مادة أسس التخدير 1 الكورس الاول

جامعة ساوة الاهلية
كلية التقنيات الصحية والطبية
قسم التخدير - اللجنة العلمية

SAWA UNIVERSITY

Intraoperative patient monitoring) part 1)

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. المرحلـــــــــــــة .الثانية	.Second .. Stage

نظـــــــري ... محاضرة رقم11

Theoretical ..... Lecture No.11

استاذ المادة : .د. حسن جساب البركي

Intraoperative monitoring: Introduction

The most primitive method of monitoring the patient 25 years ago was continuous palpation of the **radial pulsations** throughout the operation!!

Standard

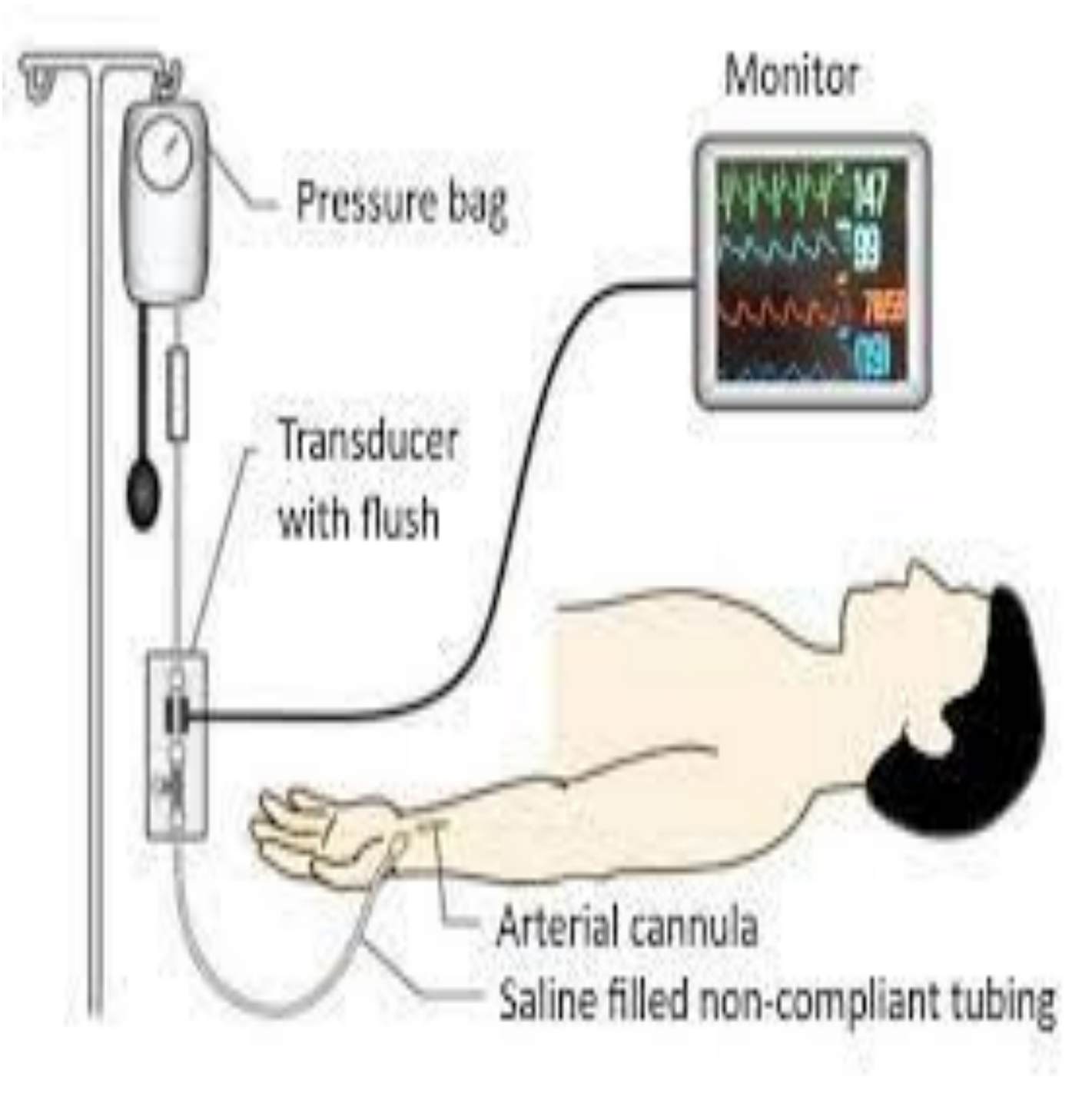
ASA monitoring for general anesthesia , monitored anesthesia care and regional anesthesia :-

- Oxygenation (oxygen analyzer, pulse oximetry),
- Ventilation (capnography, minute ventilation), respiratory rate (under regional anesthesia)
- Circulation (electrocardiogram [ECG], arterial blood pressure, perfusion assessment),
- Temperature.

