

**SECTION 4: Pain management, sedation and local and general anaesthesia** (IMEESC 3.1, 3.2, 14.7, 3.5, 14.4 to 14.7 and 3.9 and WHO Pregnancy C-43, C-46 and C-58)

Babies and children are often under-treated for pain because of:

- fear of the harmful side effects
- failure to accept that children feel pain like adults
- a child's fear of receiving IM injections

### Recognition of Pain

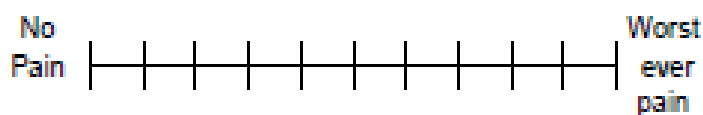
- description from the patient (self-reporting)
- behavioral changes, eg crying, guarding of the injured part, facial grimacing
- physiological changes, eg vasoconstriction, tachycardia, tachypnoea
- expectation of pain because of the pathophysiology involved, eg obstructed labour, placental abruption, fracture, burn or other significant trauma

### Assessment of pain

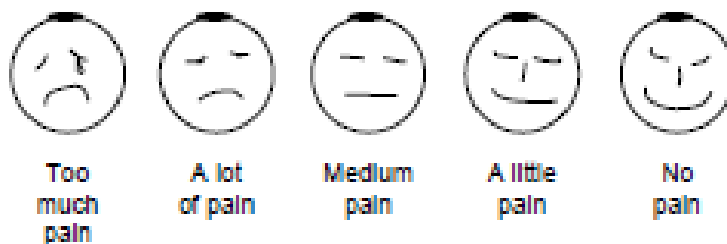
- to establish the degree of pain experienced
- to help select the right level of pain relief
- to give an indication of success of pain management

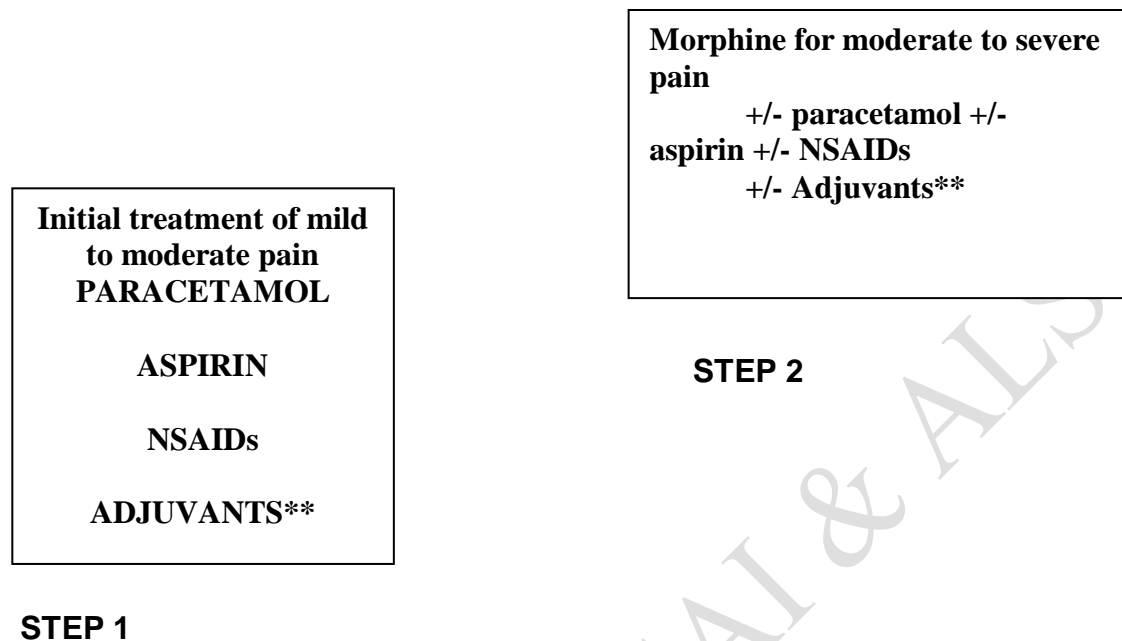
The following are 2 commonly used pain scales:

*Visual scales for showing the severity of pain*



### A commonly used pain scale for children



**WHO pain ladder**

\*\* An adjuvant is another drug (eg steroid or anxiolytic) or type of treatment (eg TENS or radiotherapy) which prevents but can also relieve pain

