



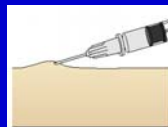
B 1-2. practicals – **Introduction to invasive monitoring**
(Tools of volume correction, injections,
infusions, technique of blood sampling,
ex vivo venous cannulation)

B 3-4. practicals – Monitoring of the cardiovascular system

B 5-6. practicals – Complex monitoring

The injections

Intracutaneous injection



Subcutaneous injection



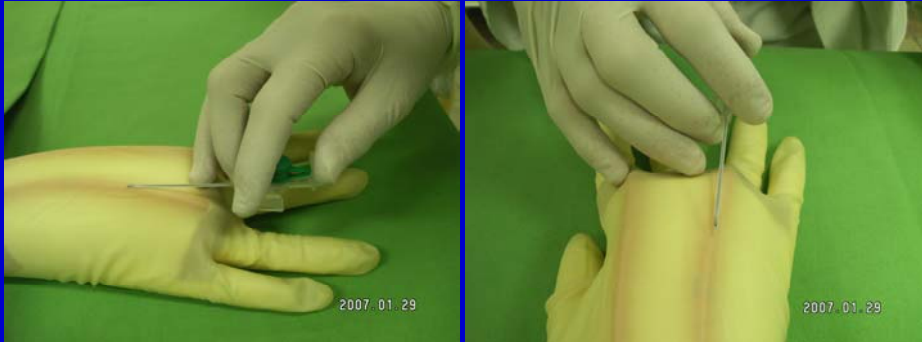
Intramuscular injection



Intravenous injection



Introduction of Braunule



**Computer simulation of vein
access
CATHSIM**

Information from your patient

Case Scenario

Pedestrian Struck

Level ●●●●●

Procedure Time 00:06:00

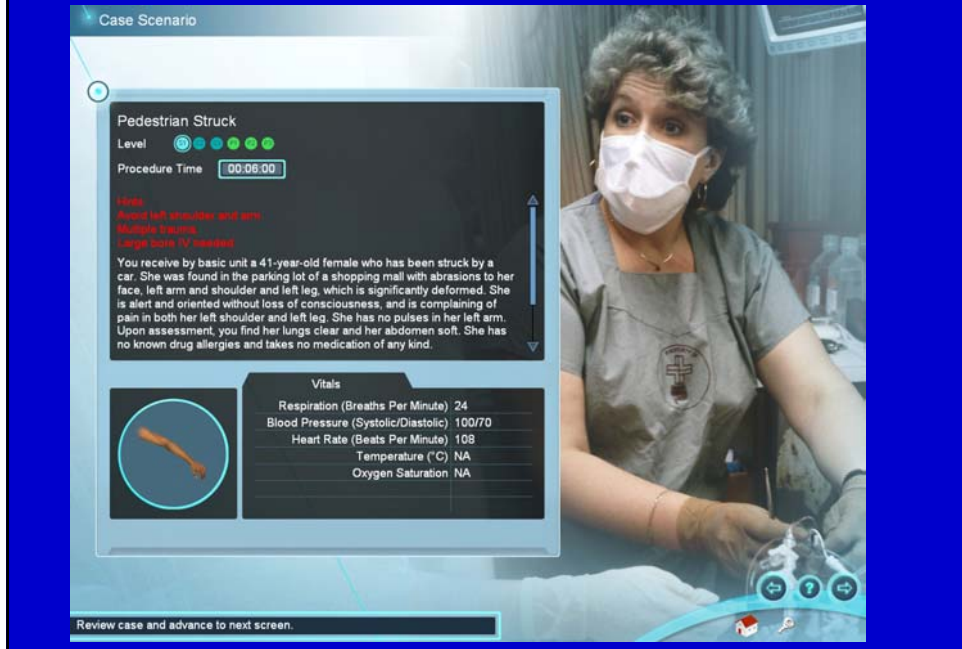
Notes
Awake left shoulder and arm
Multiple trauma
Large burn IV needed

You receive by basic unit a 41-year-old female who has been struck by a car. She was found in the parking lot of a shopping mall with abrasions to her face, left arm and shoulder and left leg, which is significantly deformed. She is alert and oriented without loss of consciousness, and is complaining of pain in both her left shoulder and left leg. She has no pulses in her left arm. Upon assessment, you find her lungs clear and her abdomen soft. She has no known drug allergies and takes no medication of any kind.

Vitals

Respiration (Breaths Per Minute)	24
Blood Pressure (Systolic/Diastolic)	100/70
Heart Rate (Beats Per Minute)	108
Temperature (°C)	NA
Oxygen Saturation	NA

Review case and advance to next screen.



