**Positioning the Patient's Head**

The purpose of the improved „Jackson" or „sniffing" position is to bring the oral axis into better alignment with the pharyngeal and laryngeal axes. In the normal supine position these axes intersect at an unfavorable angle (Fig. 153.1). Placing a pillow beneath the elevated head ( ⇧ ) brings the axes of the pharynx and larynx into better alignment (Fig. 153.2). When the head is placed in a „sniffing position" by extending the neck (Fig. 153.3), the oral axis is also at a more favorable angle, improving the laryngoscopic exposure of the larynx. However, you should avoid excessive hyperextension or allowing the patient's head to hang over the edge of the table.

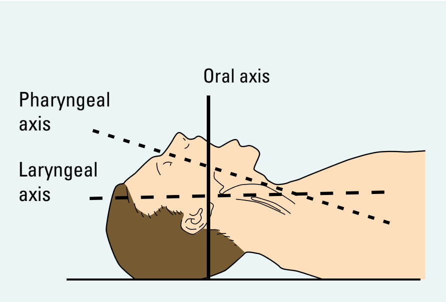


Fig. 153.1 Normal supine position.

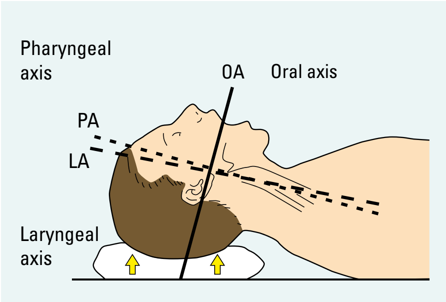


Fig. 153.2 Head elevated ...

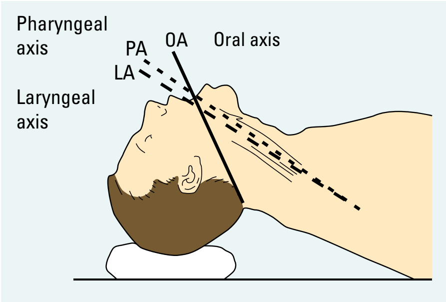


Fig. 153.3 ... and neck extended.

It is best to first practice this maneuver on a training dummy (Fig. 153.4) and on each other (Fig. 153.5). Pull the chin anteriorly and superiorly ( ⇖ ) and carefully push the back of the head slightly inferiorly ( ⇨ ) to align the visual axis of the mouth with the larynx (Fig. 153.6). Then open the patient's mouth using the Esmarch maneuver: press the jaw inferiorly with both thumbs ( ⇩ ) while pulling the angles of the mandible anteriorly with the other fingers ( ⇧ ). This lifts the floor of the mouth and the tongue, keeping the airway open (Fig. 153.7). Now press the face mask tightly against the patient's face while continuing to lift the jaw slightly with your middle, ring, and little fingers ( ⇧ ) and holding the mask with your thumb and index finger (Fig. 153.8). As you do this, your hand appears to form a C, which is why the maneuver is also known as the „C grip" (Fig. 153.9).

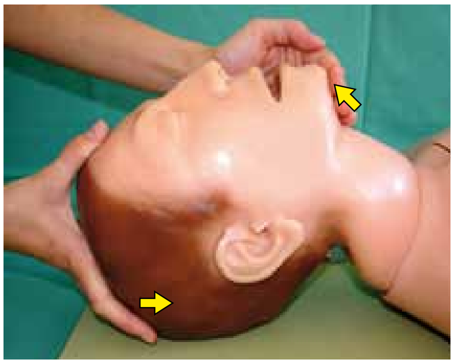

Fig. 153.4 Practice on an dummy ...

Fig. 153.5 ... and on each other.

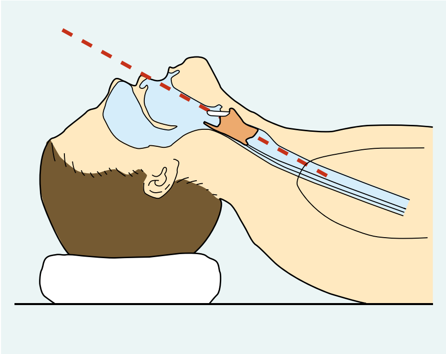

Fig. 153.6 Line the sight.

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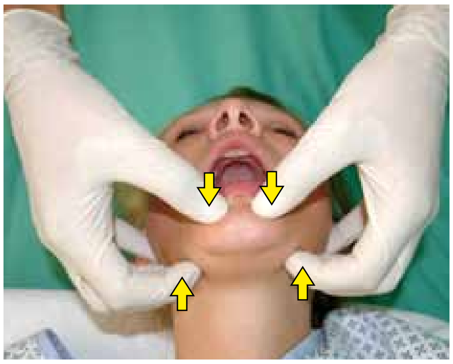

Fig. 153.7 Esmarch maneuver

Fig. 153.8 Press mask tightly to face.