Routinely measured parameters

The parameters measured in most surgical procedures include:

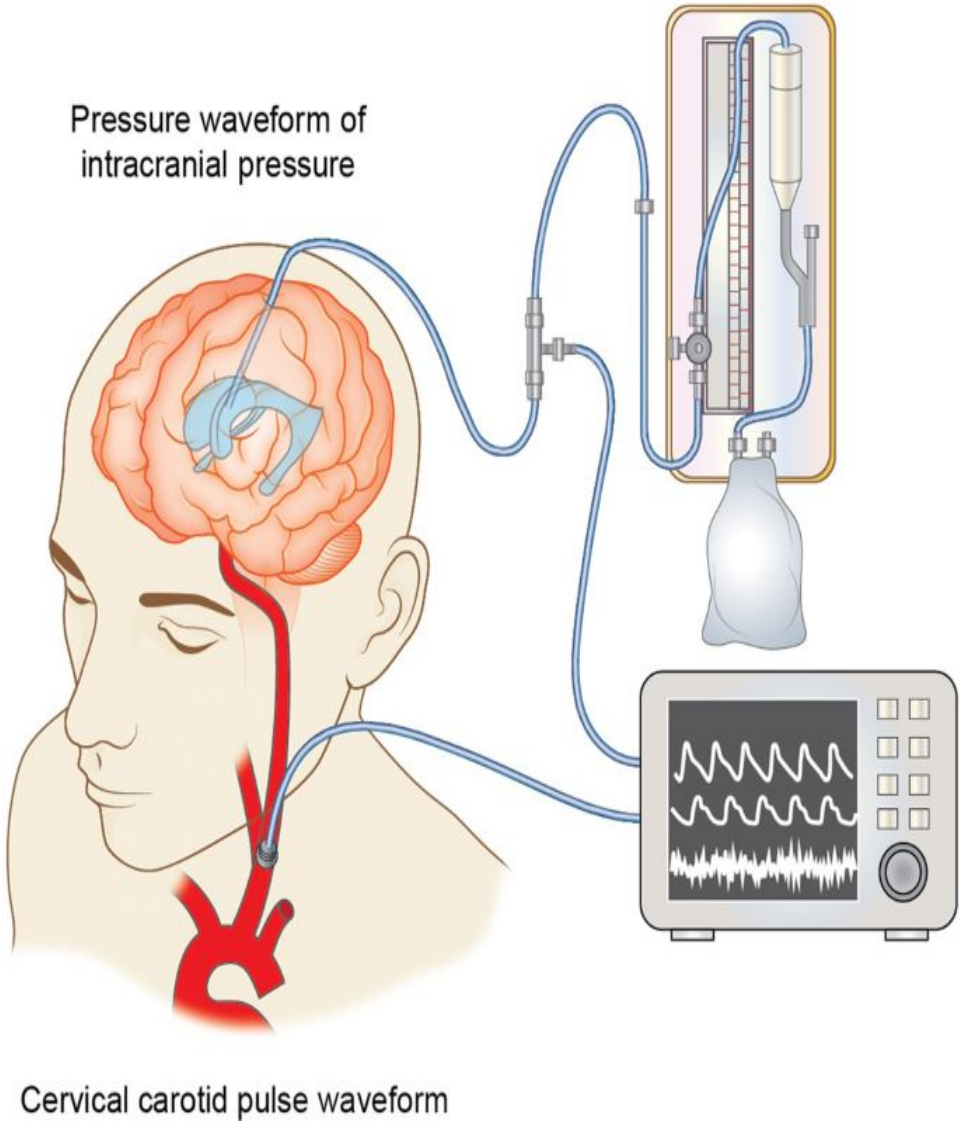
- The heart's electrical activity via an electrocardiogram **(ECG)**
- The respiratory rate **(RR)**
- The blood pressure **(BP)** , which can be measured by both **invasive** and **non-invasive** means
- The **body temperature** via **temperature probes** or t**hermometers**, especially when **general anesthesia lasts over 30 minutes in duration.**
- The **cardiac output** (COP)
- The **arterial blood oxygen level** measured by a pulse oximeter, a photoelectric sensor clipped over the finger or toe (SaO2 + Spo2)


Monitor
Pressure bag
Transducer
with flush
Arterial cannula
Saline filled non-compliant tubing

- **Mixed venous oxygenation** (Svo2)
- Pulmonary functions such as **end-tidal carbon dioxide** (ETCO2)

- **Intracranial pressure monitors** in patients suffering from **trauma to the head**, or **raised intracranial pressure because of brain tumors**, **edema,** or **intracranial hemorrhage**.

The sensor is inserted through a burr hole made in the skull. These are important in detecting rises in the pressure inside the head, and recording the pattern for comparison.



Electrocardiography (ECG)

The ECG may be used in two ways.

