ZSMU

Department of general practice – family medicine

CARDIOPULMONARY RESUSCITATION

HISTORICAL REVIEW

- **5000 - first artificial mouth to mouth   3000 BC ventilation**

- **1780 – first attempt of newborn resuscitation by blowing**

- **1874 – first experimental direct cardiac massage**

- **1901 – first successful direct cardiac massage in man**

- **1946 – first experimental indirect cardiac massage and defibrillation**

- **1960 – indirect cardiac massage**

- **1980 – development of cardiopulmonary resuscitation due to the works of Peter Safar**

all cases accompanied with hypoxia

extracardiac

Causes of cardiac arrest

cardiac

Primary lesion of cardiac muscle leading to the progressive decline of contractility, conductivity disorders, mechanical factors

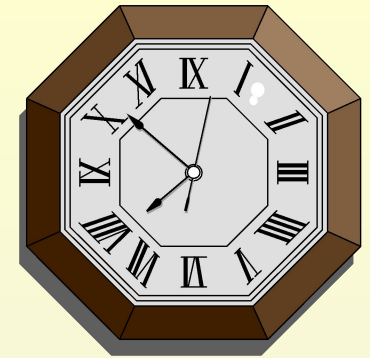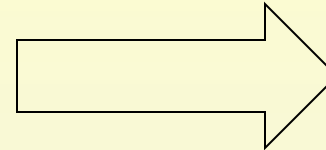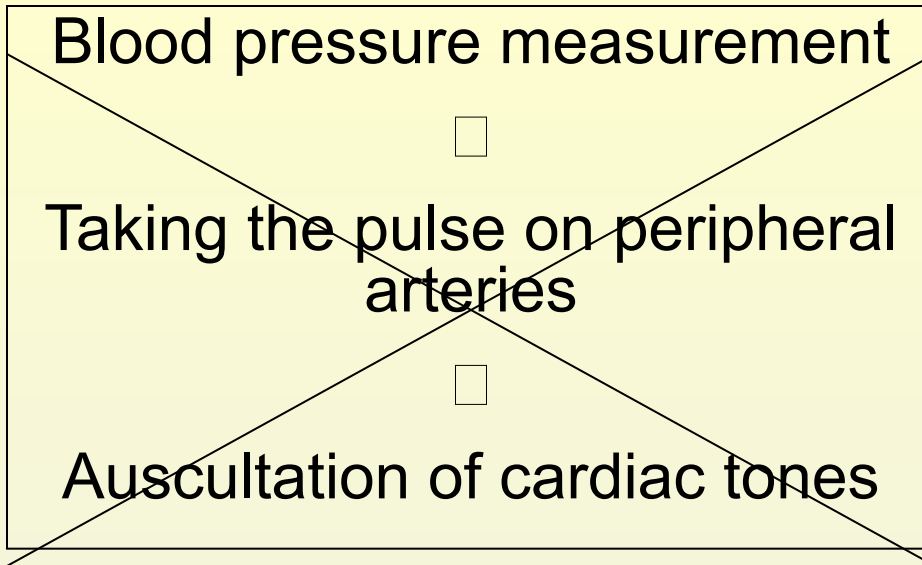# Causes of circulation arrest

Cardiac

- Ischemic heart disease (myocardial infarction, stenocardia)
- Arrhythmias of different origin and character
- Electrolytic disorders
- Valvular disease
- Cardiac tamponade
- Pulmonary artery thromboembolism
- Ruptured aneurysm of aorta

Extracardiac

- airway obstruction
- acute respiratory failure
- shock
- reflector cardiac arrest
- embolisms of different origin
- drug overdose
- electrocution
- poisoning

Diagnosis of cardiac arrest

Blood pressure measurement

☐

Taking the pulse on peripheral arteries

☐

Auscultation of cardiac tones

Loss of time !!!