Fig. 153.9 „C grip"

It is best to kneel next to the patient's chest and place your shoulders in a vertical line (↓) directly over the middle of the patient's sternum. This allows you to use the weight of your own upper body to achieve better compression. Lock your elbows and keep them extended the whole time **(Fig. 179.1)** while pressing the sternum 100 to 120 times per minute about 5-6 cm (↕) posteriorly toward the spine **(Table 179.2)**. These values apply to an adult.

This activity is very strenuous. If several people are present, trade off about every 2 minutes. Change places quickly: Every interruption of cardiac compression leads to a rapid drop in aortic diastolic pressure in particular, which is crucial to maintaining coronary perfusion. Current practice reflects these findings and has shifted the ratio of compression to respiration cycles in favor of compression at 30:2 [30.2].
After 30 compressions administer two artificial ventilations using the mouth-to-mouth technique, holding the patient's nose closed (⇨ ⇦) with his or her neck hyperextended and chin drawn forward (⇧ in **Fig. 179.3**).

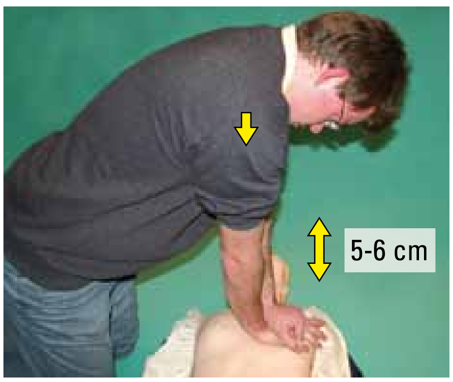


**Fig. 179.1** Body position

**Body position, cardiac massage**

- Kneel next to patient
- Shoulders directly over patient's sternum
- Lock elbows and keep then extended
- Press sternum approx. 5 - 6 cm posteriorly: 100 - 120 times per min.
- Allow sternum to rise completely but keep balls of hands in place
- Compression and relaxation phases are equally long (approx. 2 per sec.)

**Table 179.2** Cardiac massage

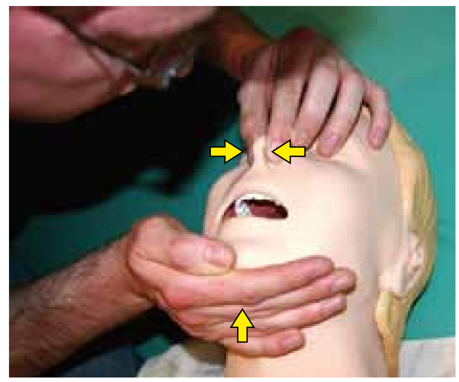

**Fig. 179.3** Nose closed, chin raised.

**Fig. 179.4** First ventilation

**Fig. 179.5** Check: does chest fall?


**Fig. 179.6** Second ventilation

After you have taken a deep breath yourself, seal the patient's mouth with your lips and exhale the air at a constant rate for about two seconds **(Fig. 179.4)**. Avoid rapid forceful exhalations. That could increase the risk of the insufflated air entering the stomach and leading to regurgitation and possible aspiration of stomach contents. An alternative is to use the mouth-to-nose technique, holding the patient's mouth shut.

Then lift your head and turn it toward the patient's chest **(Fig. 179.5)** to evaluate the effect of the ventilation: The patient's chest should fall again in its expiration phase. While doing this, you will breathe in ambient air for the next ventilation at some distance from the patient's face **(Fig. 179.6)** and not the air exhaled by the patient. Alternate between 30 cardiac compressions and two ventilations (30:2) in this manner.

### Indications

The technique of placing a Swan-Ganz catheter in a pulmonary artery was developed especially for patients undergoing cardiac surgery or in the intensive care unit who require intensive hemodynamic monitoring. Other candidates include patients with severe hypovolemia, sepsis, acute heart or kidney failure, and adult respiratory distress syndrome (ARDS). The thermodilution method can be used after bolus injections to determine cardiac output even with „simple" pulmonary artery catheters **(Fig. 227.1)**. More advanced catheter models are also able to measure cardiac output continuously with the aid of thermal energy from a thermal wire ( ⇙⇩⇩ ) on the catheter **(Fig. 227.2)**. These catheter designs usually require several additional connections ( ⇧ ) to monitors specifically designed for this purpose.