**Pain Management - Non-drug Treatment**

Distraction – toys, play, allow parents to be present for painful procedures

**Pain management - Drug Treatment****Local anaesthetics - infiltrated****Lidocaine 0.5 to 2%**

- used for rapid and intense sensory nerve block
- onset of action is within 2 minutes MUST NOT DO PROCEDURE UNTIL TAKES EFFECT
- effective for up to 2 hours
- maximum dose given locally 3 mg/kg (7mg/Kg with 1 in 200,000 adrenaline)
- safest is to use 0.5%
- 3mg/kg of 1%, up to a maximum of 200mg not more than 4 hourly, nothing about increased dose with adrenaline

**Preparation of lidocaine 0.5% solution****Combine:**

- lidocaine 1%, 1 part

- **normal saline or sterile distilled water, 1 part.**

**DO NOT use local anaesthetic containing adrenaline in areas served by an end artery, eg finger, toe, penis. Tissue necrosis will occur.**

If the **procedure requires a small surface to be anaesthetized** or in the pregnant woman or girl **requires less than 40 mL of 0.5% lidocaine**: adrenaline is not necessary.

Advantages of adding adrenaline:

- less blood loss
- longer effect of anaesthetic (usually 1–2 hours);
- less risk of toxicity because of slower absorption into the general circulation.

The concentration of adrenaline to use is 1:200 000 (5 micrograms/mL). In children maximum dose of adrenaline is 5 micrograms/kg.

**Note:** It is critical to measure adrenaline carefully and accurately using a 1 ml syringe. Mixtures must be prepared observing strict infection prevention practices.

**Table 4 Formulas for preparing 0.5% lidocaine solutions containing 1 in 200 000 adrenaline**

Desired Amount of Local Anaesthetic Needed	0.9% Saline	Lidocaine 1%	Adrenaline 1:1 000
20 mL	10 mL	10 mL	0.1 mL
40 mL	20 mL	20 mL	0.2 mL
100 mL	50 mL	50 mL	0.5 mL
200 mL	100 mL	100 mL	1.0 mL

## COMPLICATIONS OF LOCAL ANAESTHESIA (IMEESC 14.4 and WHO Pregnancy C-38)

### *Prevention of complications*

- If **more than 40 mL of 0.5% lidocaine is to be used**, add adrenaline as above. Procedures that may require more than 40 mL of 0.5% lidocaine are Caesarean Section or repair of extensive perineal tears.
- Use the lowest effective dose.
- Inject slowly.
- Avoid accidental injection into a vessel. There are three ways of doing this:

- moving needle technique (preferred for tissue infiltration): the needle is constantly in motion while injecting, this makes it impossible for a substantial amount of solution to enter a vessel
- plunger withdrawal technique (preferred when considerable amounts are injected into one site): the syringe plunger is withdrawn before injecting, if blood appears the needle is repositioned and attempted again
- syringe withdrawal technique: the needle is inserted and the anaesthetic is injected as the syringe is being withdrawn.

### Symptoms and signs of lidocaine allergy and toxicity

**Allergy: Shock, redness of skin, skin rash/hives, bronchospasm, vomiting, serum sickness**

#### **Management of lidocaine allergy**

See anaphylaxis section

#### **Management of lidocaine toxicity**

Mild Toxicity	Severe Toxicity	Life-Threatening Toxicity (very rare)
<ul style="list-style-type: none"> <li>• Numbness of lips and tongue</li> <li>• Metallic taste in mouth</li> <li>• Dizziness/lightheadedness</li> <li>• Ringing in ears</li> <li>• Difficulty in focusing eyes</li> </ul>	<ul style="list-style-type: none"> <li>• Sleepiness</li> <li>• Disorientation</li> <li>• Muscle twitching and shivering</li> <li>• Slurred speech</li> </ul>	<ul style="list-style-type: none"> <li>• Tonic-clonic convulsions</li> <li>• Respiratory depression or arrest</li> <li>• Cardiac depression or arrest</li> </ul>

- direct intra-arterial or IV injection of even a small amount may result in [cardiac arrhythmias](#) and [convulsions](#) (see above)
- resuscitative facilities and skills should be present
- can be absorbed through mucous membranes in sufficient concentration to be toxic

Immediately stop injecting and prepare to treat severe and life-threatening side effects.

**If symptoms and signs of mild toxicity are observed** wait a few minutes to see if the symptoms subside. Check vital signs and talk to the patient. Continue the procedure if possible.