A 12 lead ECG :

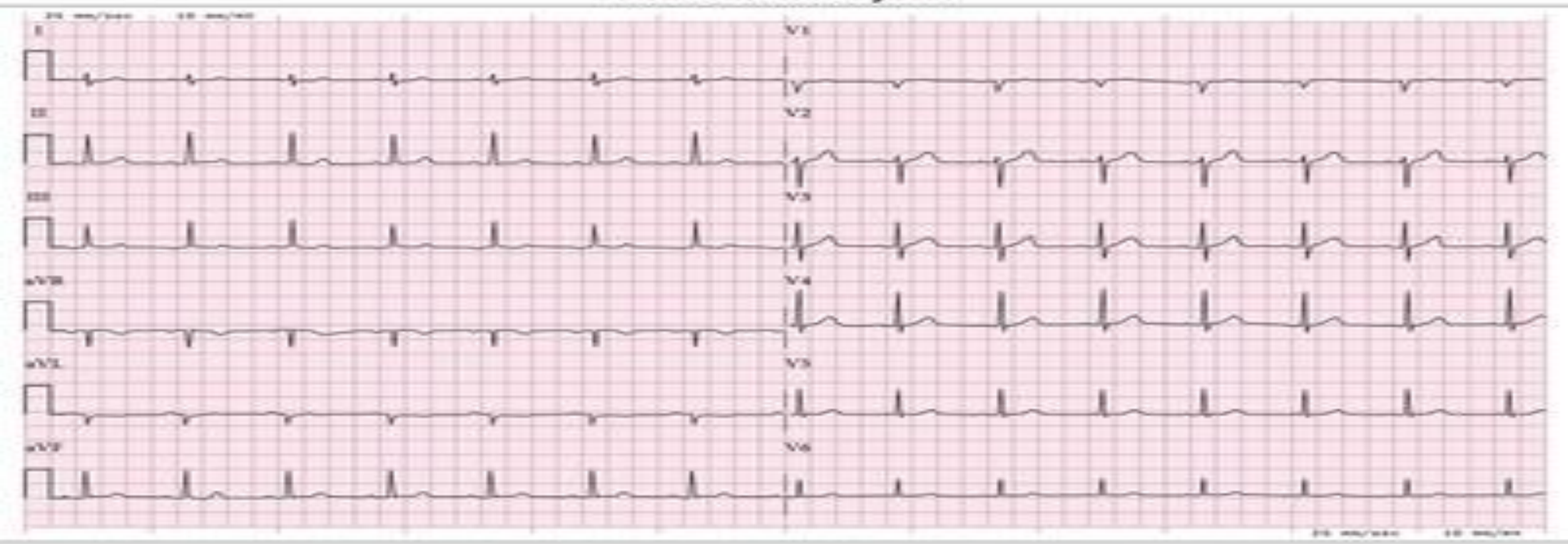
May be performed which analyses the cardiac electrical activity from a number of electrodes positioned on the limbs and across the chest.

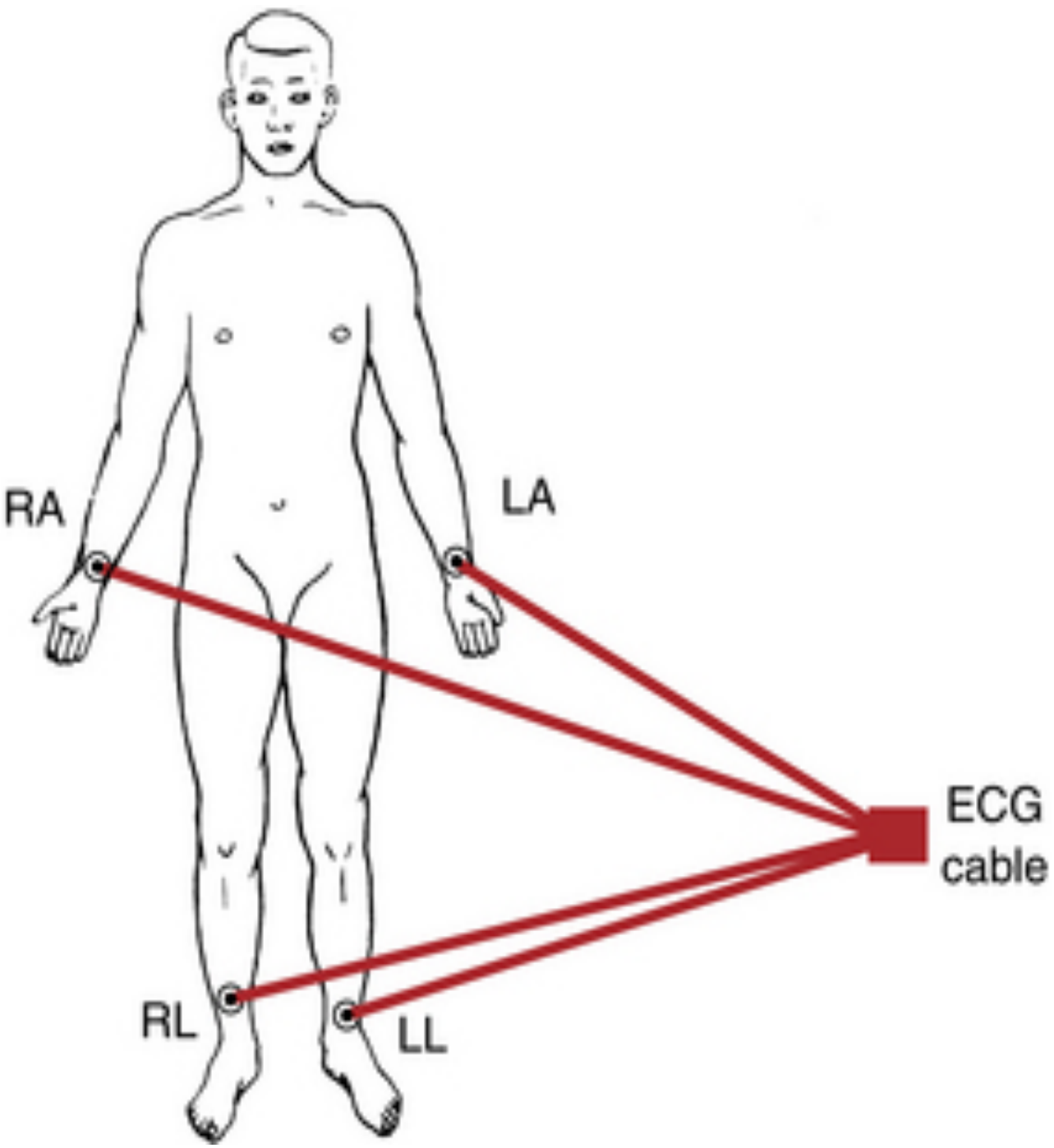
A wide range of abnormalities may be detected including: **Arrhythmias**