Symptoms of cardiac arrest

● absence of pulse on carotid arteries – *a pathognomonic symptom*

● respiration arrest – *may be in 30 seconds after cardiac arrest*

● enlargement of pupils – *may be in 90 seconds after cardiac arrest*

Sequence of operations

- Check responsiveness
- Call for help
- Correctly place the victim and ensure the open airway
- Check the presence of spontaneous respiration
- Check pulse
- Start external cardiac massage and artificial ventilation

In case of unconsciousness it is necessary to estimate quickly
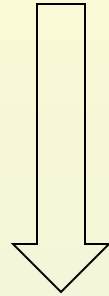
✔ **the open airway**

✔ **respiration**

✔ **hemodynamics**

Main stages of resuscitation

C (Circulation) – restore the circulation by external cardiac massage

A (Airway) – ensure open airway by preventing the falling back of tongue, tracheal intubation if possible

B (Breathing) – start artificial ventilation of lungs

D (Differentiation, Drugs, Defibrilation) – quickly perform differential diagnosis of cardiac arrest, use different medication and electric defibrillation in case of ventricular fibrillation

A (Airway)
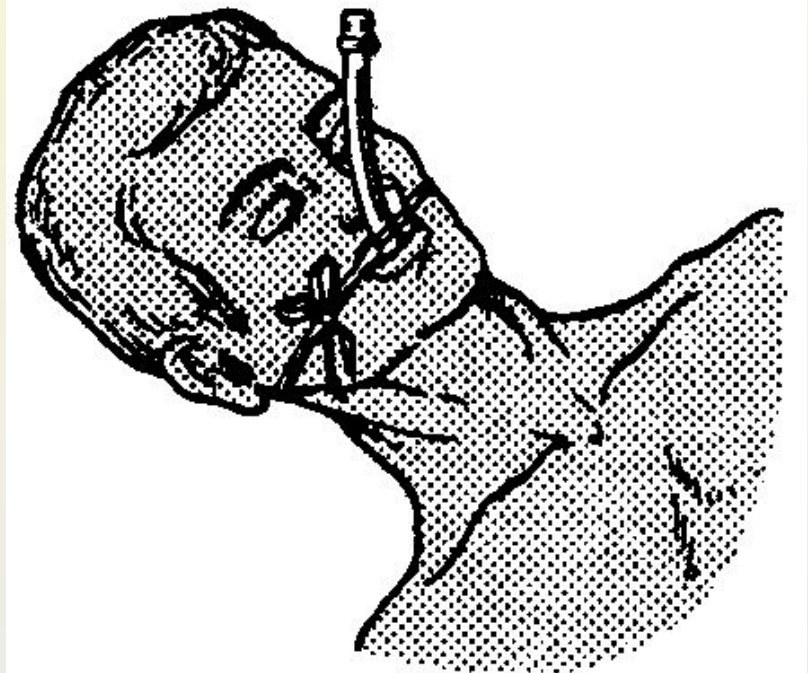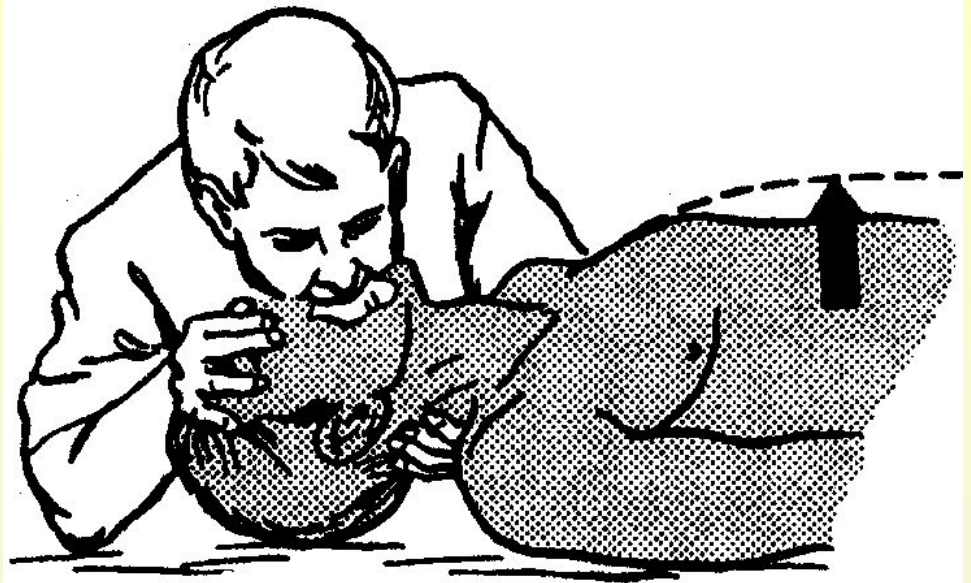## ensure open airway
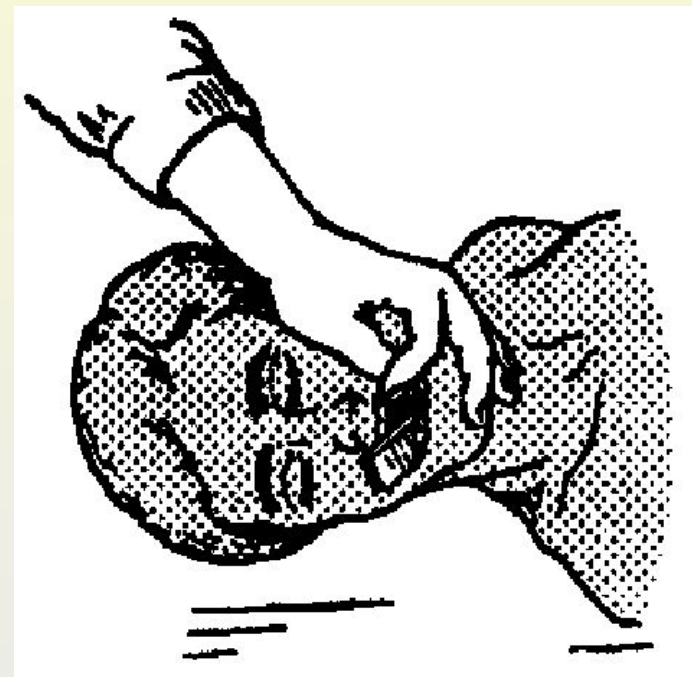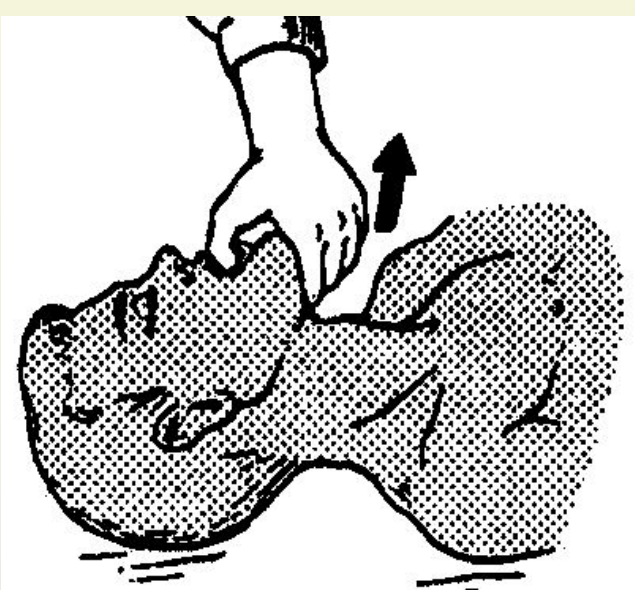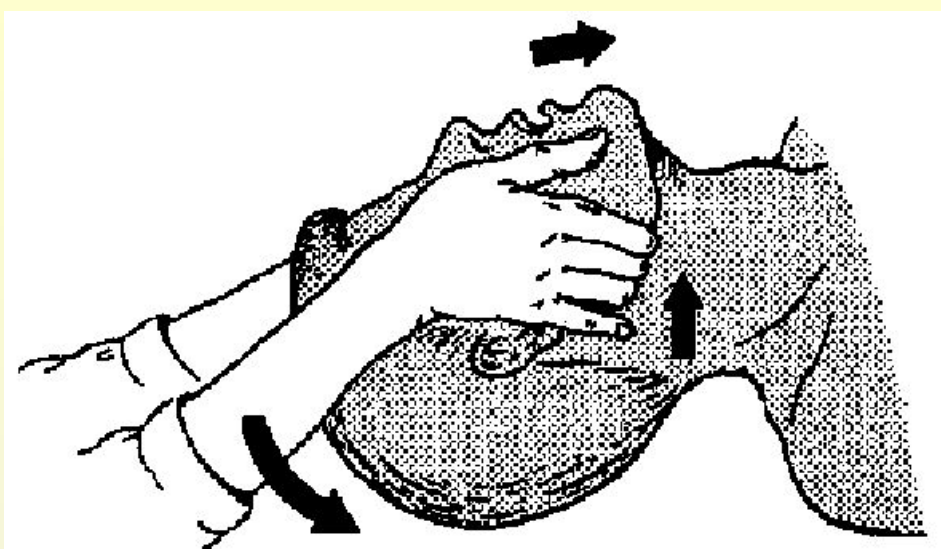
Open the airway using a head tilt lifting of chin. Do not tilt the head too far back

