

PERINATAL EDUCATION PROGRAMME

NEONATAL ASPHYXIA AND RESUSCITATION

SKILLS WORKSHOP 16

OBJECTIVES

When you have completed this skills workshop you should be able to:

1. Perform an Apgar score
2. Mask ventilate an infant.
3. Intubate an infant.
4. Give cardiac massage.

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ASSESSING THE APGAR SCORE

The Apgar score determines the infant's clinical condition after birth (i.e. the degree of birth asphyxia). It consists of scoring the infant's heart rate, breathing, colour, tone and response to stimulation.

16-A COUNTING THE HEART RATE.

The heart rate can be counted by listening to the heart with a stethoscope, or by feeling the pulsations at the base of the umbilical cord. The femoral, brachial and carotid arteries are difficult to feel immediately after birth. Usually the heart rate is counted for 30 seconds and then multiplied by 2. A wall clock with a second hand is needed in all delivery rooms.

The normal heart rate is 140 beats per minute with a range of 120 to 160. If the heart rate is above 100, a score of 2 is given. A score of 1 is given if the heart rate is less than 100, while a score of 0 is given if no heart beat can be detected.

16-B ASSESSING THE RESPIRATORY EFFORT.

Observe the infant's respiratory movements. If the infant breathes well or cries, a score of 2 is given. If there is poor or irregular breathing, or occasional gasping only, a score of 1 is given. A score of 0 is given if the infant does not make any attempt to breathe. If infants are being ventilated, stop the ventilation for a few seconds to assess any spontaneous respiration.

16-C DETERMINING THE PRESENCE OR ABSENCE OF CYANOSIS.

The infant's tongue must be examined to determine the presence or absence of central cyanosis. Normally the tongue is pink. Do not look at the lips or mucous membranes of the mouth as their colour is not reliable. Also look at the infants hands and feet for peripheral cyanosis (blue or gray). Most infants have peripheral cyanosis for the first few minutes after birth.

If the tongue, hands and feet are pink the infant is given a score of 2. If the tongue is pink but the hands and feet are cyanosed, a score of 1 is given. A score of 0 is given if the tongue, hands and feet are all cyanosed.

16-D ASSESSING MUSCLE TONE.

The normal infant has good muscle tone at delivery. In the supine position, the arms and feet are moved actively in the air or are held in a flexed position against the body and lifted off the towel. If the tone and movement appear normal, a score of 2 is given. If there is some movement of the limbs but the tone appears decreased, then a score of 1 is given. With decreased tone the limbs are usually not flexed but lie in an extended position away from the body and resting on the towel. If the infant is completely limp and does not move at all, a score of 0 is given.

16-E DETERMINING THE RESPONSE TO STIMULATION.

The infant can be stimulated by drying with a towel or by flicking the feet. If the infant responds well with a cry and movement of the limbs, a score of 2 is given. However, if the response is poor, a score of 1 is given. A score of 0 is given if there is no response to stimulation.

The individual scores of the 5 criteria are now added up to give the Apgar score. The best way to learn how to perform an Apgar score accurately is to score infants with an experienced colleague. With practice the Apgar score can be accurately performed in less than a minute. Do not guess the Apgar score. Always record the Apgar score in the infant's notes.

Usually the individual scores and total Apgar score are recorded at 1 and 5 minutes on a special form which should be attached to the infant's notes.

Figure 16-A. The Apgar scoring sheet.