(Bradycardia, Tachycardia I, A premature or extra heart beat , Atrial flutter, Ventricular tachycardia (VT) , Ventricular fibrillation (VF))

Myocardial ischemia, **left ventricular hypertrophy** and **pericarditis**.

(1) ECG

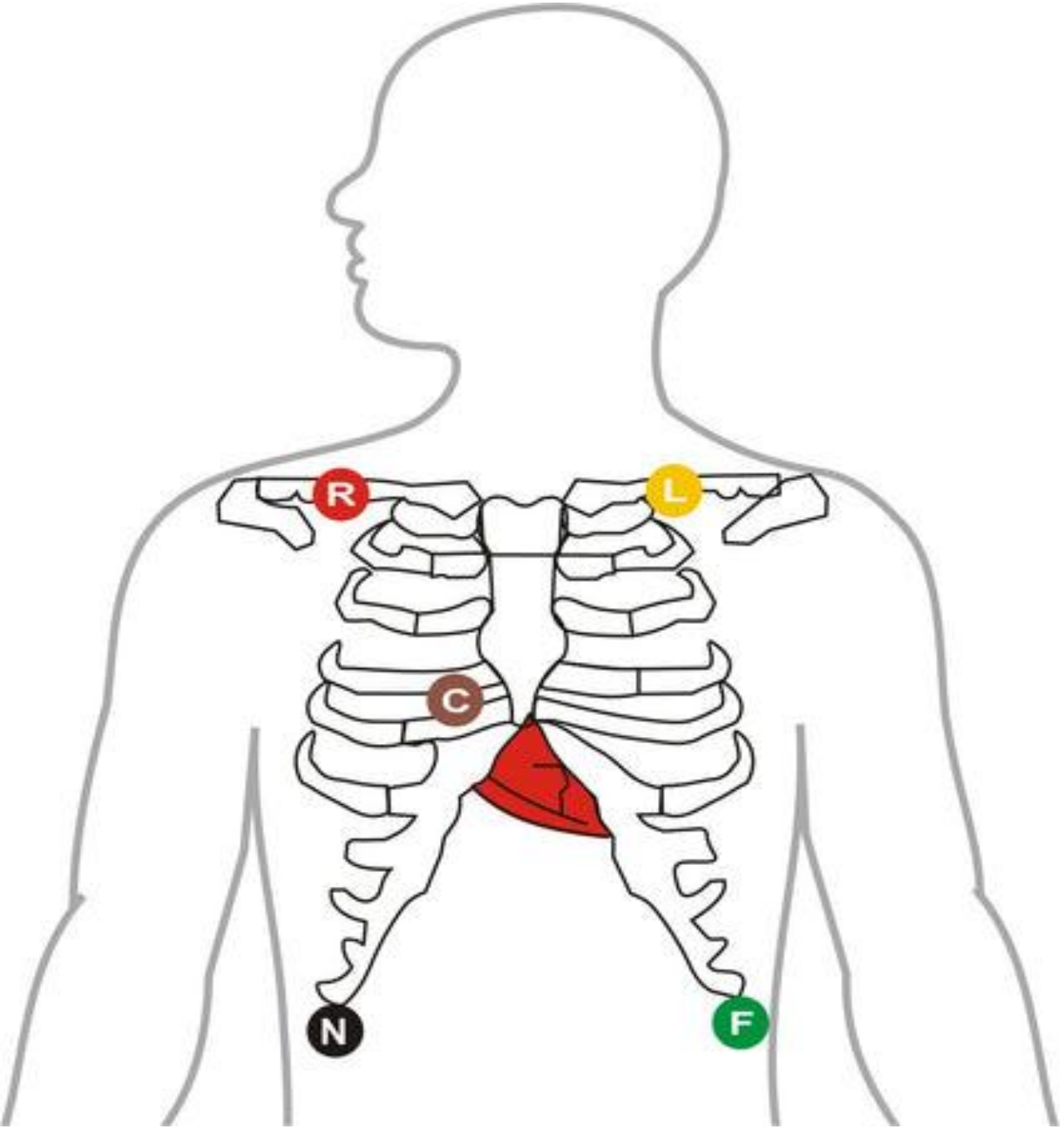


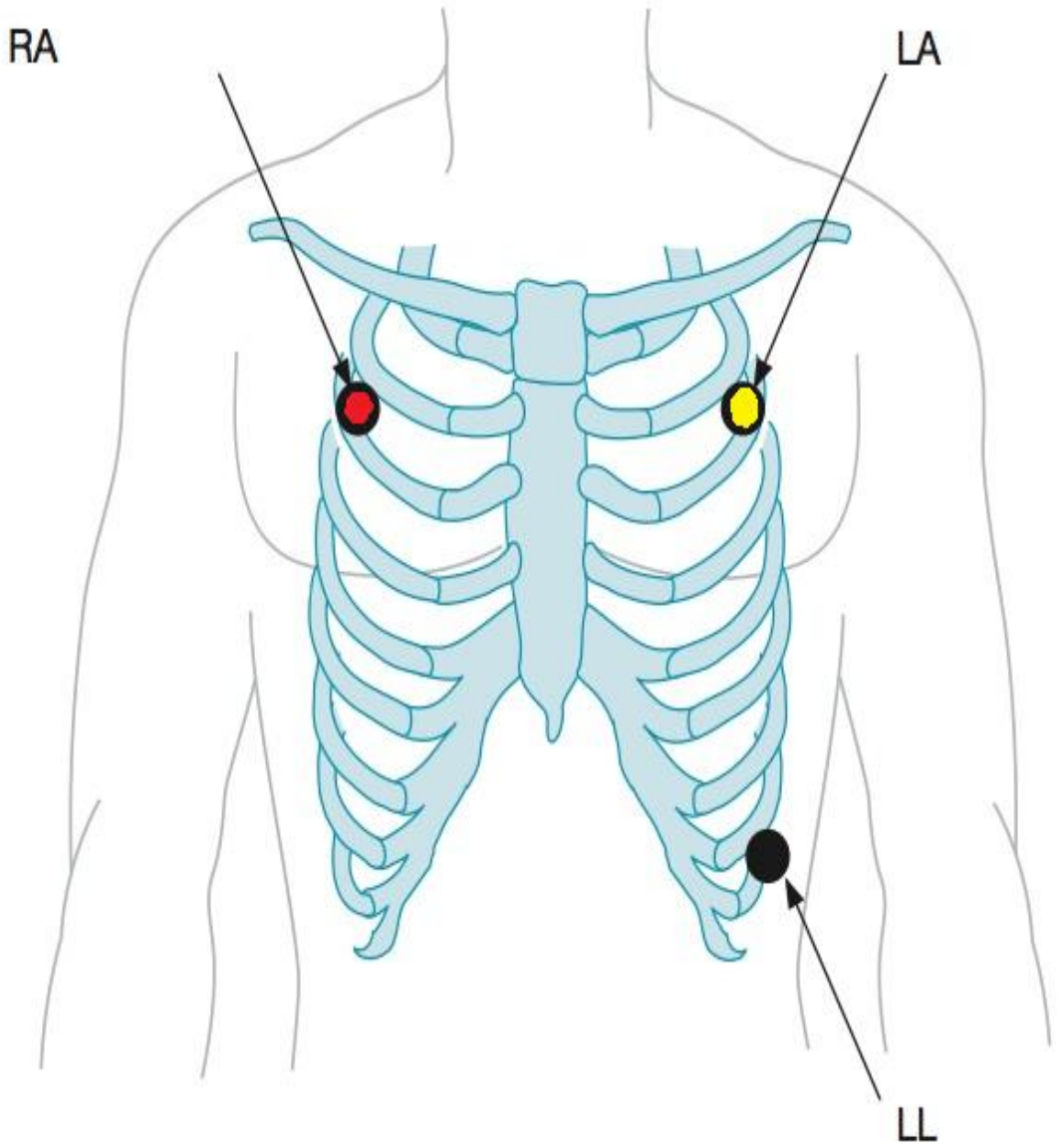

RA
LA
ECG
cable
RL
LL

Intraoperative monitoring: (1) ECG

During anesthesia, however, the ECG is monitored using only 3 (or occasionally 5) electrodes which provide a more restricted analysis of the cardiac electrical activity and cannot provide the same amount of information that may be revealed by the 12 lead ECG..