Check the pulse on carotid artery using fingers of the other hand

B (Breathing)

Tilt the head back and listen for. If not breathing normally, pinch nose and cover the mouth with yours and blow until you see the chest rise.

Algorithm
for artificial ventilation

mouth to mouth or mouth to nose respiration	**ventilation by a face mask and a self-inflating bag with oxygen**

2 initial subsequent breaths

wait for the end of expiration

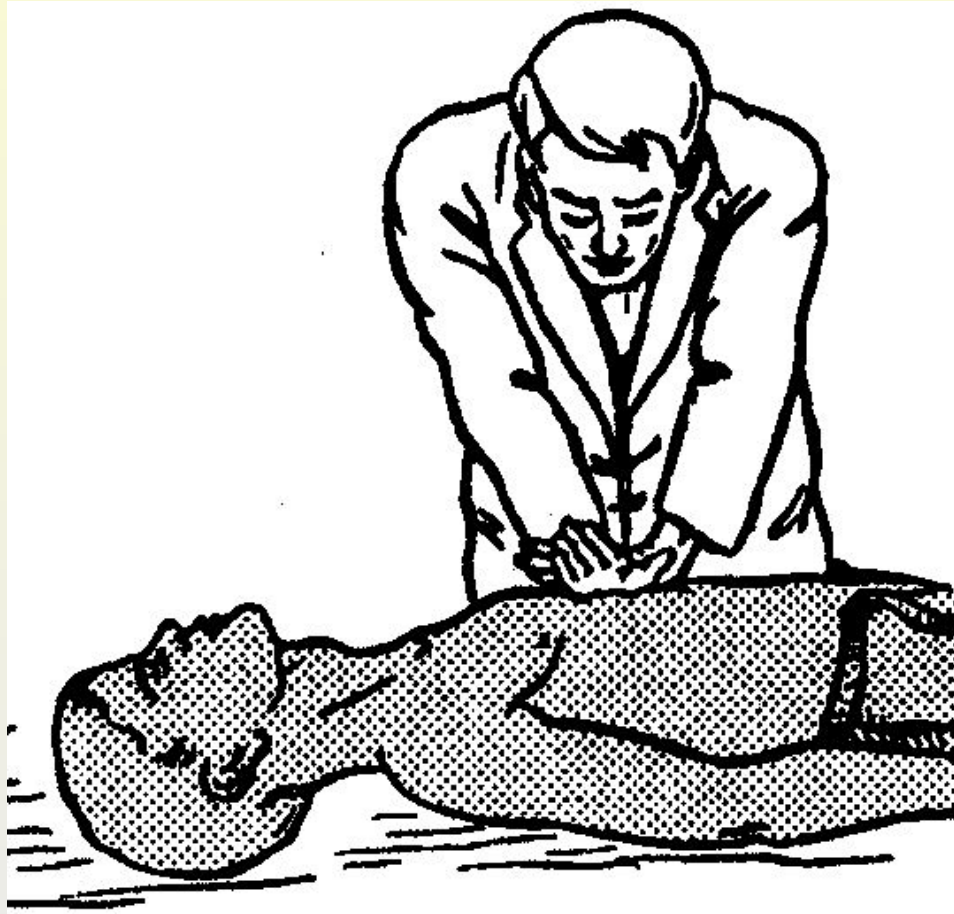**10-12 breaths per minute with a volume of app. 800 ml, each breath should take 1,5-2 seconds**

