RAUMEDIC®
Lifeline to Health

# Compartment Pressure Measurement
# Traumatology

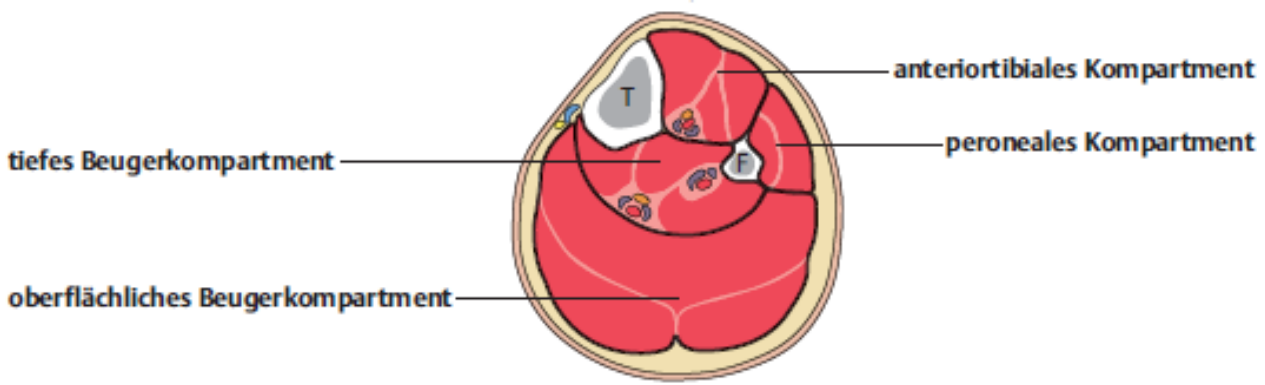
# Compartment Pressure Measurement Basics

**Definition**

A compartment syndrom is a multi-factorial induced increase of the compartment pressure in closed and from fascies surrounded spaces, which lead to a disorder of the muscular microcirculation.

Due to the intracompartmental increase of the compartment pressure an acute or chronic blood flow disorder of the muscels occurs in association with an impairment of the muscle tissue and the related nerves.

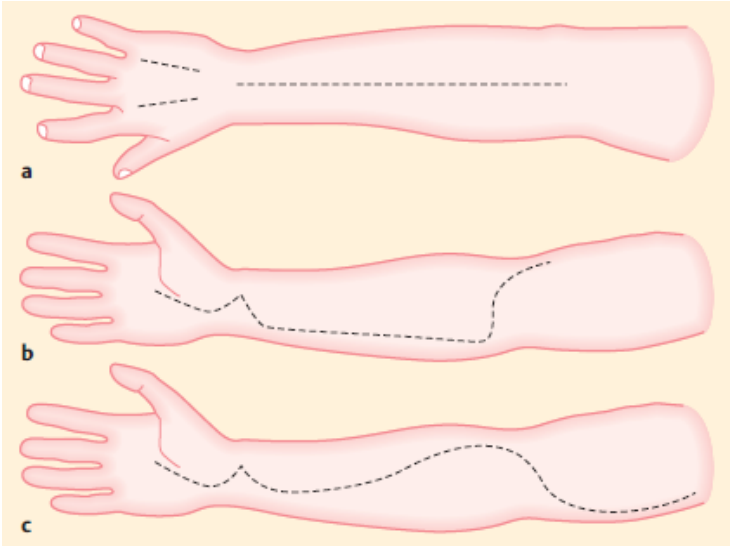
Muscels are in closed, tight chambers  - the muscle compartments -  and each are sourrounded from a fascie made of dense connective tissue.

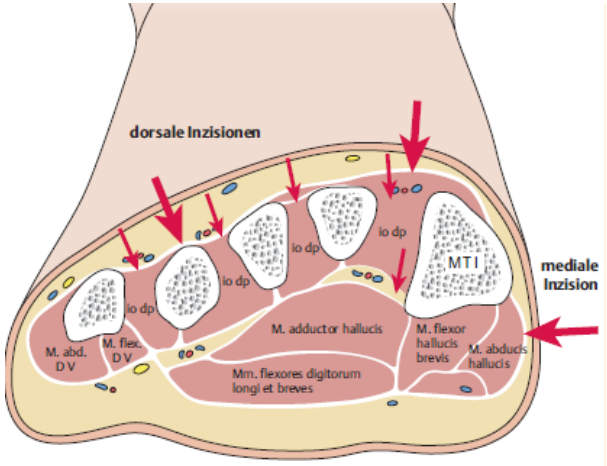


# Compartment Pressure Measurement Basics

**Common affected Compartments**

- Muscles of the lower leg especially in the area of the tibia
- Forearm muscles
- Muscles of the foot
- Muscels of the toes