APGAR SCORE

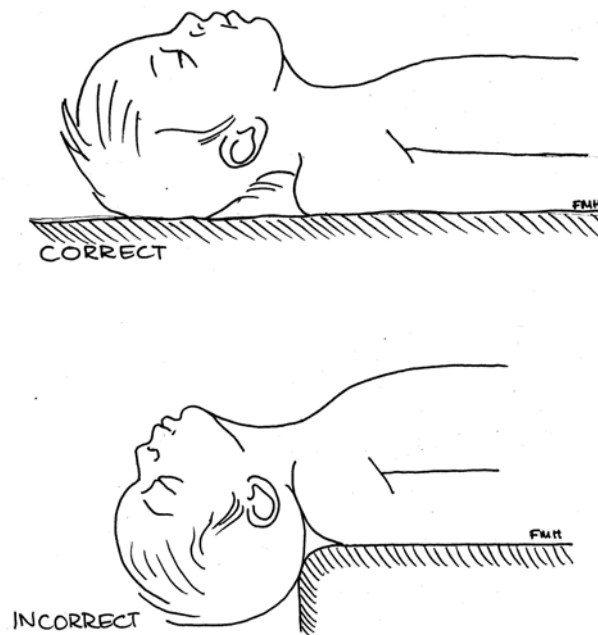
	1 MINUTE		5 MINUTES	
Heart rate per minute	None	0	None	0
	Less than 100	1	Less than 100	1
	More than 100	2	More than 100	2
Respiratory effort	Absent	0	Absent	0
	Weak/irregular	1	Weak/irregular	1
	Good/cries	2	Good/cries	2
Colour	Centrally cyanosed	0	Centrally cyanosed	0
	Peripherally cyanosed	1	Peripherally cyanosed	1
	Peripherally pink	2	Peripherally pink	2
Muscle tone	Limp	0	Limp	0
	Some flexion	1	Some flexion	1
	Active/well flexed	2	Active/well flexed	2
Response to stimulation	None	0	None	0
	Some response	1	Some response	1
	Good response	2	Good response	2
TOTAL SCORE		/10		/10

GIVING MASK VENTILATION**16-F POSITION OF THE INFANT.**

The infant must lie supine (back down) on a firm, flat surface. A resuscitation unit, table or bed can be used. Ideally, the working surface should be at the height of the examiner's waist. The infant's neck should be slightly extended. Do not over extend the neck. If possible, a folded nappy or sheet should be placed under the infant's shoulders to keep the head in the correct position.

If you pretend that you are offered a flower to smell. You would hold the flower in front of your nose, push your head slightly forward and slightly extended your neck. This is the position that you want the infant's head and neck to be in as it keeps the upper air ways open (and makes the larynx easier to see with a laryngoscope). Lifting the angle of the jaw forward also helps to open the airway.

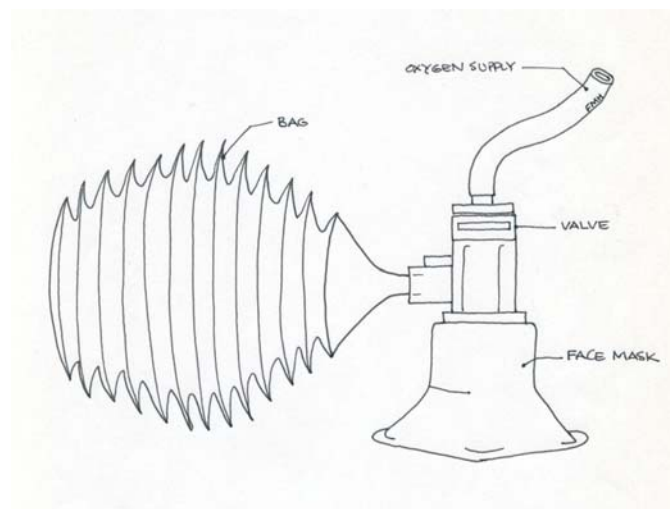
Figure 16-B. Position of head during mask ventilation.



16-G BAG AND MASK VENTILATION.

A neonatal ventilation bag and mask is an essential piece of equipment. If possible a soft face mask should be used. The neonatal Laerdal, Cardiff or Ambu bag and mask are recommended. Alternatively, the Samson resuscitator is a cheap, simple ventilation bag designed to ventilate a newborn infant via a moulded face mask or an endotracheal tube. It can be dismantled and cleaned with soap and water. The mask can be cleaned with an alcohol swab. If looked after well, the Samson ventilator can be used again and again. Always make sure that the little valve is present so that the resuscitator rattles when shaken. Other resuscitation bags (e.g. Cardiff, Ambu or Laerdal) are more effective than the Samson resuscitator but also more expensive. Make sure that the oxygen source is switch on at 5 litres per minute to ensure an adequate flow. A bag and mask can be used with room air alone.

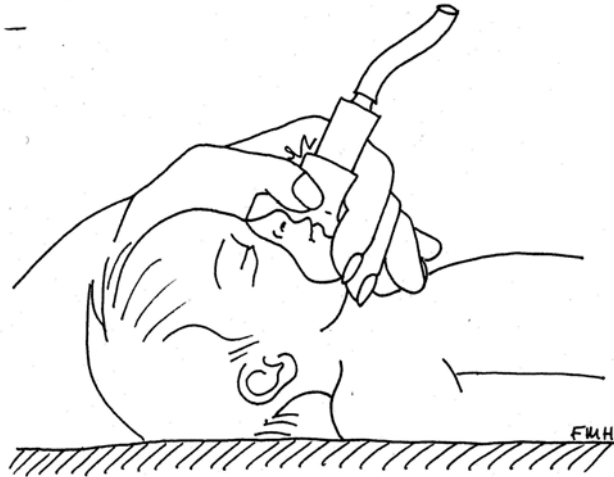
Figure 16-C. The Samson resuscitator.