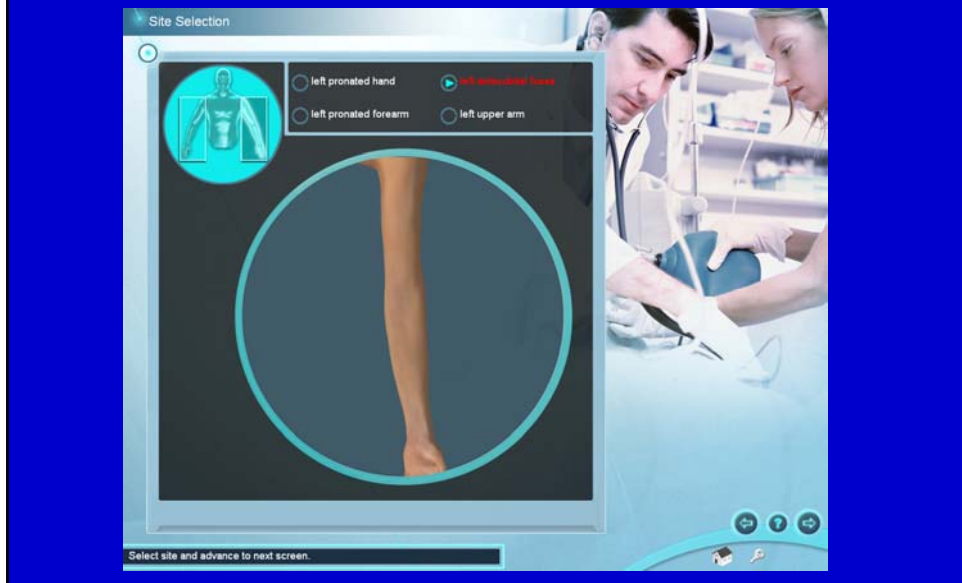
Site selection: You can choose among sites: left or right hand, arm or antecubital fossa

Site Selection

left pronated hand left antecubital fossa

left pronated forearm left upper arm

Select site and advance to next screen.



1. Patient Identification
2. Inform patient
3. Wash hands
4. Setting for venous cannulation



11. Apply the catheter – needle introducing into the lumen



Evaluation of your intervention



Debriefing

Leg Pain
Score: 80%
Learner: proba
Level: ● ● ● ● ●

Procedure Time: 00:04:29
C-Band Time: 00:01:57
Unsuccessful Completion of Procedure

Cannulation Events

- ✓ Correct Cannulation
- ✓ Vein Punctured

Critical Errors

- ✓ Procedure Completed in Appropriate Time
- ✓ Standard Precautions Performed Correctly
- ✗ C-Band Usage Incorrect (-4)
 - Insertion made too close to constricting band
- ✓ Catheterization Attempted
- ✓ Vein Cannulated and Correctly Threaded
- ✓ Flash Chamber Observed Correctly
- ✓ Site Preparation Correct
- ✓ No Site Contamination
- ✓ Equipment Disposed Correctly
- ✓ Insertion Made at Allowable Site
- ✓ Patient identification performed correctly

Non Critical Errors

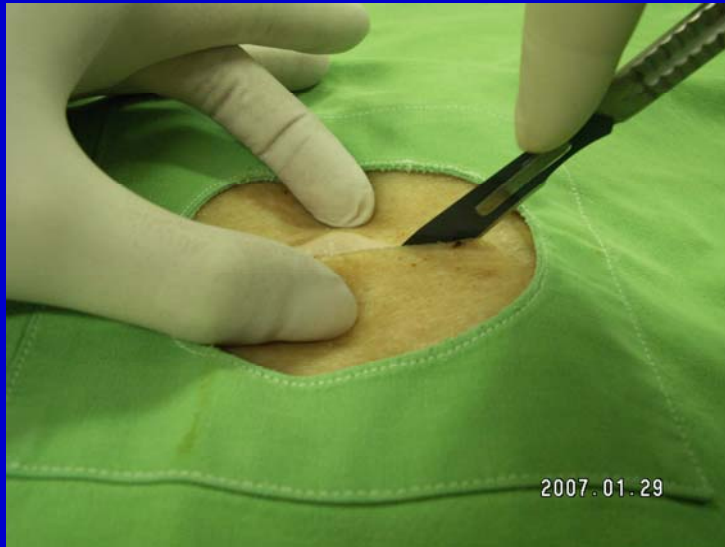
- ✓ Appropriate Site Selected
- ✓ Patient Informed at Appropriate Time
- ✗ Extension tubing Used Incorrectly (-4)
 - Extension tubing required but not used
- ✗ Incorrect Bevel Angle (-4)
 - Needle inserted with the bevel down