Control over the ventilation

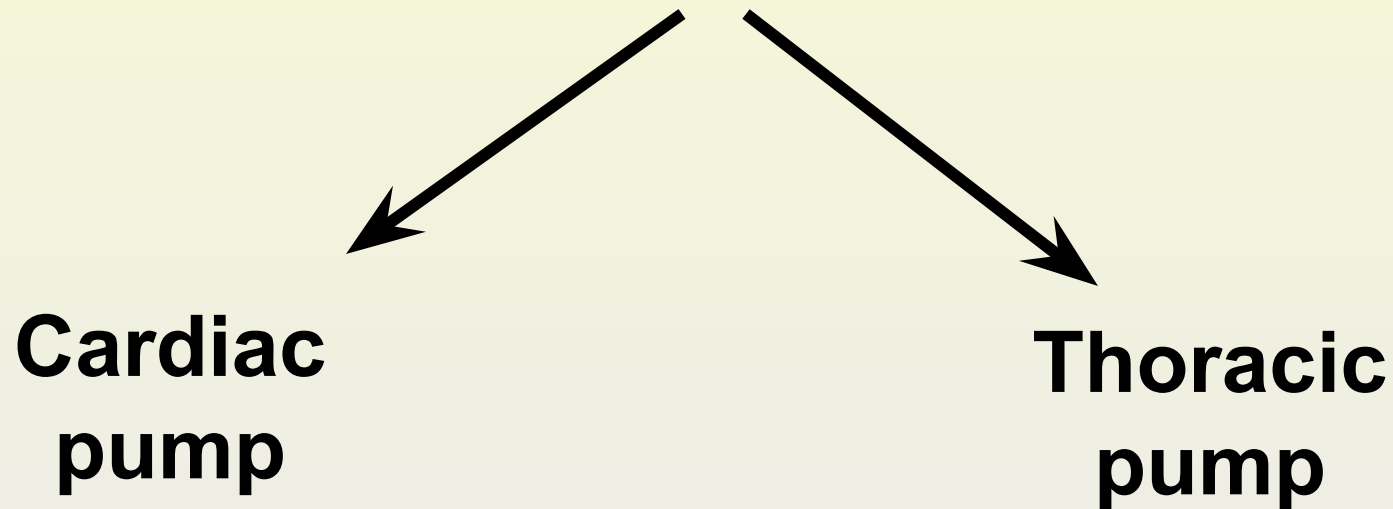**check chest movements during ventilation**

check the air return

C. Circulation
Restore the circulation, that is start external cardiac massage

2 mechanisms explaining the restoration of circulation by external cardiac massage