#### **Adrenaline Toxicity**

Results from excessive amounts or inadvertent IV administration and results in:

- restlessness
- sweating
- hypertension

- cerebral haemorrhage
- rapid heart rate
- cardiac arrest

### **Bupivacaine 0.25%**

- used for longer lasting local anaesthesia
- onset of action is up to 30 minutes
- effective up to 8 hours
- maximum dosage is 2 mg/kg ( in pregnant woman or girl the pre-pregnant weight)

For uses of other preparations of Bupivacaine –see anaesthetic section

### **Non-Opiate Analgesics**

#### **Paracetamol**

- the most widely used analgesic and anti-pyretic
- does not cause respiratory depression
- dangerous in overdose

#### **Non-steroidal anti-inflammatory drugs (NSAID)**

- anti-inflammatory, anti-pyretic drug with moderate analgesic properties
- less well tolerated than Paracetamol causing gastric irritation, platelet disorders and bronchospasm
- should be avoided with gastric ulceration, platelet abnormalities, and significant asthma
- especially useful for post-traumatic pain because of anti-inflammatory effect
- given by mouth or by rectal administration (for example diclofenac)

**Caution: use in 3<sup>rd</sup> trimester of pregnancy may close the ductus arteriosus and predispose to pulmonary hypertension of the newborn. It may also delay the onset and progress of labour**

### **Opiate Analgesics**

#### **Morphine**

- in appropriate dose, analgesia occurs without loss of consciousness
- in single doses has minimal haemodynamic effect in a supine patient with normal circulating volume
- in hypovolaemic patients it will contribute to hypotension
  - monitor cardiovascular status
  - have IV fluid bolus of Ringer-Lactate or Hartmann's ready (20ml/kg in a child and 500ml to 1 litre in a pregnant woman or girl)
- opiates produce a dose-dependent depression of ventilation and decreased respiratory rate.
- Patients who have received opiates need observation and/or monitoring of respiratory rate and sedation

- do not discharge home until the opiate's effects are significantly reduced
- nausea and vomiting seen in adults and children
- better controlled IV than IM—if giving IV, give small dose initially and repeat every 3-5 minutes until patient is comfortable. Individuals vary widely as to the doses needed to provide pain relief
- dangerous in situations of raised intracranial pressure without means to provide respiratory support
- in pregnant woman or girl can produce respiratory depression in the neonate

### **Naloxone**

Naloxone is an opiate antagonist which reverses sedative, respiratory depressive, and analgesic effects of morphine and codeine

### **Sedative Drugs**

- may be useful with analgesics when undertaking lengthy or repeated procedures. The aim of sedation is to make the procedure more comfortable while maintaining verbal contact with the patient.
- start with small dose IV, wait 2-3 minutes, observe response and repeat if necessary
- relieve anxiety and not pain
- when given to pregnant woman or girl can result in floppy babies
- may reduce a patient's ability to communicate discomfort and therefore should NOT be given without concomitant analgesia
- side effects include hyper-excitability or prolonged sedation, delaying discharge after procedure

### **Midazolam**

- is an amnesic and sedative drug
- can be given orally, intra-nasally, or IV
- has an onset time of action of 15 minutes if given orally or intra-nasally
- duration of action is about an hour after oral or intranasal use
- can cause respiratory depression
- needs monitoring of respiratory rate and depth, and pulse oximetry

### **Diazepam**

An anxiolytic, amnesic and sedative drug also used to stop convulsions

- half the sedative potency of midazolam
- can be given orally (15 minutes to onset of action), IV or rectally (few minutes to absorption)
- can cause respiratory depression

### **Other agents useful for inducing Light Sedation in children**

Promethazine hydrochloride (Phenergan): 0.5mg/kg Deep IM or IV, or 1 to 2 mg/kg orally – to maximum of 50mg

Chloral hydrate

single doses up to a maximum of 50mg/kg or total 1gm rectally

25-50mg/kg (max 1g), oral or rectal, 45-60 minutes before procedure

Can give 100mg/kg (max. 2g) with respiratory monitor

Can be used in conjunction with Trimeprazine at 2mg/Kg. In children over 2 years, max 60mg 1-2 hours before procedure

### **Minimum facilities and skills required to prescribe sedation**

Anyone giving sedation, particularly when given IV, could inadvertently produce anaesthesia and must be able to deal with the following possible consequences:

- support respiration
- manage upper airway obstruction – have resuscitation equipment available
- use suction appropriately
- intubate if necessary and available

Patients needing sedation should have oral intake restricted as for anaesthesia.

Some patients are more vulnerable to effects of sedation, particularly those with problems with respiration or the upper airway. If not possible to avoid sedation, give smaller dose than expected for weight.