# Compartment Pressure Measurement Basics

**Reasons for compartment syndrom**

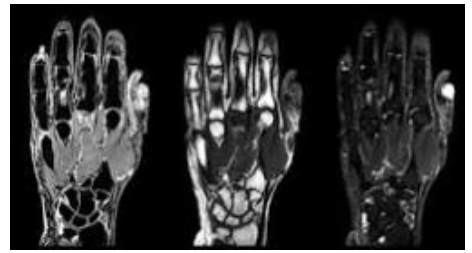
- Accumulation of fluids with haematoma and edema caused by bone fracture or contusion

- Permanent load of the muscles from long-distance runners

- Too fast muscle growth from strength athletes

- String impact with too tight plaster cast or high boots

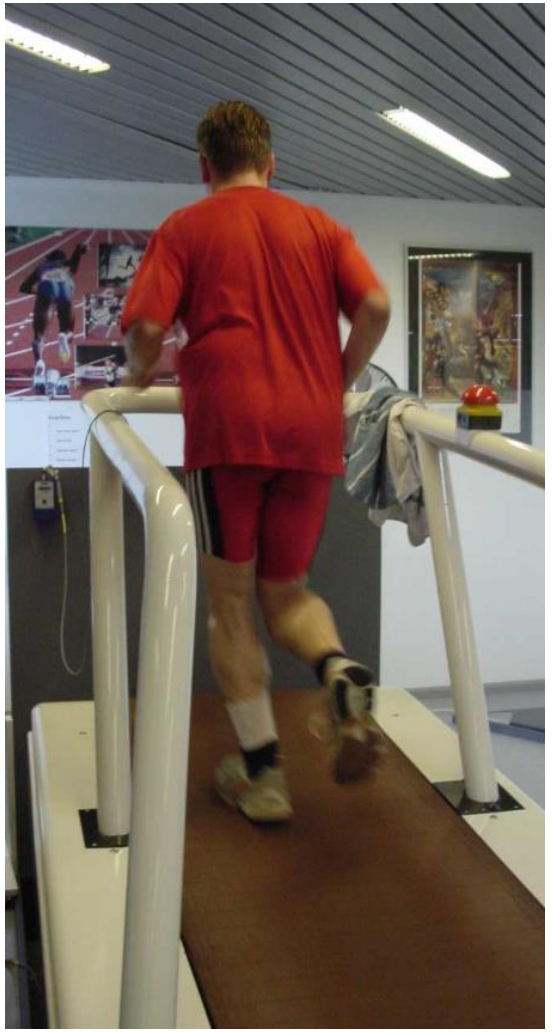
- Long-lastung external pressure
- Drugs, medicines, alcohol
- Spontaneous bleedings with coagulopathy or administration of contrast media



# Compartment Pressure Measurement Basics

**Symptoms of compartment syndrom**

- Feeling of tension*
- Neuronal deficites at a early stage*
- Muscular deficites*
- Strong pain*
- Palsy of the muscle group*
- Muscle stiffness
- Swelling of the muscle group



* Here is the feedback from the awake patient necessary!

# Compartment Pressure Measurement Basics

**Diagnosis of compartment syndrom**

- Examination of neuronal and muscular deficites
- Imaging procedures provide especially at an early stage only unproductive  statements.
- Measurement of intramuscular pressure IMP is very important with unconscious patients, because there is no feedback from the patients

# Compartment Pressure Measurement Basics

**Complications of the compartment syndrom**

- Necrosis, mortify of muscle tissue
- Scarring of the muscels with a significant functio laesa right up to a ankylosis
- Damage of nerves leads to a neural deficit and permanent palsy

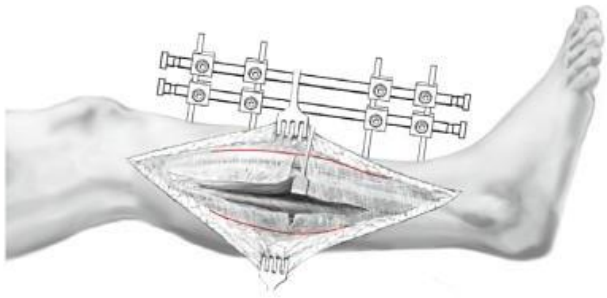
# Compartment Pressure Measurement Basics

