Puncture

Puncture, in medical terms refers to **puncture of a body cavity, joint, organ** or **a pathological structure** for diagnostic or therapeutic purposes.

Puncture division

1. **According to purpose**:
    1. **Diagnostic** – sampling *the body fluid* (transudate, exsudate – most often pus, blood) or *tissue sample* for histological, cytological, microbial (culture) or biochemical examination.
    2. **Therapeutic**:
        1. *evacuation of the fluid or gas* (elimination of pressure – hemopericardium, hemotorax, PNO, ascites, etc.),
        2. *drug instillation*,
        3. *drainage*, or *lavage* followed by puncture.
2. **According to design**:
    1. **straight**,
    2. **stepped** (specific absces, joint) – protection against infections.
3. **According to the knowledge of the punctured unit**:
    1. **targetted**,
    2. **probatory**.

Puncture units

- **Natural cavities** (pleural, pericardial, peritoneal, joints, bladder, paranasal sinuses, etc.).
- **Parenchymatous organs** (liver, kidneys, spleen, etc.) and **bone marrow** (aspiration biopsy or trepanobiopsy).
- **Pathological formations** (cyst, absces, tumor, hematoma, etc.).

Administration of the puncture

- **Superficial formations** may be punctured *blindly*;
- **deep-seated** formations and organs, punctures are performed under the control of *ultrasound* or *CT*;
- it is necessary to follow rules of asepsis and use appropriate local anesthetics.
- Puncture **needles**:
    - vary in *diameter* and *length*;
    - some contain *mandrel*, so they do not clog (very wide mandrel needles are called **trocars**);
    - recently used **Chiba-needle** 15 to 20 cm in length, from 0,5 mm in internal diameter, that is *soft* and *flexible* and minimizes the risk of injury to surrounding structures.

Complications

- Complications of **abdominal punctures** include:
    - bleeding,
    - peritonitis,
    - fistula formation,
    - tumor metastasis to the puncture canal,
    - pneumotorax,
    - pancreatitis in pancreatic punctures.

Punctures of body cavities

Puncture of the pleural cavity

- Based on the indication (gas, liquid) *two approaches* are used:

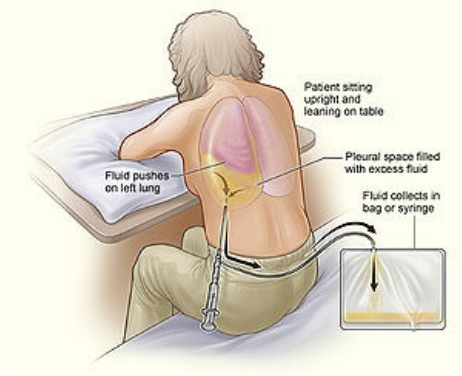
1. according to **Monaldi** – puncture of *pneumothorax* – in the 2nd or 3rd intercostal space in medioclavicular line, in half-sitting position;
2. according to **Bullau** – puncure of *fluidothorax* – in the 6th intercostal space along the anterior axillary line, in sitting position.

- The puncture can be followed by *drainage*, possibly performed:

1. by using **trocar** (modification by ***Seldinger technique*** included: needle – guidewire – dilators – drain);
2. blunt dissection by a **peanut sponge**.

Puncture of a pericardial cavity

- Through **Larrey's left slit - trigonum sternocostale**.
  - inserting the needle *just to the left* of gladiolus at *45°* angle – with the tip of the needle directed to the center of the left clavicle.
  - ECG electrode can be attatched to the needle.
- If the **intracardial drug administration** is necessary (resuscitation), we puncture the left ventricle obliquely in the 5th intercostal space in the medioclavicular line.



Pleural cavity puncture.

Pucture of peritoneal cavity

- It is indicated primarily for **ascites** as a relieving procedure and for **puncture examination** ;
- it is performed outside the center of the left umbilicospinal line at the **Monro point** ;
- in women, the Douglas space is punctured through the posterior vaginal arch , transrectal access is possible with an abscess in the Douglas space ;
- diagnostic **peritoneal lavage** (ultrasound of the abdomen is prefered nowadays) in traumas is performed by punctures in all *4 abdominal quadrants*.

Bone marrow biopsy

1. **Aspiration biopsy** – sternal puncture, puncture of the hipbone wing or tibia.
2. **Trepanobiopsy** – wing of the hipbone;

    - Bone marrow sampling sites are laid superficially, under the skin, hematopoiesis takes place here until old age.

Sternal puncture

- Performed at **body of the sternum** at the level of 2nd or 3rd intercostal space in the midline (in children, manubrium or tibia is preffered);
- **Hynk needle** is used;
- after *disinfecting* the skin and under *local anesthesia* (mesocain) the bone marrow is punctured and about 0,5–1 ml is aspirated into a syringe;
- it is stated, that the puncture itself with appropriate anesthesia **isn't painful**, throughout the aspiration the patient might feel unpleasant pressure (the sound made by a needle when penetrating the bone is unpleasant as well).

Trepanobiopsy

- **A sample of both spongy bone and bone marrow** is obtained in the form of a cylinder 15-20 mm high (in addition to marrow, the bone composition is also being determined);
- Performed out by **Jamshidi needle**.

Spinal tap

- Puncture is performed in the **subarachnoid space** (between arachnoid and pia mater spinalis).
- Main indications :
  - diagnostically when **meningitis** is suspected (bacteria and leukocytes are found in cerebrospinal fluid);
  - **brain bleed** (erythrocytes found in cerebrospinal fluid);
  - therapeutically administrating **drugs to CNS** (cytostatics in CNS tumors, subarachnoid anesthesia).
- Performed **under L2 vertebra** where the spinal cord ends and continues further down as spinal roots - so called *cauda equina*:
  - between *L3 – L4 vertebrae* or *L4 – L5*;
  - the patient is leaning forward (seated or lying on one side), so that the vertebral arches are as far apart as possible;
  - the needle then penetrates the skin and subcutaneous tissue to the spine, between the arches of adjacent vertebrae connected by ligamenta flava finally reaches **the spinal canal**: at first the *epidural space*→ through *dura mater* → *subdural space* → *arachnoid* → to *subarachnoid space*;
  - **drip of the cerebrospinal fluid from the inserted needle** indicates the penetration into the subarachnoid space.

Links

Related articles

- Collection of biological material
- Blood samples for examination

Sources

- PASTOR, J. *Langenbeck's medical web page* [online]. [cit. 2009]. <http://www.freewebs.com/langenbeck/>.

External links

- Osacká Petronela: Punkcie. Multimediálna podpora výučby klinických a zdravotníckych disciplín :: Portál Jesseniovej lekárskej fakulty Univerzity Komenského [online] 2.12.2011, posledná aktualizácia 15.12.2011 [cit. 2011-12-23] Dostupný z WWW: <https://portal.jfmed.uniba.sk/clanky.php?aid=169>. ISSN 1337-7396