### **Procedures:**

- are often painful, undignified or both. Ideally should be undertaken in a treatment room so that other patients are not frightened and so that the patient's bed-space is a safe place where such events will not happen.
- often have to be repeated. Therefore provide optimal treatment on first occasion in order to minimise a dread of future procedures
- fear is often the major emotion to address: explain each step
- pharmacological and non pharmacological methods should be used
- for major procedures requiring powerful analgesia/sedation, 2 people should be present, one to undertake the procedure and the other to administer analgesia, sedation and ensure the airway is maintained. These include chest drain insertion and repeated lumbar puncture

For venous cannulation, size appropriate catheters must be available. It is not, for example, appropriate to have to use an 18 or 20 gauge cannula in a neonate.

Give analgesics or sedatives at an appropriate time before the procedure (30 minutes before for IM and 60 minutes before for oral medication but this varies with drug used) so that maximum relief will be provided during the procedure.

Check the level of anaesthesia by pinching the area with forceps. If the patient feels the pinch, wait 2 minutes and then retest.

Wait a few seconds after performing each step or task for the patient to prepare for the next one.

Handle tissue gently and avoid undue retraction, pulling or pressure.

Talk with the patient throughout the procedure.

### **Post operative pain management**

Provide analgesia before pain becomes established.

Use safe and effective doses of opioids along with regular paracetamol and non-steroidals to reduce the amount of opioid required.

Avoid IM injections if possible.

**Give analgesia - check response - reassess**

Most at risk of poor pain control are children with limited/absent verbal ability.

If pain seems out of proportion to surgical trauma consider complication and re-assessment by surgeons.

If asleep, assume pain is acceptable -don't wake up to make assessment but check regularly to ensure still asleep. If awake and lying quietly do not assume comfortable without enquiring.

**Analgesia/anti-emetics during labour**

- morphine 10mg IM or 2.5- 5mg IV or pethidine 50- 100 mg IM or 25-50mg IV
- promethazine 25-50 mg IM or IV, max 100mg if vomiting occurs-although some antiemetics better if given before vomiting starts

**Barbiturates and sedatives should not be used to relieve anxiety in labour.**

**Special issues regarding pain in the newborn infant**

Neonates (premature and full term) react to, and certainly feel, pain.

Infants can easily be forced to put up with suffering.

Small doses should be measured and given with an oral syringe.

Local anaesthetics must be used when they would be used in an older child undergoing the same procedure.

**Pain control during procedures in neonates**

Breast feeding during procedures may be helpful.

In all cases comfort and containment (swaddling) should be provided by a parent or a nurse.

COPYRIGHT EMCH & ALSG



**Table 5 - analgesic drug doses**

<b>Morphine IV</b>	<b>Dose</b> <b>No standard dose of IV morphine</b> <b>Give repeated small doses until pain is relieved</b>	Pregnant woman or girl:- 10mg diluted to 10mls – give 2mg (2mls) every 5 mins until pain relieved <u>Child over 1 year:</u> -200 micrograms/kg – diluted to 10mls – give 2mls every 5 mins until comfortable <u>Child 1-12 months</u> 100-200 micrograms/kg – diluted to 10mls – give 1-2mls every 5 mins until comfortable <u>Neonate</u> - 50-100 micrograms/kg - diluted to 1ml in 1ml syringe – give 0.2mls boluses every 5 minutes with dextrose 10% flush between each bolus
	<b>Frequency of dose</b>	4-6hrly
	<b>Common side effects</b>	Respiratory depression, hypotension
	<b>Comments</b>	Monitor - respiration - SaO <sub>2</sub> - ECG (ideally)

<b>Analgesic</b>		
Morphine oral	<b>Pain Severity</b>	Moderate
	<b>Dose</b>	Pregnant woman or girl:- 10-20mg <u>Child over 1 year:</u> - 400 micrograms/kg <u>Child under 1 year:</u> - 200 micrograms/kg
	<b>Frequency of dose</b>	4 hourly
	<b>Common side effects</b>	Constipation
	<b>Comments</b>	Observe respiration

<b>Analgesic</b>		
Paracetamol oral	<b>Pain Severity</b>	Mild
	<b>Dose</b>	Pregnant woman or girl:- 500 mg to 1 gram 6 hourly <u>Child over 3 months:</u> - 20mg/kg orally or rectally <u>Child under 3 months</u> 15mg/kg PO/PR 4-6 hourly max 60mg/kg/day

	<b>Frequency of dose</b>	4-6hrly, max 4g/24hrs for pregnant woman or girl, max 80 mg/kg/24hrs for children
	<b>Common side effects</b>	
	<b>Comments</b>	Avoid in liver impairment

<b>Analgesic</b>		
Ibuprofen oral	<b>Pain Severity</b>	Mild - moderate
	<b>Dose</b>	<b>NOT IN PREGNANCY</b> Child:- 5mg/kg up to 30mg/kg/day in 3-4 divided doses
	<b>Frequency of dose</b>	6-8 hourly
	<b>Common side effects</b>	Avoid in asthmatics
	<b>Comments</b>	Not recommended for patients <10kg