16-H POSITION OF THE MASK.

The mask must be firmly placed over the infant's nose and face. Hold the mask tightly against the infant's face so that there are no air leaks. The mask should be held in place with the left hand while the bag is compressed at about 40 times per minute with the right hand. If the little and ring fingers of the left hand are placed under the angle of the infant's jaw, the jaw can be gently pulled upwards to keep the airway open and the tongue from falling back.

Figure 16-D. How to hold a Samson resuscitator for mask ventilation.



When giving mask ventilation, always watch the chest movement. Squeeze the bag hard enough to move the chest with inspiration. Good, bilateral air entry should be heard if ventilation is adequate. Most infants can be well ventilated with bag and mask if the airway is open and clear.

MOST INFANTS CAN BE WELL VENTILATED WITH A BAG AND MASK

TRACHEAL INTUBATION

16-I EQUIPMENT NEEDED FOR INTUBATION.

1. A firm, level surface on which to place the infant.
2. A good light so that you can see the infant.
3. A source of heat, such as an overhead heater or a warm room, so that the infant does not get cold.
4. A source of oxygen, a flow meter and plastic tubing. An air/oxygen blender is useful to control the concentration of oxygen provided.
5. A water filled blow-off valve set at 30 cm is often provided. This apparatus consists of a clear perspex cylinder filled with water to a depth of 40 cm. From a T-piece in the oxygen supply line, a glass or perspex tube passes into the water filled cylinder so that the tip of the tube is 30 cm below the surface of the water. If the pressure in the supply line exceeds 30 cm water, the tube starts to bubble and, thereby, prevents any further increase in pressure. The water in the blow-off valve must be changed daily.
6. Endotracheal tubes - 2, 2.5 and 3 mm (internal diameter). Either straight tubes or shouldered tubes (Cole's tubes) can be used although straight tubes are preferable.
7. A ventilation bag and face mask (e.g. Laerdal or Ambu bag) or a Samson resuscitator.
8. Introducers for the endotracheal tubes. Before intubating an infant, the introducer should be placed into the endotracheal tube. Make sure that the end of the introducer does not stick out beyond the tip of the endotracheal tube. With the introducer in place, bend the tip of the endotracheal tube slightly upward.
9. A laryngoscope handle with small straight blades, size 0 (for small infants) and size 1 (for big infants). The blades must be cleaned or sterilized after use.

10. Spare batteries.
11. Spare bulbs.
12. Suction apparatus and tubing. The suction pressure must not exceed 200 cm water (20 kPa or 200 mbar).
13. Suction catheters, sizes F5 and F6. A size F5 catheter will pass down a 2 mm endotracheal tube while a F6 catheter will pass down a 2,5 or 3 mm tube.
14. A stethoscope. A saturation monitor is very useful but not essential.

The equipment must be checked daily to make certain that everything is present and in good working order.

Figure 16-E. An endotracheal tube with an introducer in place. However, usually straight rather than shouldered tubes are used.