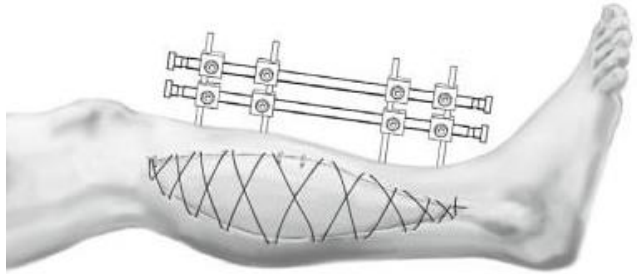
## Conventional therapies

- Correct position of the patient
- Cooling of the affected muscle group
- Mediction treatment
- Reduction of the wrong loading

## Operative therapies

- Drainage for the diverting of fluid and with this for pressure relief
- Relief-OP in the form of a fasciotomy to improve the perfusion





Skin replacement

# Compartment Pressure Measurement Basics

**Prognosis of the process of a compartment syndrom**

- Timely awareness and treatment are important
- Pressure relief within the first 4 hours
- Damages are mostly irreversible

# Compartment Pressure Measurement Basics

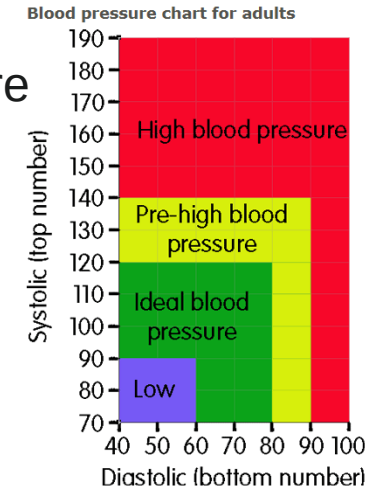
**Pressure limits**
Compartment pressure = Intramuscular Pressure **IMP**

**Simple pressure measurement** (intramuscular pressure)

- < 10 mmHg Normal value for adults
- 10 – 20 mmHg Slight increased pressure
- 20 – 30 mmHg Impending compartment pressure syndrom
- > 30 – 45 mmHg Obvious compartment pressure syndrom

**By determination of differential pressure** Δp = diastolic blood pressure - intramuscular pressure

- ≥ 30 mmHg Normal pressure difference of adults
- < 30 mmHg Pathological pressure difference




Source: https://www.amboss.com/de/wissen/Kompartmentsyndrom/

# Compartment Pressure Measurement Basics

**Dependencies of the pressure measurement**

- Position of the patient
- Position of the extremities
- The best measurement results can be achieved with comparison measurements in the healthy muscle