<b>Analgesic</b>		
Diclofenac - Oral or rectal	<b>Pain Severity</b>	Moderate
	<b>Dose</b>	Child over 12 months:- 1mg/kg orally or rectally max 150mg/day
	<b>Frequency of dose</b>	8hr
	<b>Common side effects</b>	<b>Avoid in asthmatics and NOT IN PREGNANCY</b>
	<b>Comments</b>	Not for patients under the age of 1yr

## Specific Clinical Situations

### Severe Pain

- severe pain is likely in obstetric emergencies post operatively post operatively, major trauma, significant burns, displaced or comminuted fractures
- give IV morphine as described above
- a further dose can be given after 5-10 minutes if sufficient analgesia is not achieved
- monitor ABC (HR, RR, chest wall expansions, BP, SaO<sub>2</sub>)
- have IV Ringer-Lactate or Hartmann's replacement available (20ml/Kg in a child and 500ml to 1 litre in a pregnant woman or girl)

### Head Injuries

- an analgesic dose does not necessarily cause sedation
- if the patient is conscious and in pain, the presence of a potential deteriorating head injury is NOT a contraindication to giving morphine but give maximum dose of 100 micrograms/Kg in a child or 5mg in a pregnant woman or girl
- if the patient's conscious level does deteriorate, then assess ABC. If hypoventilation occurs, ventilate with bag-valve-mask
- if necessary, a dose of naloxone will help distinguish whether reduced conscious level is due to morphine or increasing intracranial pressure but will reverse analgesia

### Venepuncture and Cannulation

The following local anaesthetics can be used prior to venepuncture and cannulation:

- an ice cube inside the finger of a plastic glove placed over the vein to be cannulated

**SECTION 4 QUIZ 1**

1. Regarding the WHO pain ladder the following statements are true
  - a. comprises 2 steps
  - b. step 2 involves combining a strong opioid with or without a non opioid and with or without adjuvants
  - c. is applicable to children and pregnant women or girls
2. When giving lidocaine 0.5 to 2% the following statements are true
  - a. onset is 2 minutes and effectiveness for 2 hours
  - b. maximum dose is 3 mg/kg
  - c. a concentration of adrenaline of 5 micrograms/ml can be added (1 in 200,000)
3. The following are signs of lidocaine toxicity
  - a. numbness lips and tongue
  - b. rapid breathing
  - c. tonic clonic convulsions

ANSWERS:

1. c 2. abc 3. ac

**SECTION 4 QUIZ 2**

1. CONCERNING NSAIDS the following statements are true
  - a. should not be given if peptic ulcer or platelet abnormalities
  - b. can be given orally and rectally
  - c. can be safely used in the 3<sup>rd</sup> trimester of pregnancy
2. CONCERNING OPIATES the following statements are true
  - a) are potentially dangerous in raised intracranial pressure
  - b) given IV can drop the blood pressure

ANSWERS:

1. ab (dangerous to fetus in last trimester) 2. ab

**Anaesthetic issues** (see [IMEESC Best Practice Protocols](#) and [WHO Pregnancy C37-C-46](#))

The limiting step is often the availability of "trained anesthetic doctors" - and woman and babies die because of it. Specially trained nurses can safely give adequate anesthesia in many situations.

**Anaesthesia for Obstetric patients**

Remember there are two patients – pregnant woman or girl and baby. The condition of the pregnant woman or girl affects the condition of the baby.

**ALL pregnant women or girls must be put in the left lateral tilt position to avoid aorto-caval compression and supine hypotension.**

Maintaining adequate oxygenation and resuscitation of the **pregnant woman or girl** is the best initial way of treating and preventing fetal distress

Potential areas for problems:

**Risks to the pregnant woman or girl:**

**Hypoxaemia:**

Pregnant women are at risk of hypoxia. They use oxygen faster than non pregnant women, and because of the pregnancy it is more difficult for them to breathe deeply. Pulse oximetry is useful.

**Hypovolaemia**

Risk in hot season, pre eclampsia, APH, starvation during prolonged labour etc.

**Acid regurgitation**

The pregnancy pushes the stomach upwards and the gut empties slower, so all pregnant women are at risk. Can result in aspiration pneumonitis. Give 30ml sodium citrate or other appropriate antacid to all women, before Caesarean section.

**Risks to the fetus:**

**Hypoxaemia****Acidosis**

Due to reduced placental perfusion. Maternal BP is maintained at the expense of placental flow; so by the time the maternal blood pressure has dropped the baby may already be distressed.

