fiddle with a pelvic haematoma!*

*N.B.* (1) A catheter balloon may neatly tamponade a bladder perforation, and so prevent any urine or contrast leak.

(2) Alternatively, the catheter may go through the hole in the bladder and suddenly drain  $\geq 2L$  urine from the peritoneal cavity!

**If there is gross disruption of the bladder**, pack the pelvis and bail out by fashioning bilateral nephrostomies: the damage control option.

**If there is a wound in the rectum or vagina as well as the bladder**, repair each separately and place a flap of omentum between, to prevent later development of a fistula.

### 56.3 Uterine injury

The non-pregnant uterus lies deep in the pelvis, and because mobile, is relatively well able to sustain blunt injury.

When the uterus is gravid, this is different. At 12wks gestation, the uterus rises out of the pelvis and reaches the umbilicus at 24wks. It is subcostal at 34-36wks. At first the uterine wall is thick, but by 30wks becomes thin, especially in the lower segment.

Unless there is a previous uterine scar (from previous Caesarean section or other surgery), the uterus usually ruptures at the fundus, usually with foetal mortality.

Of course, there are then 2 potential victims who arrive for your care simultaneously! Remember: the best resuscitation of the foetus is resuscitation of the mother.

The uterus may be injured by blunt or penetrating trauma. Obviously the most frequent injury to the uterus is iatrogenic: the uterus is easily perforated by a curette (23.4) for example, or by instruments (usually non-sterile) to induce a mechanical abortion, or at excision of a fibroid.

Every woman of childbearing age suffering trauma should have a pregnancy test as part of the routine paraclinical investigations.

*N.B.* Consider if the injury could be the result of abuse or domestic violence (47.1).

#### NON-GRAVID UTERUS

The non-gravid uterus is a tough bundle of muscle. Blunt injury is rare and usually accompanies a serious pelvic fracture. A car lap seat belt worn too low may produce a uterine tear after a deceleration injury.

A blunt injury of the uterus is mostly accompanied by serious pelvic fracture or retroperitoneal haematoma.

Penetrating wounds of the uterus may be simple or devastating, gunshot wounds particularly so.

They may of course damage other important structures, especially the bladder, rectum and adnexa.

#### MANAGEMENT

**If you find a perforation of a non-gravid uterus**, repair this with a deep running 2/0 long-acting absorbable suture, making sure your suture is deep enough, just as in a Caesarean section. *Don't forget to look for a second hole.* If there is further internal uterine haemorrhage, insert an intra-uterine balloon to tamponade further.

**If you find a major disruption of the uterus**, which now looks like an open book exposing the endometrium, you will have to perform a hysterectomy: *any attempt at repair is not only too risky for future pregnancy, but is likely to bleed!!*

#### GRAVID UTERUS

Domestic violence, falls, and traffic accidents are the most common causes of blunt trauma in pregnancy.

Of course, the introduction of any instrument into the uterus to procure an abortion is by far the commonest assault on the uterus!

*N.B.* Severe injury to other body parts or organs putting the mother's life at risk take precedence over any uterine injury not causing haemorrhage.

#### (a) Placental abruption

Many pregnant women suffering trauma will miscarry or experience a stillbirth (foetal death after 28wks' gestation). This can occur even if the uterus is not injured itself, as in placental disruption.

*N.B.* A central detachment of the placenta causes no visible blood loss.

Symptoms of placental abruption are constant abdominal pain; signs are of a tense, tender or even tetanic uterus, and a distressed or absent foetal heart sound.

Severe haemodynamic shock in the mother and decreased foetal movements may be the only signs of placental disruption after blunt abdominal trauma in pregnancy.

*N.B.* Vaginal bleeding is not necessarily present in placental disruption.

#### PLACENTAL DISRUPTION

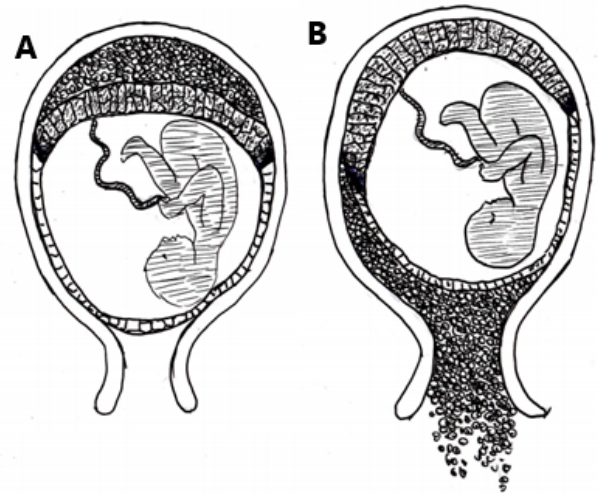


Fig. 56-8 PLACENTAL DISRUPTION. A, central. B, marginal.