Preparing for invasive monitoring:

1. Venasection *ex vivo*

2. Seldinger technique

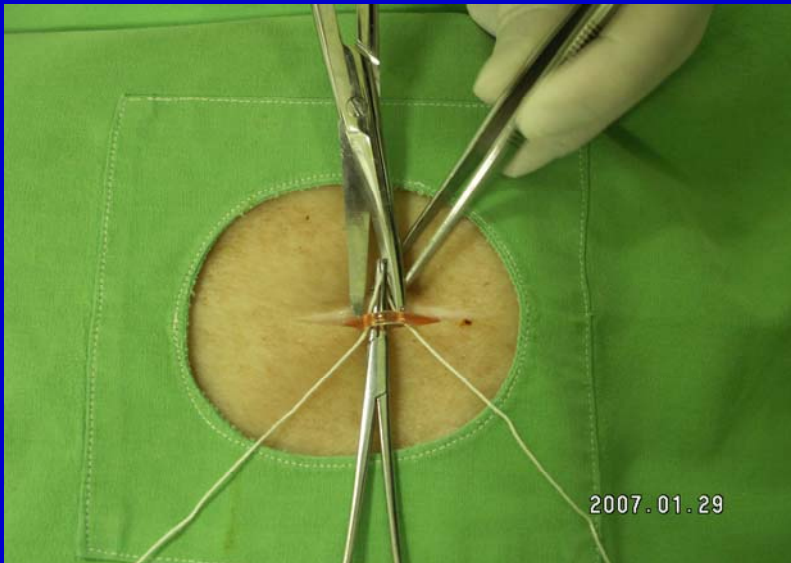
Incision



Dissection of the vein 1.



Introduction of double thread 1.

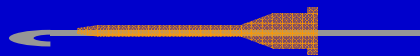


The Seldinger technique for central venous catheterization

1. Introduce a Braunule into a peripheral vein
2. Remove the needle
3. Insert a flexible guide-wire into the central vein
4. Remove the Braunule cannula

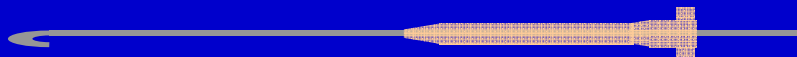


5. Insert – then remove the dilator cannula



6. Insert the central venous cannula

7. Remove the guide-wire



Practicals

Working in groups of 4 under the guidance of a tutor;

Entering the operating room: take caps and masks;

1. Administration of i.c., s.c., i.v. és i.m. injections after disinfection on a practice pad
2. Computer simulation of vein access (Cathsim)
3. Introduction of Braunule and butterfly needle on a plastic hand; giving infusions; use of infusion pump.
4. Taking blood samples;
5. Venasection *ex vivo*;
6. Seldinger technique;

Institute of Surgical Research
Basic Medical Skills



B 1-2. practicals – Introduction to invasive monitoring

B 3-4. practicals – **Monitoring of the cardiovascular system**

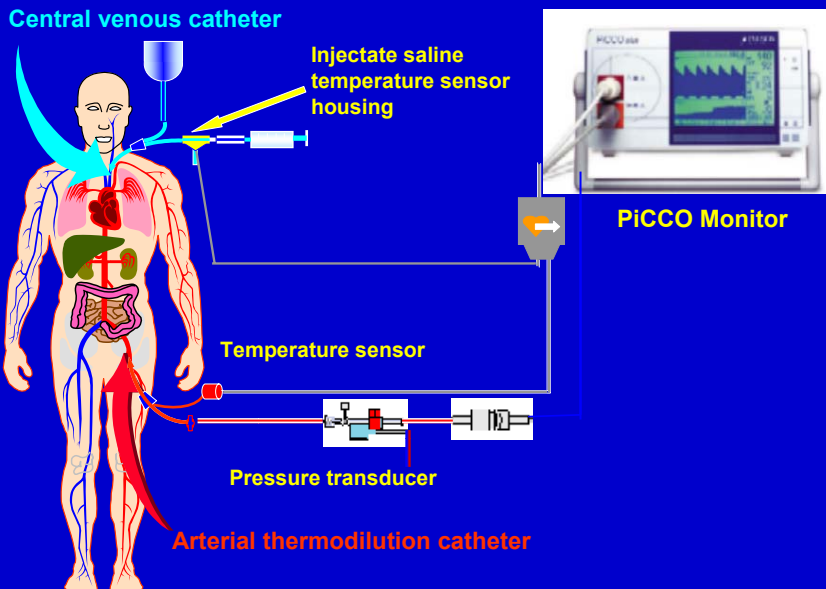
Cannulation of *jugular vein* → CVP measurement;