**Risks to both**

**Supine hypotensive syndrome**Problems with surgery:

Blood loss especially in placenta praevia, previous section etc.

Problems with drugs:

Ketamine - causes increase in BP. Should not be given to women with hypertension, but can be used in resuscitation of women with hypovolaemia. Also causes uterine contraction - may be a problem in fetal distress or where extraction of the baby may be a problem - eg. transverse lie. Narcotics and sedatives cross the placenta, so ideally should not be given until the cord is clamped.

Problems with equipment:

Make sure all resuscitation equipment is available and working: bag-valve-mask, airway equipment, oxygen, IV fluids, suction, SaO<sub>2</sub>, BP.

**Preoperative preparation:**

Explain to the patient the type of anaesthesia.

Do not give pre op sedative, as it may reduce the baby's respiration and conscious level at birth.

Give antacid (sodium citrate 30mls) immediately prior to anaesthesia.

**Spinal (sub-arachnoid) anaesthesia in the pregnant woman or girl**

A spinal injection gives a dense block of rapid (within 5-15mins) onset that lasts for about 2 hours and can be ideal for Caesarean Section.

Its downside is that it causes vasodilatation with consequent hypotension. This can be prevented with fluid loading before spinal insertion and treated with IV fluid boluses and ephedrine.

A spinal should not be used if a patient has hypovolaemia, eg due to bleeding or shocked eg due to sepsis or ruptured uterus.

**Indications for spinal anaesthesia**

Caesarean section: Laparotomy (not optimal): Evacuation of residual products of conception:

Manual removal of placenta: Repair of third and fourth degree tears.

**Precautions**

Correct hypovolaemia first.

Be aware of the possible subsequent development of a coagulation disorder, for example with severe pre-eclampsia, eclampsia or placental abruption.

**Contraindications**

No experience of spinal anaesthesia or inadequate resuscitation facilities.

Uncorrected hypovolaemia.

Coagulopathy – eg. if spontaneous bruising.

Fixed cardiac output eg aortic valve stenosis.

Allergy to local anaesthetics.

Localised infection.

**Procedure**

- Ensure [large bore IV cannula \(14 or 16G\) and IV infusion running.](#)
- Infuse 500 – 1000 ml of IV fluids (Ringer-Lactate or Hartmann's or Ringer's Lactate) to preload pregnant woman or girl and avoid hypotension. Also ensure atropine 0.6mg and ephedrine 30 or 50mg diluted to 10ml with 0.9% saline or Ringer-Lactate or Hartmann's immediately available.
- Check the blood pressure.
- **Sterility is critical. Use antiseptic skin solution to clean the patient's back over a wide area. Use sterile gloves and ideally a sterile apron. Do not touch the point or shaft of the spinal needle with your hand. Hold the needle only by its hub.**
- Prepare the spinal anaesthetic – Bupivacaine 0.5% heavy – 2 to 2.5ml.
- Inject 1% lidocaine solution using a fine 25G needle to anaesthetise the skin over the site – L3/4 or L4/5. Do not use a space above L2/3 because the spinal cord ends at around L1/2.
- Introduce the finest spinal needle available (24G) via an introducer needle in the midline through the anaesthetised skin, at a right angle to the skin in the vertical plane. Fine spinal needles greatly reduce the risk of post dural puncture headache.
- If the **needle hits bone** it may not be in the midline. Withdraw the needle and reinsert it, directing it slightly upwards while aiming in the direction of the umbilicus. It is important to have 2 correct planes ie. midline and also not too near to the spinous processes above or below.
- Advance the spinal needle towards the sub-arachnoid space. A loss of resistance may be felt as the needle pierces the ligamentum flavum.
- Once the needle is through the ligamentum flavum, push the needle slowly through the dura. You may feel another slight loss of resistance as the dura is pierced.
- Remove the stylet. Cerebrospinal fluid (CSF) should flow out of the needle.
- If **CSF does not come out**, reinsert the stylet and rotate the needle gently. Remove the stylet to see if fluid is flowing out. If you continue to fail, try another space.
- Once CS flows out of the needle inject 2 to 2.5ml of the above local anaesthetic solution.

***Never proceed with the injection if the patient complains of pain on injection***

Lie the pregnant woman or girl on her back. **Have the operating table tilted at least 15 degrees to the left or place a pillow or folded linen under her right lower back to decrease supine hypotensive syndrome.**

Recheck the blood pressure every 5 minutes after the spinal is inserted until the end of the procedure. A fall in blood pressure is likely. If there is significant hypotension ie systolic BP <100mmHg or >20% fall, or if the pregnant woman or girl has nausea or vomiting.