#### (b) Uterine rupture

Unlike during labour (when the lower uterine segment tears), traumatic uterine ruptures tends to occur in the upper uterine segment or fundus leading to almost inevitable foetal mortality.

If there is no predisposing condition such as a uterine scar, uterine rupture occurs only in the most violent trauma.

## SITES OF UTERINE RUPTURE

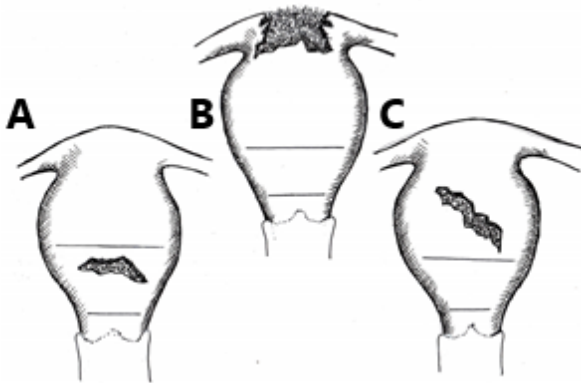


Fig. 56-9 SITES OF UTERINE RUPTURE. A, lower segment (in labour). B, fundal & C, upper segment (in trauma)

Most lacerations of the uterus cause significant bleeding, particularly if the uterus is gravid. This is usually intra-peritoneal, but may present with vaginal bleeding if the wound perforates the uterine wall, and rarely with extra-peritoneal haemorrhage.

Injury to the uterine arteries and placental abruption usually cause massive rapid bleeding.

*N.B. Unless you carry out an immediate emergency laparotomy in this situation, the mother will die.*

Penetrating objects may obviously damage the foetus, or the umbilical cord & placenta in a gravid uterus.

Palpation of foetal body parts or an abnormal lie are signs you may only find in slim or undernourished women; guarding may make the abdomen too tense, and there may be a discrepancy between the expected uterine size according to gestational age, and the apparent fundal height. Auscultation of the foetal heart maybe very difficult. *Don't waste much time on these details!*

Very occasionally the pregnant uterus may be completely avulsed.

**If trauma is related to an unsafe abortion,** instruments or objects may have perforated the uterine wall, thereby leading to vaginal and peritoneal haemorrhage (*and infection!*).

## UTERINE PERFORATION IN ABORTION

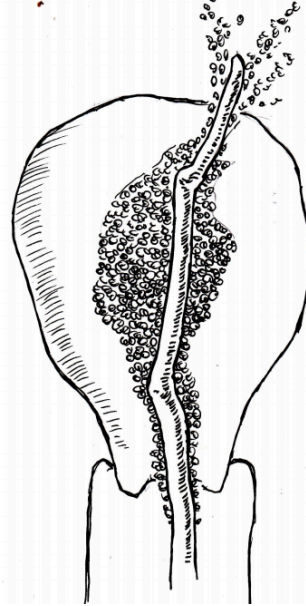


Fig. 56-10 UTERINE DAMAGE IN UNSAFE ABORTION Amniotic fluid embolism (44.5) may occur, resulting in DIC and massive haemorrhage.

## EXAMINATION

Vaginal & rectal examination must be routine. *Vaginal bleeding in pregnancy is never normal,* and you must determine if the bleeding has been provoked by the trauma (*e.g. abruptio placentae*) or by a pre-existing condition (*e.g. placenta praevia*) and be ready to deal with it.

Place a sterile compress or ordinary sanitary pad over the vulva and extravaginally to absorb any liquid until you have dealt with the problem.

**If there is vaginal bleeding,** *never perform a digital vaginal palpation in the first place!* Where there is a placenta praevia, this may make the bleeding worse and *may risk the life of both mother & foetus!* Look at the vagina & cervix with a speculum or with ultrasound.

**If you find a cervical or vaginal laceration,** repair this with absorbable sutures, placed vaginally.

**If you find fluid in the vagina and it has a pH 7-7.5,** this suggests ruptured membranes.

Check for effacement & dilation of the cervix, foetal presentation and lie. *Avoid repeat vaginal examinations.*

Ultrasound is virtually mandatory (if available) for every injured pregnant woman to assess the status of the foetus, and the position of the placenta.

As well as information on gestational age, the ultrasound scan can show a myometrial or endometrial defect, a protruding amniotic sac, and fluid around the uterus.

A deceleration injury may cause serious damage to the foetus without there being any sign of injury in the mother. The opposite may also happen, that a foetus survives when the mother dies.

In this case a rapid emergency Caesarean section may save the baby.

Get plain radiographs if necessary. *Pregnancy is not a contraindication to simple radiography:* the benefit outweighs the risk. The foetus is most at risk during the 1<sup>st</sup> trimester, but the dose used must be very low.