Another type of Swan-Ganz catheter also permits continuous measurement of mixed venous $O_2$ saturation via fiberoptic reflectance spectrophotometry. The amount of light reflection, refraction, and absorption depends on the ratio of oxygenated blood to unoxygenated blood. Yet another type of Swan-Ganz catheter can be used to calculate the right ventricular ejection fraction or the end-diastolic volume of the right ventricle, respectively.

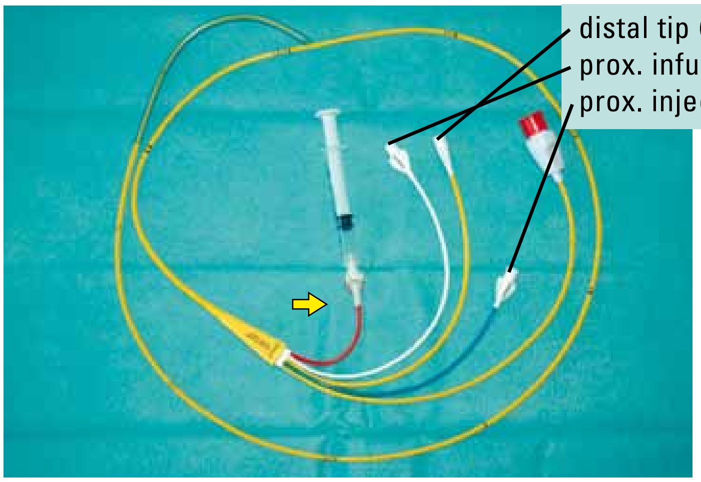


**Fig. 227.1** Regular pulmonary catheter.

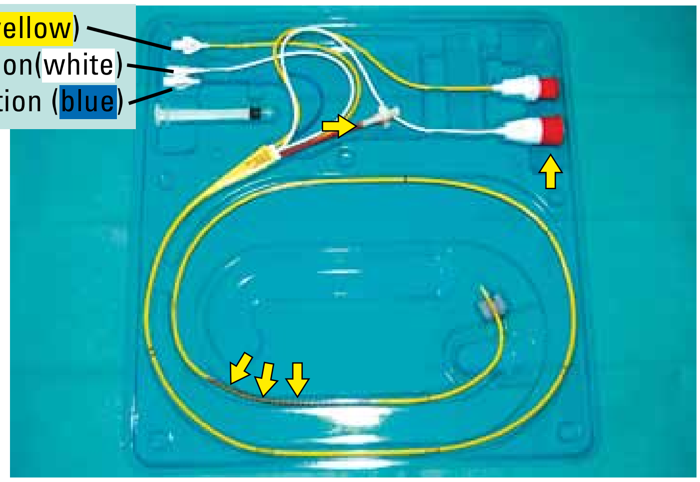

**Fig. 227.2** Catheter for continuous measurement of cardiac output.

These catheters are floated into position with the venous blood flow through the right atrium and ventricle past the pulmonary valve and into one of the two pulmonary arteries, in order to measure the pulmonary capillary wedge pressure (PCWP) to estimate the left ventricular preload (see pp 236/237): Here, over the **red connection tube** (⇨) a balloon at the distal tip of the catheter (⇗ in **Fig. 227.3**) can be inflated (⇖). Most Swan-Ganz catheters also have several lumens for withdrawing blood and infusing medications and solutions **(Fig. 227.2)**.

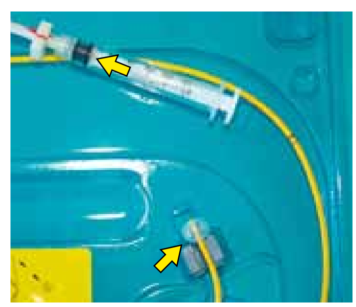

**Fig. 227.3** Inflating the distal balloon.

### Contraindications and Complications

These include infections at the insertion site, air embolisms (therefore the patient is placed in a head-down position as prophylaxis while the catheter is placed), and thrombosis of the access veins or at the tip of the catheter. Pneumothorax can occasionally occur where access is obtained via the apex of the lung. Therefore do not attempt bilateral venous access without first excluding pneumothorax on the side initially catheterized. Cervical hematoma: If the carotid artery is inadvertently opened, discontinue the attempt and compress the access site for several minutes. Cardiac arrhythmias have been known to occur as the catheter is advanced. Less common complications include coiling or kinking of the catheter.

Some catheters have a heparin-coated outer surface to minimize the risk of catheter-induced thrombosis. In patients with known hypersensitivity to heparin or heparin-induced thrombocytopenia (HIT), care should be taken to use an uncoated Swan-Ganz catheter. Particular caution and electrocardiographic monitoring are indicated in patients with preexisting cardiac arrhythmias or known aortic stenosis (due to the risk of total atrioventricular block or tachyarrhythmias including ventricular fibrillation).