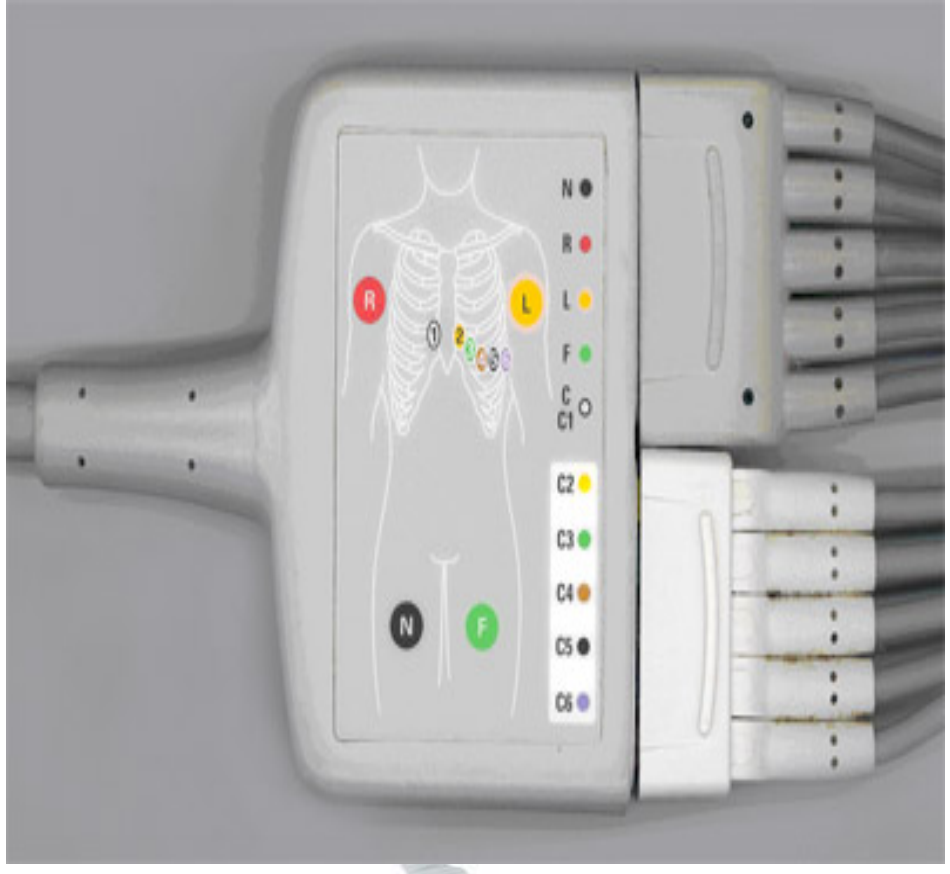
During anesthesia one of 3 possible 'leads' is generally used. These leads are called bipolar leads as they measure the potential difference (electrical difference) between two electrodes..





3 Electrode System

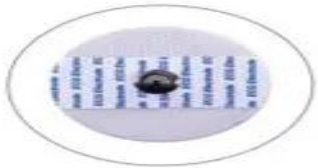
5-leads



ECG/EKG Suction ball electrode
胸吸球



Universal ECG/EKG Electrodes
通用心电电极



Limb Clamp Clip Reusable Electrodes
肢体夹



The leads are described by convention as follows:

Lead I:

Measures the potential difference between the **right arm** electrode and the **left arm** electrode. (RL)

The third electrode (left leg) acts as neutral.

Lead II:

Measures the potential difference between the **right arm** and **left leg** electrode. (RLL)

Lead III:

Measures the potential difference between the **left arm** and **left leg** electrode. (LLL)

Most monitors can **only show one lead** at a time and therefore the lead that gives as much information as possible should be chosen

Intraoperative monitoring: (1) ECG

- The most commonly used lead is lead II (figure 5) - a bipolar lead with electrodes on the right arm and left leg as above. This is the most useful lead for detecting cardiac arrhythmias as it lies close to the cardiac axis (the overall direction of electrical movement) and allows the best view of P and R waves

- For detection of myocardial ischemia, the CM5 lead is useful (figure 6).

Intraoperative monitoring: (1) ECG

The CB5 lead is another bipolar lead which has one electrode positioned at V5 and the other over the right scapula. This results in improved

QRS and P wave voltages allowing easier detection of arrhythmias and ischemia. Many other electrode positions have been described including some used during cardiac surgery, for example esophageal and intracardiac ECG's.