- Give the IV infusion as fast as possible.
- Give ephedrine in 3-6mg increments until there is a response.
- Give high flow oxygen via face mask.

After the spinal injection wait 5 minutes and then pinch the skin with forceps. There should be no pain with the pinch up to the level of the nipples. If the pinch hurts wait 5 minutes, then retest the level of the spinal block.

After surgery the pregnant woman or girl does not have to lie flat, but may not be able to move her legs for 2 – 4 hours. The first time she mobilises after a spinal she should be accompanied in case she has residual weakness.

### **Complications of spinal anaesthesia**

1. Hypotension
2. Sensory block – full bladder, unnoticed by patient
3. Headache can occur following a spinal, but uncommon if small gauge spinal needles are used

Headache occurs because of a leak of CSF, which causes traction on intracranial structures.

A typical headache is frontal and/or occipital and worse on sitting or standing, better when lying down. It can be immediate or delayed.

Management: analgesia as per WHO pain ladder (page xx)

Keep patient well hydrated. Spread of local anaesthetic

When using "heavy" (ie hyperbaric – heavier than CSF) Bupivacaine as is used for spinals, the position of the patient affects where the local anaesthetic lies and can be used to influence the height of the block. All patients should have their head raised on a pillow to prevent high spread of the anaesthetic. The position of the block can be brought higher by placing the table head down. Gravity can be made to influence the level of the block for up to 20 minutes after the injection.

If there is bradycardia, tingling or weakness in the hands, or difficulty breathing, the block is likely to be high. Give atropine 0.6mg in the pregnant woman or girl if bradycardic, increase the IV infusion rate and give ephedrine. An ampoule of ephedrine may be put into the IV infusion.

Intracranial spread can rarely also occur. It produces loss of consciousness and apnoea = Total spinal block.

### **Management of spinal blocks which are too high or total**

Call for help

#### Airway

Assess and maintain patency

Give oxygen 15L/min via facemask: pulse oximetry – should be already attached

#### Breathing

Assess and give chest inflations with bag mask valve if there is apnoea or inadequate breathing

Ideally protect airway by intubation if patient is unconscious (P or U on AVPU)

#### Circulation

High or total spinal blocks can cause cardiac arrest.

Assess pulse and BP

Chest compressions if cardiac arrest or inadequate central pulse (BP may be unrecordable)

Tilt to left if not already

Treat hypotension with IV Ringer-Lactate or Hartmann's and ephedrine

Treat bradycardia <50/min in the pregnant woman or girl with atropine 0.6 mg IV, repeated after 3 minutes as necessary

Check fetal heart and consider timing and method of delivery.

Consider and exclude other causes of unconsciousness eg. eclampsia, hypoglycaemia, epilepsy, opioid drugs, intracranial bleed.

Keep chart of pulse, BP, respiratory rate, SaO<sub>2</sub>, FH and treatments given.

5. Anaphylaxis: see Section 9 for management

### **Ketamine in pregnancy**

Ketamine causes a trance-like state. It is a unique drug causing sleep, analgesia and short term memory loss (amnesia). The patient is unconscious, pain-free and has no memory of the time under anaesthesia. The pharyngeal and laryngeal reflexes are active but are not completely normal. Therefore it is important that the patient is **starved** and anaesthetised on a **tipping table** with a **sucker** available. It is *relatively* safe (no anaesthesia is 100% safe), acts very *quickly*, and can be given IV or IM.

### **Contraindications**

High BP/PIH/Eclampsia/Heart disease.

### **Effects:**

Ketamine causes sympathetic nervous system stimulation. The additional use of diazepam will reduce the amount of sympathetic stimulation.

Ketamine also raises intracranial pressure which makes it unsuitable for patients with Eclampsia.

### **Central nervous system:**

The effects start 1- 5 minutes after IV injection. It produces a "dissociative state". The eyes may remain open and may make quick side – to –side movements (nystagmus), and the patient may move during surgery. The patient can be quite agitated, crying and distressed on waking up. This can be helped with diazepam (see below) as part of the premedication.

Causes an increase in intracranial pressure.

### **Cardiovascular system:**

Ketamine causes mild stimulation of the CVS – BP rises by about 25% and heart rate increases by 20%. This increases the workload of the heart. Premedication with diazepam (see below) can reduce the rise in BP. A further small dose of diazepam can be given IV if BP rises too high. It is not ideal to give to pregnant women or girls with PIH because of the rise in blood pressure.