Cannulation of *femoral artery* → Arterial pressure measurement;

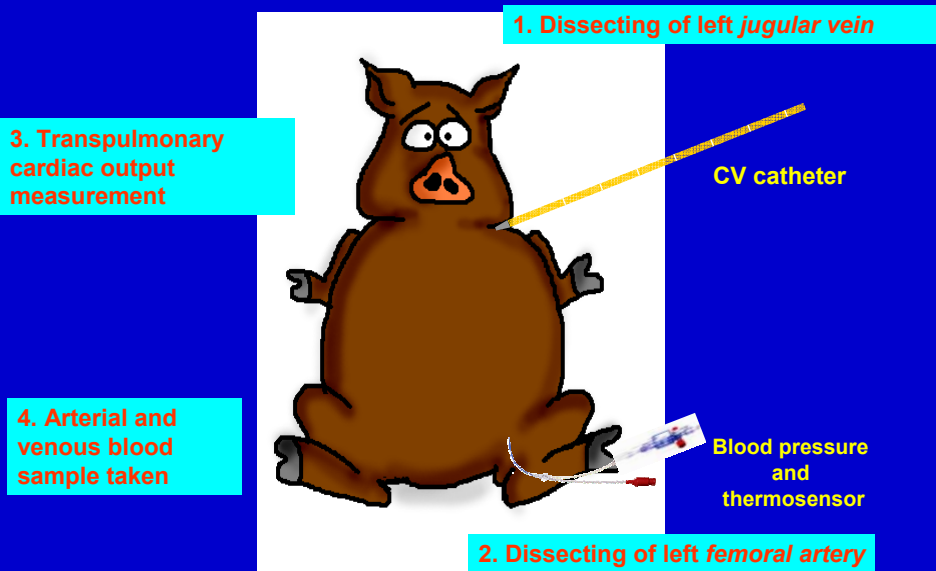
Thermodilution cardiac output measurement;

B 5-6. practicals – Complex monitoring

3. Cardiac Output measurement with a transpulmonary thermodilution (TDA) method



Summary of the Practical



The execution of the practical

Scrub preparation, gowning, gloving: approx. 8 min;

8 students/operating tables

Three surgical teams /operating table:
as surgeon, first and second assistants and nurse

Surgical Team 1:
Dissection and cannulation of the left *jugular vein*;

Surgical Team 2:
Dissection and cannulation of the *femoral artery*;

Surgical Team 3:
Dissection and cannulation of the right *jugular vein*

Institute of Surgical Research
Basic Medical Skills



B1-2 Practicals – Perioperative volume therapy

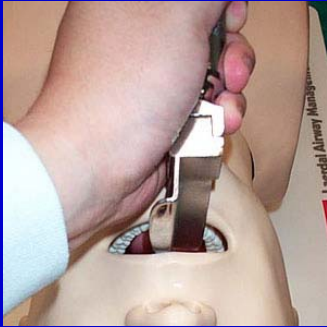
B3-4 Practicals – Cardiovascular monitoring

B5-6 Practicals – **Complex (non-invasive) monitoring**

1. respiratory system,
2. microcirculation,
3. gastrointestinal system,
4. excretion – urinary tract monitoring

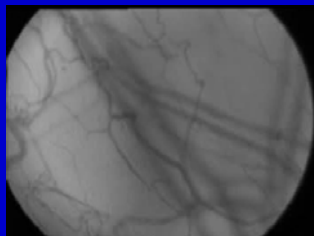
I. Respiratory System Monitoring

1. Observations: respiratory movements; type, depth and frequency of breathing; skin colour (cyanosis).
2. Methods for monitoring the respiratory system:
 - Securing open airways – intubation
 - Mechanical ventilation
 - Monitoring of respiratory gases



II. Monitoring of the microcirculation

Microcirculation of sublingual mucosa using intravital videomicroscopy or orthogonal polarization spectral (OPS) imaging.