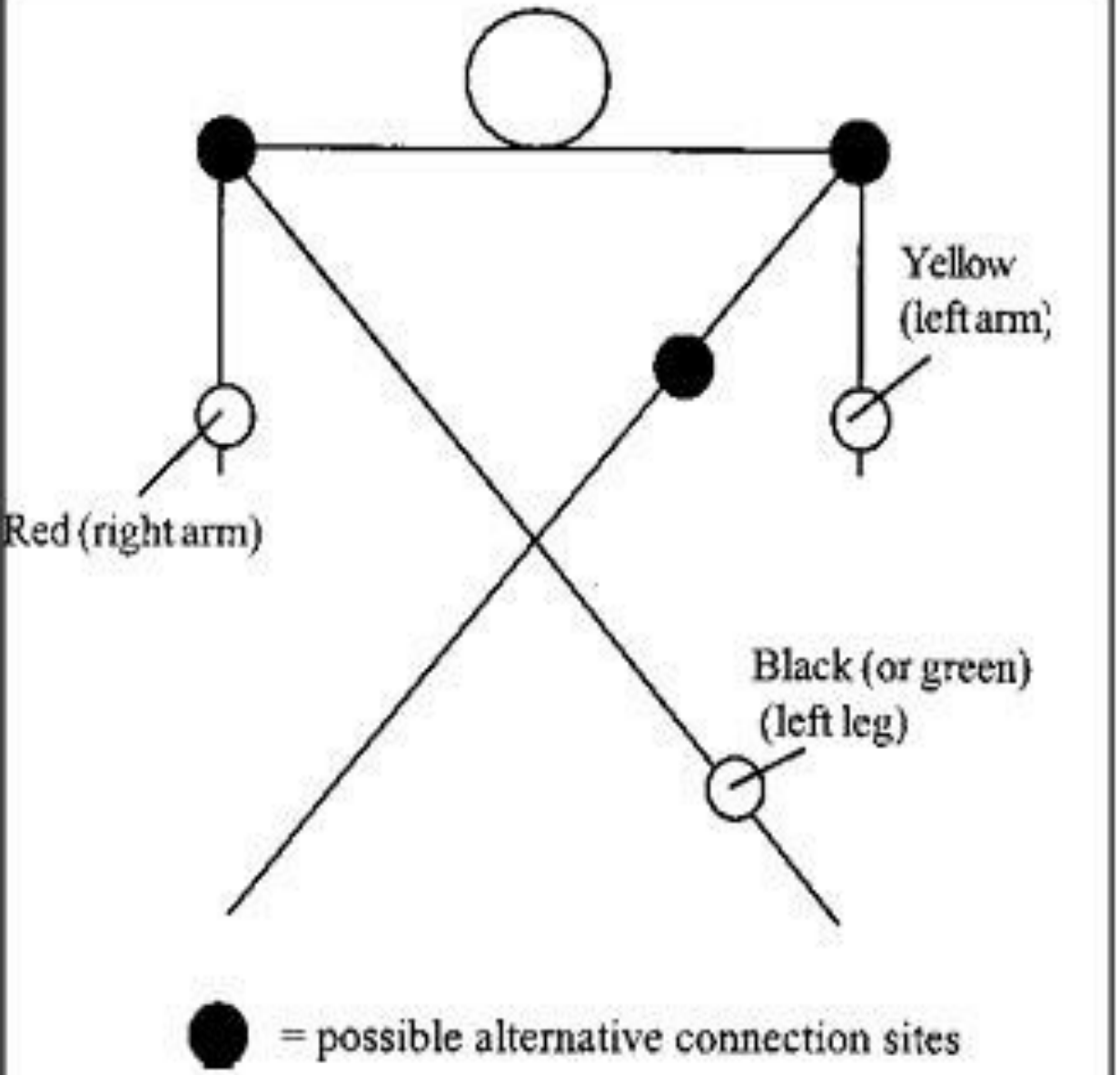


Figure 5: Lead II - electrode connections

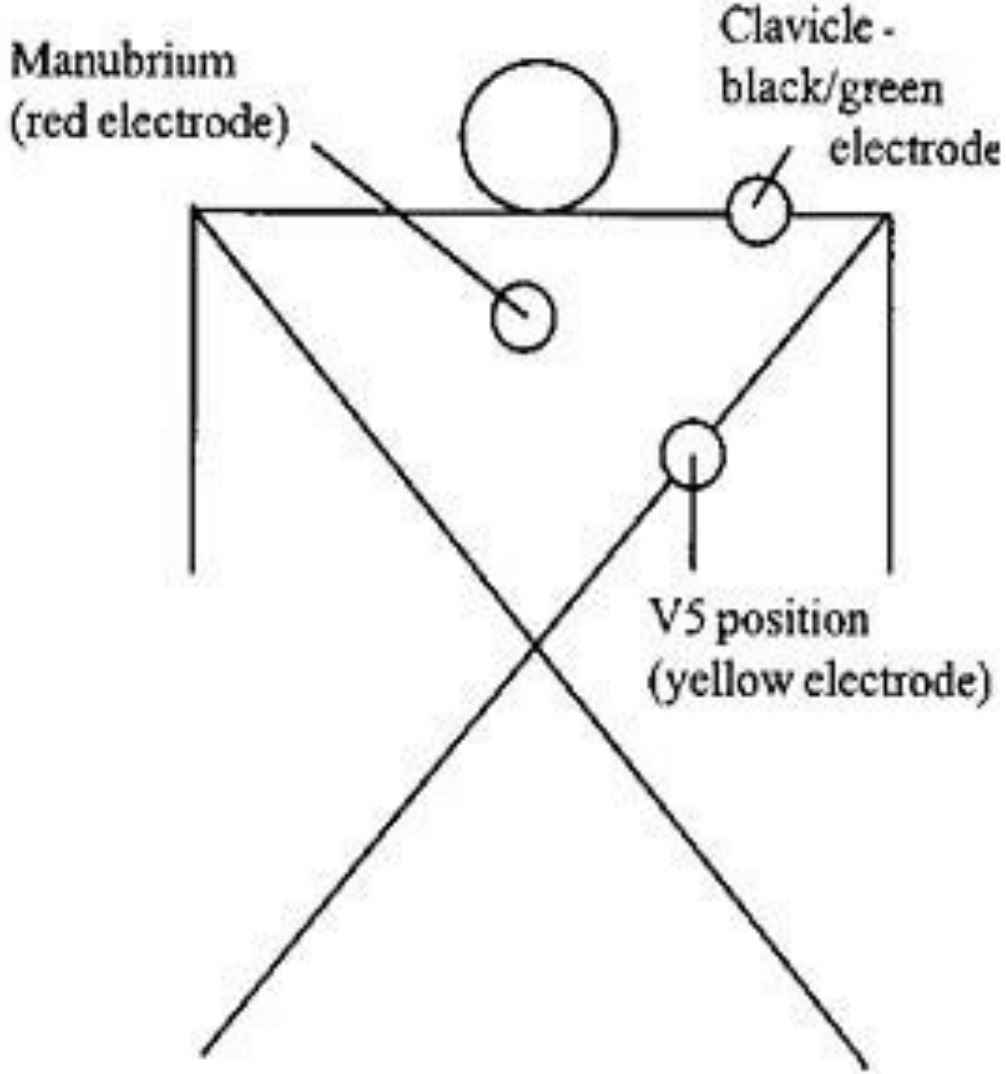


Figure 6: CM5 - electrode connections

Intraoperative monitoring: (1) ECG

- CARDIAC ARRHYTHMIAS

The detection of cardiac arrhythmias and the determination of heart rate is the most useful function of the intraoperative ECG.

Anesthesia and surgery may cause any type of arrhythmia including: Transient supraventricular and ventricular tachycardia due to sympathetic stimulation during laryngoscopy and intubation.

Bradycardia produced by surgical manipulation resulting in vagal stimulation.Severe bradycardia and asystole may result. It is more common in children because the sympathetic innervation of the heart is immature and vagal tone predominates. Bradycardia are most commonly seen in ophthalmic surgery due to the oculocardiac reflex.

Generally, the heart rate will improve when the surgical stimulus is removed.

Atrial fibrillation is common during thoracic surgery

Action Plan

when faced with an abnormal rhythm on the ECG monitor:

- Assess the vital signs - A.B.C.
- Check the airway is patent
- Check the patient is breathing adequately or is being ventilated correctly
- Listen for equal air entry into both lungs
- Circulation - check pulse, blood pressure, oxygen saturation.

Consider the following:

- Increase the inspired oxygen concentration
- Reduce the inspired volatile agent concentration

- Ensure that ventilation is adequate to prevent CO_2 build up.
- Check end tidal CO_2 where this measurement is available
- Consider what the surgeon is doing - is this the cause of the problem?

Eg: **traction on the peritoneum** or **eye causing** a **vagal response** (Bradycardia).

If so :

✔ Ask them to stop while you treat the arrhythmia.

✔ If the arrhythmia is causing hemodynamic instability, rapid recognition and treatment is required.

Intraoperative monitoring: (2) SpO2

- It is the most important monitor. It gives **a LOT of information about the pt (patient)** .

- **<u>Timing</u> of SpO2 monitoring:**

<u>Throughout the surgery:</u>

<u>Before induction till after extubation & recovery</u>. It is the **<u>LAST</u>** monitor to be removed from the pt before the pt is transferred outside the operating room to recovery room.

- SpO2 monitoring should be continued in recovery room.

Intraoperative monitoring: (2) SpO2