Cardiac pump

Thoracic pump

Cardiac pump during the cardiac massage

Veins | Aorta

Compression = Systole

Diastole
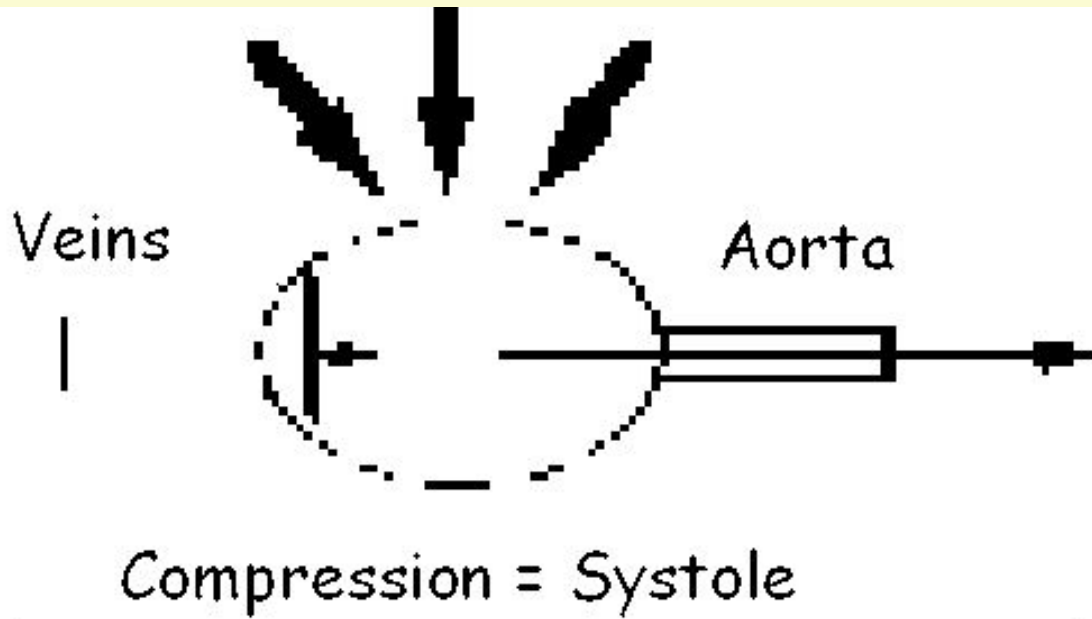
Blood pumping is assured by the compression of heart between sternum and spine
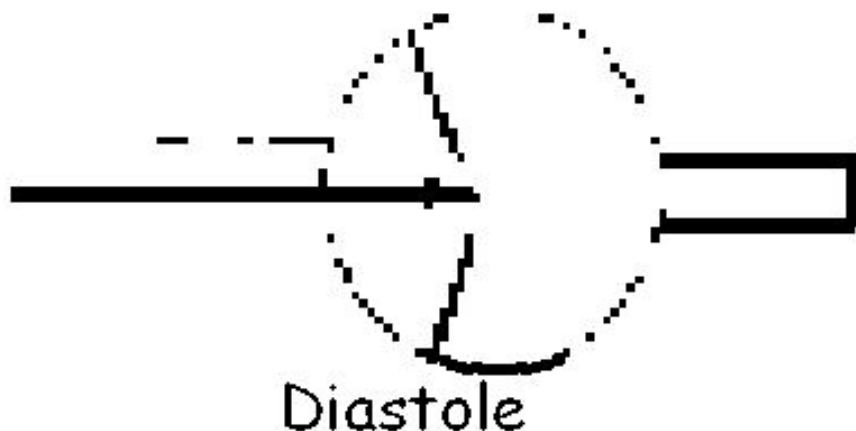
Between compressions thoracic cage is expanding and heart is filled with blood