Natural contrast agent: Hgb in the capillaries;

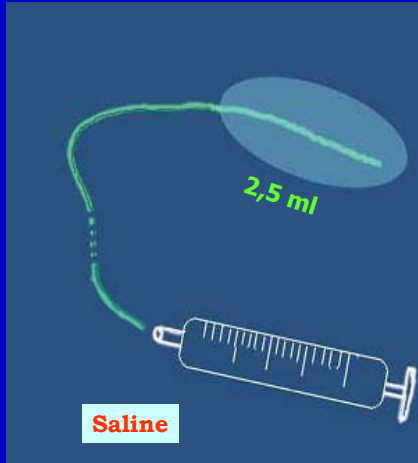
Visibility: approx. 1 mm depth;

Measured parameters:

Red blood cell velocity

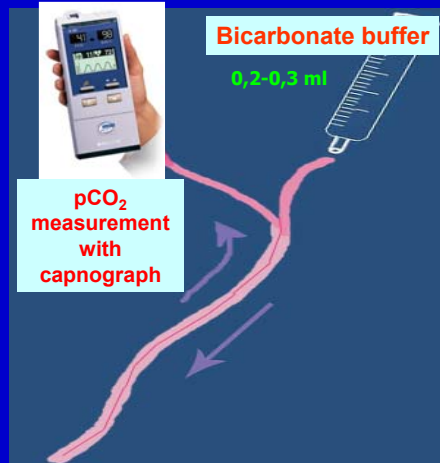
Capillary perfusion ratio (perfused/nonperfused capillaries ratio)

Monitoring of the microcirculation 2: Catheters of gastrotonometry



**Sigmoid Tonomitor
(with balloon)**

Equilibration time : min. 30 min
„Static” device



Capillary Tonomitor

by Boda et al. 2006

Equilibration time: 5-6 min
Dynamic device

Summary of the Practical

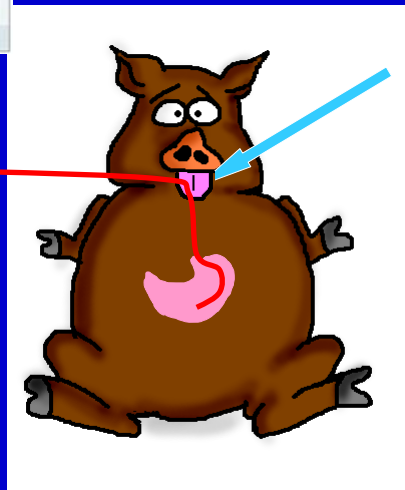
Mechanical ventilation



Sublingual and
gastric
tonometer
probe



CO₂ gap
determination



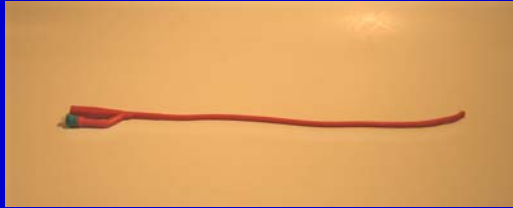
Monitoring of
sublingual
microcirculation



Non-invasive
monitoring of
respiratory gases:
• Capnometry
• Pulseoxymetry

Analysing of previous
blood sample
taken and blood
gase measurement

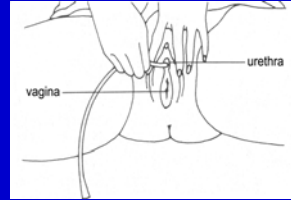
IV. Urinary system monitoring Catheterization of the bladder



Male catheterization



Female catheterization



The execution of the practice

Demonstration of non-invasive monitoring
(outer operating room)

max. 4 students
Endotracheal
intubation - model
(internal op.
room)

max. 8 students
Capnometry → EtCO₂
Pulsoxymetry → O₂ saturation
Mechanical ventilation –
settings
Sublingual and gastric
tonometry
Analysing of previous blood
gase measurement
Direct monitoring of sublingual
microcirculation by OPS
technique

max. 4 students
Bladder
catheterization -
model
(internal op.
room)
male female

Statistics of Basic Medical Skills Course

	Hungarian	Foreign students
Number of applicants to the course:	115	37
Number of graduates of the course:	115	37
Average grade at practical exam:	4.82	4.91

Results of the opinion polls regarding the practicals:

„Opinion about the practices”	4.8	4.8
„Distinctness and usefulness of presentations introducing the practices”	4.5	4.5
„Utilization of available time”	4.2	3.4
„Organization of the practices”	4.5	4.2
„Possibility of active participation”	4.6	4.3
„Readiness of teachers to help”	4.7	4.8
„Usefulness of teaching tools, models, phantoms, computer simulator program”	4.6	4.7
„The value of the subject in medical education”	4.7	4.8