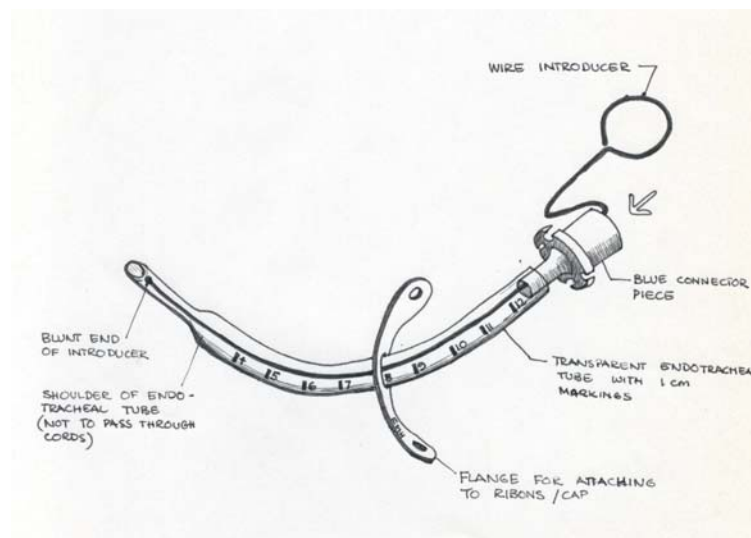
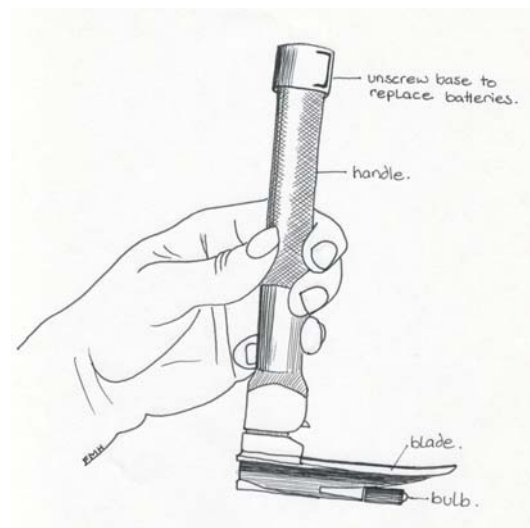


Figure 16-F. A laryngoscope with a small, straight blade.

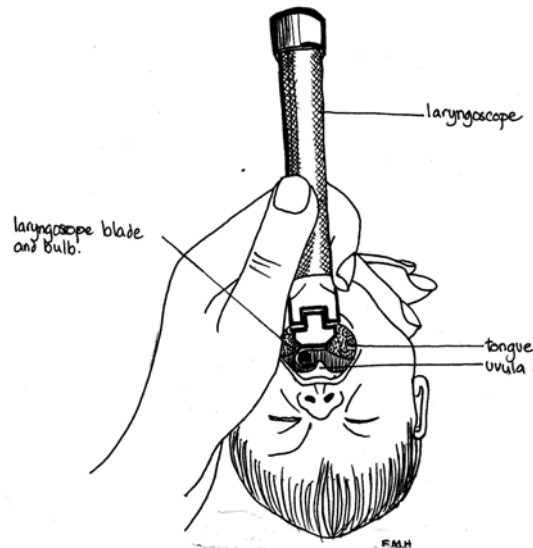


16-J LOOK FOR THE LARYNX WITH THE LARYNGOSCOPE.

1. Pull the laryngoscope blade into a 90 degree position so that the light is switched on. Make sure that bulb is tightly screwed in.
2. Hold the laryngoscope in your left hand (even if you are left handed).
3. With the infant lying supine, and the head in the correct position for mask ventilation, place the blade into the infant's mouth. Keep the base of the blade to the left of the mouth with the tip of

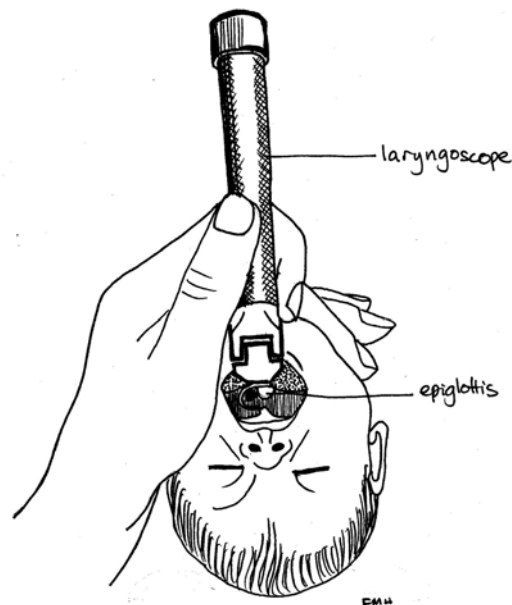
the blade in the midline of the tongue. Throughout the procedure the tip of the blade must always remain in the midline.

Figure 16-G. The blade of the laryngoscope on the tongue.



Slowly move the tip of the blade along the back of the tongue until you can see the infant's epiglottis. The epiglottis is about 1 cm long and is in the midline. It hangs down from the back of the pharynx to cover the opening of the larynx. If your view is obstructed by mucus, suction the pharynx with a catheter held in your right hand.