- **Value:**
  - **SpO2**: arterial O2 saturation (oxygenation of the pt).
  - **HR.**
  - **Peripheral perfusion status (loss of waveform in hypoperfusion states: hypotension & cold extremeties**).
  - Gives an idea about the **rhythm** from the **plethysmography wave** (arterial waveform).

    (Cannot identify the type of arrhythmia but can recognize if irregularity is present).
  - **Cardiac arrest.**

- Note . Pulse oximeter tone changes with **desaturation** from **high pitched** to **low pitched** (deep sound). So just by listening to the monitor you can recognize:

(1) **HR** (2) **O2 saturation**.

Intraoperative monitoring: (2) SpO2

- How to attach/apply saturation probe:
  - To the **finger** or **toe** (if finger is not accessible). The red light is applied to the nail. **Nail polish and stains** should be removed → false readings .
  - Can also be applied to the **ear lobe**.
  - In infants and children can be applied to **2 fingers** or **to the hand**.
  - **Usually** attached to the limb with the IV line (**opposite the limb with the blood pressure cuff**).

Intraoperative monitoring: **(2) SpO2**

Readings:

- Normal person on room air (O2 = 21%) > **96%.**
- Patient under GA (100% O2) = **98-100%.**
- It is not accepted for O2 saturation to ↓ below **96%** with 100% O2 under GA. **Must search for a cause.**
- **< 90%** = hypoxemia.
- **< 85%** = severe hypoxemia.

Intraoperative monitoring: (2) SpO2

- Fallacies & Inaccuracies(False reading) occur when:
  1. **Misplaced** on the pts finger, slipped.
  2. **Patient** movement, shivering.
  3. **Poor tissue** perfusion (cold extremities) → warm the pt, put a glove filled with warm water in the pts hand (always avoid hypothermia).
  4. **Poor tissue** perfusion (hypotension & shock).
  5. **Cardiac** arrest.
  6. Sometimes by electrical interference from **cautery** in some monitors.

Intraoperative monitoring: (2) SpO2

RULES:

- Keep the **sound** of the pulse oximeter **ON** at ALL times.
- Pay attention to the sound of the pulse oximeter. **NO silent** monitors.
- ALWAYS Remember that your **clinical judgement** is much more superior to the monitor. Check pt colour for cyanosis: lips, nails.
- If hypoxemia occurs immediately check the correct **position of the probe** on the pt and check the pts **colour**: nails & lips, then manage accordingly & **CALL for HELP**.

Any questions?