Thoracic pump at the cardiac massage

Veins | Aorta

Compression = Systole
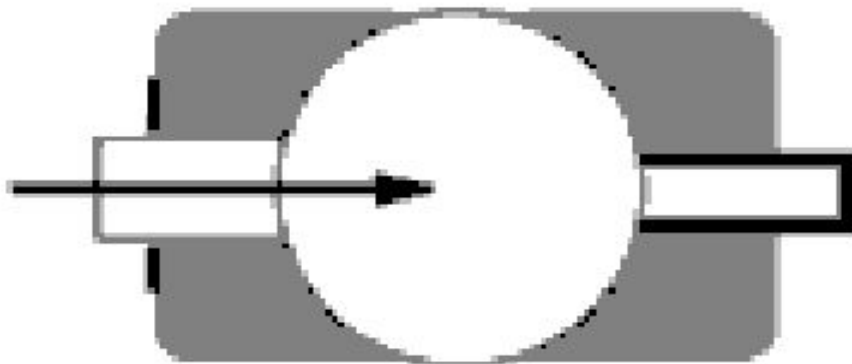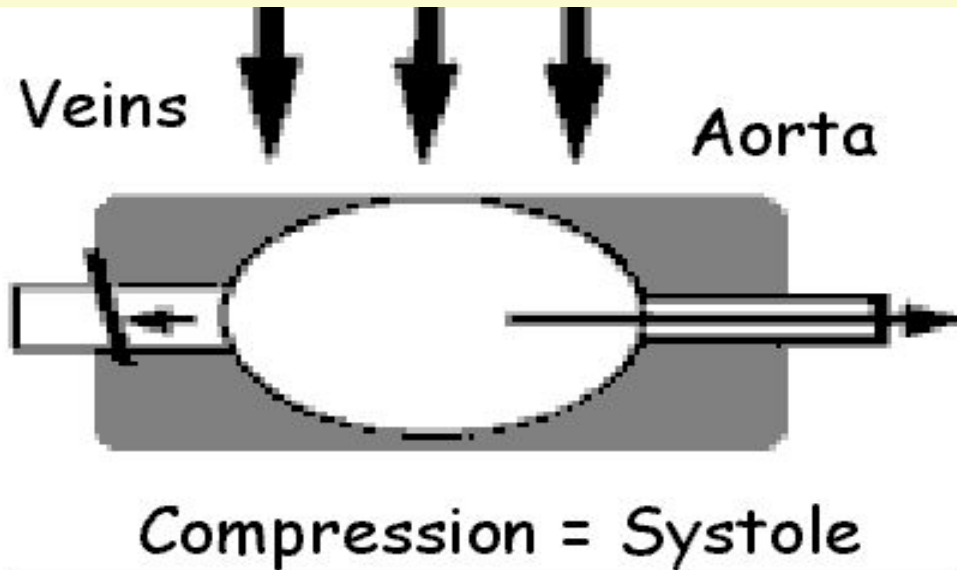
 Blood circulation is restored due to the change in intra thoracic pressure and jugular and subclavian vein valves

 During the chest compression blood is directed from the pulmonary circulation to the systemic circulation. Cardiac valves function as in normal cardiac cycle.

ALGORITHM of Cardiopulmonary resuscitation

2 breaths (duration[a] 1 – 1.5 sec.)

palpation of pulse on carotid arteries (5 – 10 sec.)

in case of absence of pulse initiate external cardiac massage

1 person

2 persons

compression rate[a] 80 – 100/min.
compression/breath = 15 : 2

compression rate 80 – 100/min
compression/breath = 5 : 1

2 breaths[a] in 4 – 7 sec.

breath during 1 – 1.5 sec. after each 5th compression

4 cycles: 15 compression and 2 breaths

10 cycles: 5 compression and 1 breath

check the pulse on carotid arteries (5 sec)

in case of absence of pulse continue resuscitation

VENTRICULAR FIBRILLATION OR PULSELESS TACHYCARDIA

Witnessed

Unwitnessed

Precordial thump

Check pulse, if none:

- ✔ Begin CPR

- ✔ Defibrillate with 200 joules

- ✔ Defibrillate with 200-300 joules

- ✔ Establish IV access, intubate

- ✔ Adrenaline 1 mg push

- ✔ Defibrillate with 360 joules

- ✔ Lidocaine 1 mg/kg IV, ET

- ✔ Defibrillate with 360 joules

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Possible arrhythmias after cardiac defibrillation

✔ **ventricular tachycardia**

✔ **bradyarrythmia including electromechanical dissociation and asystole**

✔ **supraventricular arrhythmia accompanied with tachycardia**

✔ **supraventricular arrhythmia with normal blood pressure and pulse rate**

Operations in case of asystole

Asystole

- Start CPR
- IV line
- Adrenaline:IV 1 mg, each 3-5 min.
   -or
   - intratracheal 2 - 2.5 mg
   - in the absence of effect increase
    the dose
   -Atropine 1 mg push (repeated once
    in 5 min)

- Na Bicarbonate 1 Eq/kg IV
- Consider pacing

Drugs used in CPR

- **Atropine** – can be injected bolus, max 3 mg to block vagal tone, which plays significant role in some cases of cardiac arrest
- **Adrenaline** – large doses have been withdrawn from the algorithm. The recommended dose is 1 mg in each 3-5 min.
- **Vasopresine** – in some cases 40 U can replace adrenaline
- **Amiodarone** - should be included in algorithm
- **Lidocaine** – should be used only in ventricular fibrillation