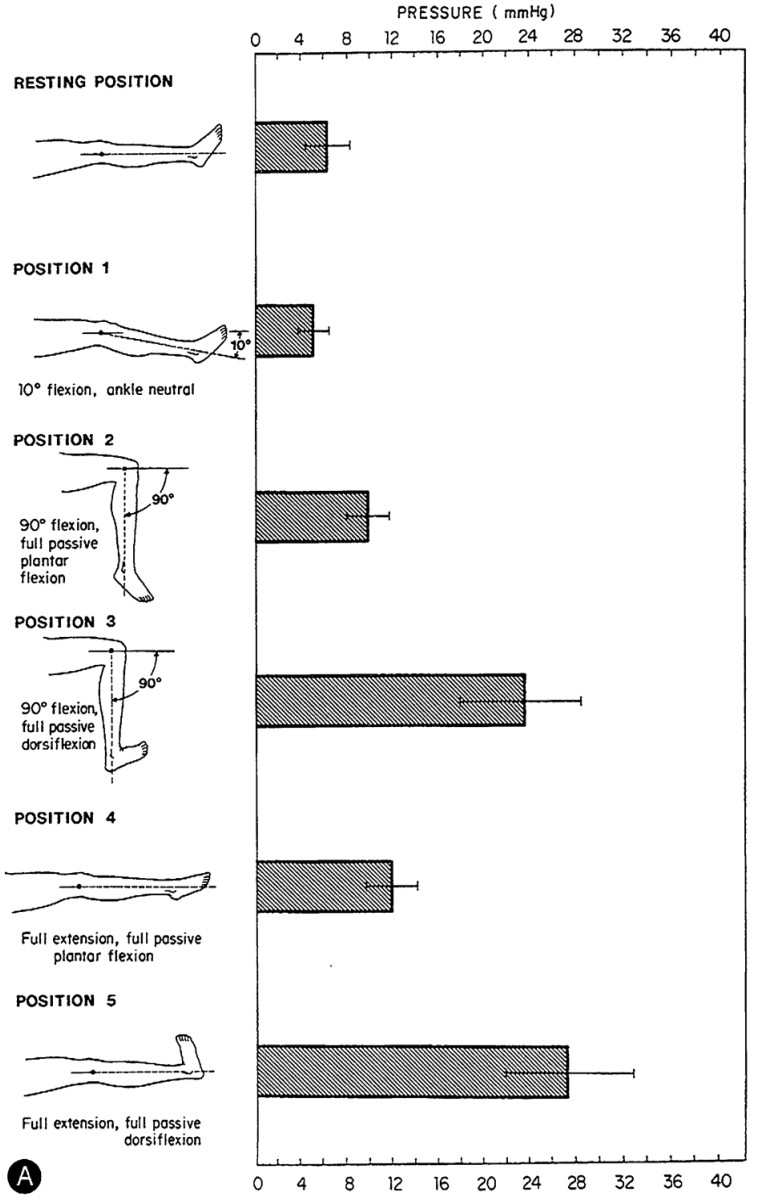



**Figure 3.** Anterior *(A)* and deep posterior *(B)* compartment IMPs as a function of knee and ankle position. (*From* Gershuni DH, Yaru NC, Hargens AR, et al: Ankle and knee position as a factor modifying intracompartmental pressure in the human leg. J Bone Joint Surg Am 66:1415–1420, 1984; with permission.)

# Compartment Pressure Measurement
# Measuring technique

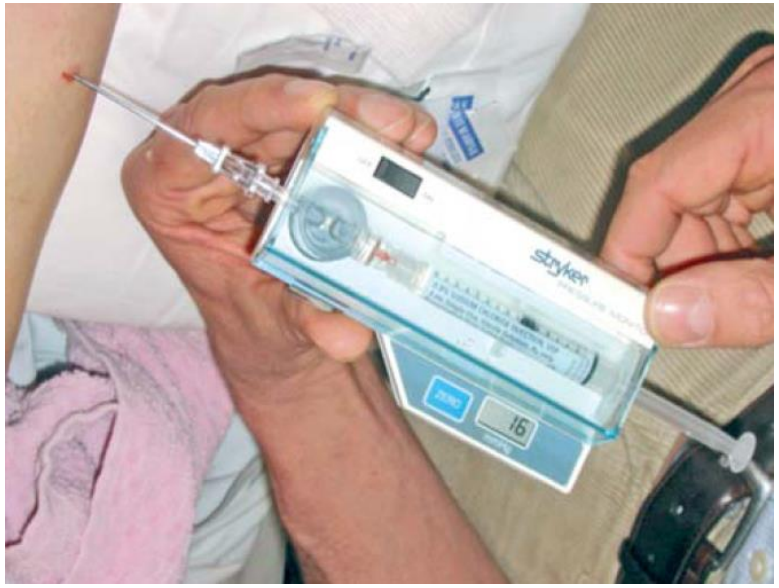
**Stryker Pressure Monitor:**
Small pressure display device in combination with a fluid measurement  via a cannula

**Pro**

- Continous measurement is possible
- Economic: For each measurement only one new needle and a syringe filled with NaCl-solution is necessary
- Slot needle, thereby reduction of agglutination
- No sterilisation, because the cannula is disposable

**Contra**

- Injection of NaCl-solution leads to an increase of the pressure
- Needles agglutinate
- Air bubbles can falsify the measurement values
- No connection to a monitor possible
- Inconvenient handling



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NO LONGER AVAILABLE ON THE MARKET

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# Compartment Pressure Measurement
# Measuring technique

**RAUMEDIC NPS3 and OMNIBAR E5F**

Precise Measurement via a 5F microchip-catheter with piezo-resistive technique

**Pro**


- User friendly pressure display device NPS3 (or with NPS2 direct to the patient monitor or with MPR 1 DATALOGGER several measurements at the same time)
- Connection to the patient monitor with NPS2
- continuous measurement
- very easy handling
- no calibration of the catheter necessary
- catheter is a disposable product and steril supplied
- Connection of the measurement device (NPS3) with the implanted catheter is every time possible, that means one device (NPS3) can measure the pressure from different catheters alternating
- no hydrostatic artefacts
- no additional fluids which will be injected in the affected compartment