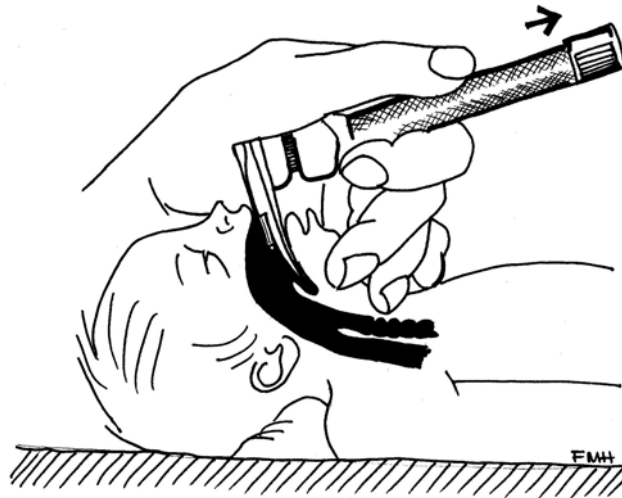
Figure 16-H. A view of the epiglottis.



4. Place the tip of the laryngoscope blade against the epiglottis. The epiglottis must always remain in view. One of the commonest mistakes is to push the blade in too far, beyond the epiglottis. It is important to initially look for the epiglottis rather than the larynx.
5. Now use the laryngoscope to lift the epiglottis out of the way so that the larynx can be seen. It is important to lift the laryngoscope upwards and not to pull the handle back towards you, as this may damage the infant's upper gum.

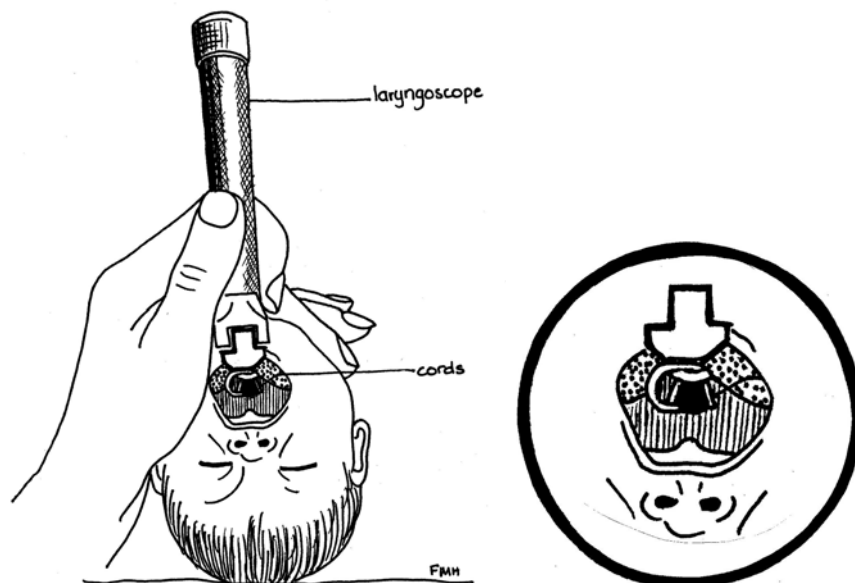
Slight downward pressure on the infant's throat with the little finger of your left hand may make the larynx easier to see.

Figure 16-I. The laryngoscope is lifted upwards to see the larynx.



6. The larynx is a triangular structure and, therefore, is easy to recognise. The two sides of the triangle are formed by the vocal cords. The vocal cords tend to move apart when the infant breathes out. If the cords are in spasm against one another, they can be separated by gently squeezing the infant's chest.

Figure 16-J. View of the larynx.



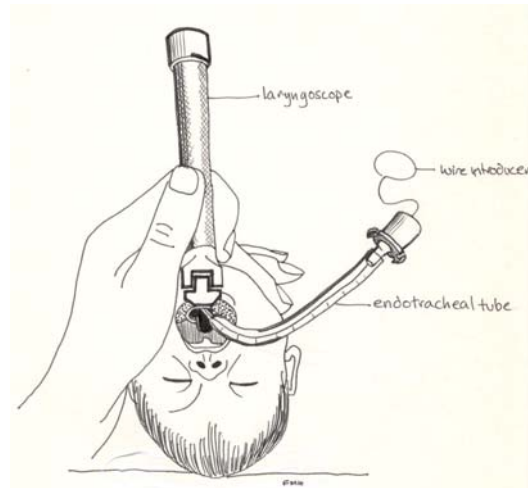
16-K INTRODUCING THE ENDOTRACHEAL TUBE.