#### MONITORING

Foetal monitoring is important: check for

- (1) heart rates <120/min or >160/min,
- (2) repetitive decelerations,
- (3) beat to beat variations,
- (4) frequent uterine contractions,

*Don't forget to get the mother's blood type, especially the Rh factor.*

*N.B.* Seeing foetal umbilical blood flow on ultrasound is a helpful sign of life. If this is poor, you may be able to check for blood flow in the foetal middle cerebral artery, or monitor its maximum velocity in case of foetal anaemia.

#### MANAGEMENT

*N.B.* Your theatre temperature must be hot to prevent hypothermia!

Start resuscitation with blood transfusion, as uterine bleeding is likely to be massive. *Don't waste time!*

At laparotomy, endeavour to pack the pelvis after scooping out blood and clots, so you can get an idea where the haemorrhage is coming from.

**If you find a perforation in a gravid uterus, and the foetus is still alive and >28wks gestation,** perform an immediate Caesarean section. Monitor the foetus.

The most common foetal injury from a stab wound to the uterus is a compound skull fracture. Surprisingly, debridement and closure of such injuries frequently results in good recovery.

**If you find a perforation in a gravid uterus, and the foetus is still alive and <28wks gestation,** if the perforation is small, close it and monitor the foetus.

If the perforation is large and allows you to visualize the foetus, unless it is almost at term, it is very unlikely to have survived. If the foetus is at term, deliver it by enlarging the uterine opening if necessary and then repair the uterine wall as in a Caesarean section. If the foetus is not at term (and depending on your facilities), you may try to repair any damage (especially to the head) with absorbable sutures. Surgery on a foetus in utero does not produce scarring! This is obviously very heroic surgery, but you may be surprised by a happy result! Monitor the foetus carefully. Early labour will prompt you probably to perform a Caesarean section!

**If the wound is relatively small and the foetus has died,** *don't perform a Caesarean section* unless you cannot close the uterine wounds haemostatically. The woman will be able later to deliver the foetus vaginally. This carries very little risk unless the pregnancy is near term. In the case of induced abortion, add IV antibiotics.

**If the wound is very large,** this is the equivalent of a traumatic Caesarean section and the foetus is now effectively or actually intraperitoneal, and dies quickly.

Remove the foetus and placenta. Apply a cervical tourniquet, and see if you can repair the rupture; if not, perform a B-Lynch suture (22-14), or resort to an emergency hysterectomy (21.17) depending on the extent of uterine damage, just as in obstructed labour.

*N.B.* The uterus may remain atonic and bleed severely (20.12). Administer oxytocin IV (or methylergometrine), prostaglandins if available, and apply pressure to the uterus (Hamilton's manoeuvre, 56-11).

**If the uterine arteries or veins are bleeding,** *don't hesitate to ligate them on one side:* this will not put the foetus in danger.

#### HAMILTON'S MANOEUVRE

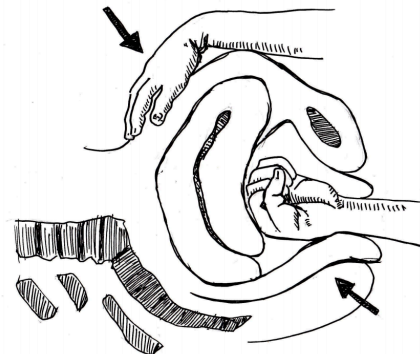


Fig. 56-11 UTERINE PRESSURE BY HAMILTON'S MANOEUVRE. Keep your hand in the vagina for 5 full mins.



**If you find a simple external uterine laceration**, repair this with a deep running 2/0 long-acting absorbable suture.

**(c) Cervix injury**

There may be a single tear, large enough to need suturing, or numerous small tears. Bleeding from small tears is most easily controlled by packing (22.11).

**CERVIX LACERATION REPAIR (GRADE 2.5)**

Deeper tears of the cervix can easily lead in a short time to a life-threatening haemorrhage from branches of the uterine artery, on the lateral side of the cervix.

You must visualize the cervix properly; so  
 (1) get an assistant to push the uterus into the pelvis by pressing forcefully on its fundus.  
 (2) insert a wide vaginal speculum.

Grip the edges of the laceration with long clamps. Often you cannot see the upper edge of the wound at the start. Place your 1<sup>st</sup> suture as high as you can reach comfortably and suture reliably. Then by retracting on this suture, visualize the top end of the wound & suture it meticulously as this is where the bleeding artery is located. Complete the repair towards the external cervix. Always use round; *never sharp or cutting* needles, as they can lead to further vessel injury.

*N.B. Careful reconstruction is necessary to avoid later cervical insufficiency.*