### **Respiratory system**

If given rapidly IV it can stop the patient breathing for up to a minute. Ventilate the patient until the effect wears off. If given slowly the breathing rate may increase. The airway is usually maintained, but still needs to be watched closely. The oxygen saturation may decrease so give oxygen. Ketamine causes bronchodilatation so can be useful in asthmatic patients.

Laryngeal spasm may occur (rarely), and may be caused by secretions or blood falling onto the vocal cords.

Salivation is increased.

### **Muscle**

Tone is increased. This makes it an unsuitable drug for major abdominal surgery where abdominal relaxation is necessary, but is usually not a problem for Caesarean section. Some body movements can occur.



**Uterus and placenta**

May increase the tone of the uterus. Crosses the placenta easily so the fetus gets ketamine. At doses of >2mg/kg this may cause respiratory depression in the baby. Don't give phenergan or diazepam until after the baby is delivered.

**Premedication before Ketamine**

Atropine 10-20micrograms/kg (max 600micrograms) IM 30 mins before or IV at induction of anaesthetic.

Diazepam 100micrograms/kg (maximum 10mg in a pregnant woman or girl) can be given IV at time of induction to prevent hallucinations (for Caesarean section, give diazepam **after** the baby is delivered).

Give oxygen at 6–8 L per minute by mask or nasal cannulae.

**Administration:**

Start an IV infusion and ensure reliable IV cannula is in place.

Ketamine may be given IM, IV or by infusion.

Most patients will require 5–10 mg/kg body weight IM. Surgical anaesthesia is reached within 10 minutes and lasts up to 30 minutes.

Alternatively, give 2 mg/kg body weight IV slowly over 2 minutes (in which case the action lasts for only 15 minutes).

Infusion of ketamine is described below. This is suitable for Caesarean section.

When additional pain relief is needed, give ketamine 1 mg/kg body weight IV.

**Ketamine anaesthesia should not be used in women with elevated blood pressure, pre-eclampsia, eclampsia or heart disease.**

In doses of **250-500micrograms/kg IV** ketamine is a good analgesic.  
**1-2mg/kg IV or 5-10mg/kg IM** is anaesthetic.

**KETAMINE INFUSION**

- Check vital signs (pulse, blood pressure, respiration, temperature)
- Induction of anaesthesia is achieved by slowly administering ketamine 2 mg/kg body weight IV slowly over 2 minutes. For short procedures lasting less than 15 minutes, this will provide adequate anaesthesia.
- If there are signs of airway obstruction insert an oro-pharyngeal airway
- Ideally, oxygen at 2L/min should be given, but if limited supply, give oxygen if SaO<sub>2</sub> <95%
- For longer procedures, infuse ketamine 200 mg in 100ml 5% dextrose at 2 mg per minute (i.e. 20 drops per minute). May need more or less. Stop the infusion 10 minutes before the end of the operation. If the patient needs a blood transfusion put it through another drip.

Advantages are:-

- 1) gives more control than an IM or IV bolus
- 2) uses less ketamine than IM dose
- 3) is simple and fast and safe
- 4) makes anaesthesia and recovery quick

- Check the level of anaesthesia before proceeding with the surgery. Pinch the incision site with forceps. If the pregnant woman or girl **feels the pinch** wait 2 minutes and then retest.

Monitor vital signs (pulse, blood pressure, respiration) every 5 minutes during the procedure.

#### POST-PROCEDURE CARE

Discontinue ketamine infusion and administer a postoperative analgesic suited to the type of surgery performed.

Takes about 2 hours to wake up. Needs to be in a quiet area. Let her wake up naturally.

Maintain observations every 30 minutes until the pregnant woman or girl is fully awake; ketamine anaesthesia may take up to 60 minutes to wear off.

#### Local Anaesthesia

In extreme situations Caesarean Section can be undertaken under infiltration with local anesthetic.  
– This is not ideal but can be helpful in an extremely ill patient – for example unconscious and eclamptic - where GA/intubation is not available and ketamine/spinal inadvisable.

#### SECTION 4 QUIZ 3

1) **When giving anaesthesia in pregnancy the following statements are true**

- a) left lateral tilt is needed after 22 weeks gestation
- b) acid regurgitation is no more frequent than in the non-pregnant
- c) the mother is susceptible to hypoxaemia

2) **Regarding spinal anaesthesia in pregnancy the following statements are true**

- a) should not be given if mother has a low blood pressure
- b) can be given if there is a blood clotting disorder
- c) may result in a high spinal block with apnoea or inadequate breathing

3) **Regarding ketamine in pregnancy the following statements are true**

- a) is contraindicated if there is pre-eclampsia or eclampsia
- b) is contraindicated if hypovolaemia is present
- c) is indicated if heart disease is present

**ANSWERS:**

1. ac 2. ac 3. a