1. Take the endotracheal tube, with the introducer in place, in your right hand and insert it towards the larynx from the right side of the mouth. This will allow you to keep the larynx in view all the time. Push the first 1 to 2 cm of the tube through the vocal cords. Always make sure that you can see the vocal cords clearly, otherwise you will push the tube into the oesophagus. If you are using a shouldered tube, make sure that you do not push the tube in

too far. The shoulder will damage the larynx if it is pushed through the vocal cords. Once the tube is correctly in place, the laryngoscope can be removed. Your left hand can now be used to hold the endotracheal tube.

Remove the introducer with your right hand while the endotracheal tube is held in position with your left hand. Make sure that the endotracheal tube does not slip out of the larynx.

Figure 16-K. Introducing the endotracheal tube.



2. Attach the connector at the end of the endotracheal tube to the ventilation bag or Samson resuscitator and ventilate the infant at about 40 breaths per minute using your right hand. Usually the mask is removed before the ventilation bag or Samson resuscitator is attached to the connector of the endotracheal tube.
3. Listen to both sides of the chest and watch the chest movement:
 - (i) The chest should move well with each inspiration and air should be heard to enter both sides equally when the chest is examined with a stethoscope.
 - (ii) If the air entry is good on the right side but poor on the left side of the chest, then the endotracheal tube has been pushed in too far and has entered the right bronchus. Slowly pull the endotracheal tube back until good air entry is heard over the right chest.
 - (iii) If the endotracheal tube has been placed into the oesophagus by mistake, then the air entry will be poor on both sides of the chest and the chest movement will also be poor. In addition, the stomach will become distended with air and air entry will be well heard over the abdomen. The tube must be removed and be replaced correctly.
 - (iv) If the infant cannot be intubated within 30 seconds of attempting, remove the laryngoscope & mask ventilate for a minute to allow the infant to recover. Then try again.
 - (v) Once the infant has started to breathe well, the heart rate is above 100 beats per minute and the tongue is pink, the endotracheal tube can be pulled out.

A plastic intubation head model or fresh stillborn infant can be used to learn the method of laryngeal intubation.

CARDIAC MASSAGE

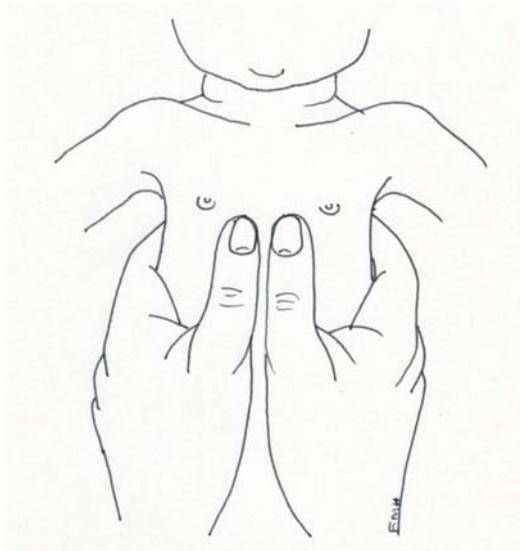
If the heart rate remains below 60 beats per minute after adequate ventilation has been achieved, the infant should be given cardiac massage by applying chest compressions to improve the circulation.

16-L GIVING CARDIAC MASSAGE.

It is best if an assistant ventilates the infant while you give cardiac massage. With the infant supine and the head facing away from you, place both of your hands under the infant's chest. Both thumbs are now placed on the lower half of the infant's sternum. Push down with both thumbs but do not

squeeze the chest. This will depress the sternum by about 2 cm. Push down on the sternum at about 100 times per minute. It is not necessary to pause after every few pushes so that the assistant can expand the lungs. Both ventilation and cardiac massage should be given continuously and not in "cycles". Continue with the cardiac massage until the infant's heart rate increases to above 60 beats per minute.

Figure 16-L. The position of the hands when giving cardiac massage.



In an emergency, if you do not have an assistant, cardiac massage can be given using one hand only to depress the sternum while the other hand is used to ventilate the infant.

Pressing on the sternum compresses the heart between the sternum and the spine. This squeezes blood out of the heart and into the circulation. When the sternum returns to the normal position, the heart fills again with blood. Repeated compression of the heart causes the blood to circulate throughout the body.

**** The main aim of chest compressions is to perfuse the coronary arteries. This takes place during diastole. Therefore, do not give chest compressions too fast.*