

8

Training Objectives:

- ✓ Gain an overview of the various infusion access points and their areas of application
- ✓ Knowledge of the criteria for the respective venous access
- ✓ Be familiar with the infusion solutions used in connection with venous access
- ✓ Knowledge of the risks associated with the various sites of infusion access

APPLICATION POSSIBILITIES

The chapter “Application Possibilities” identifies different possibilities of infusion access. A basic distinction is made here between venous, arterial and subcutaneous infusion.

8.1 Venous Access

Via a cannula or a catheter the desired agents are infused directly into the vein and very quickly (dilution) conducted to the heart. From there, they are evenly distributed throughout the entire body (systemic effect).

A distinction is made with venous access between peripheral venous access and central venous catheter accesses.

8.1.1 PERIPHERAL VENOUS ACCESS

Using a cannula, the veins of the lower arm (from the elbow downwards) and the back of the hand as well as the veins of the top of the foot (in exceptional cases) are punctured. This puncture is performed with:

- **stiff cannulas (Venofix):** Only for short infusions and one-time administrations (ca 20 - 100 ml, e.g. antibiotics, asthma drugs) or

- **flexible I.V. cannulas (Braunula®, Vasofix®, Introcan®)** for repeated infusions, larger fluid quantities or also blood transfusions.

Solutions which can be infused over a peripheral venous access are, for example:

- Glucose 5%, 280 mOsmol/l
- Crystalloid solutions 300 -320 mOsmol/l
- Sodium chloride solution 0.9%, 310 mOsmol/l
- Lipid emulsions 10%, 300 - 380 mOsmol/l
- Glucose 10%, 555 mOsmol/l
- Mixed solutions for parenteral nutrition of about 570 - max 900 mOsmol/l (depending on the length of the infusion therapy and the state of the patient).

Important

Only isoosmolar and slightly hyperosmolar solutions should be infused via a peripheral access. Highly hyperosmolar solutions can damage and even destroy the veins.

8.1.2 CENTRAL VENOUS CATHETER ACCESS

The veins which are solidly fixed in the tissue of the chest and neck area known as central veins.

In a state of shock, the peripheral veins collapse so that only a central access is possible. If even this form of access is not possible then a vena sectio must be performed (operative opening and cannulation of the vein).

The tip of all of these catheters is located in the superior vena cava. Because of the high rate of blood flow there, the greatest dilution effect is achieved.

Solutions which must be infused with a central venous access are, for example:

- Mixed and combination solutions for parenteral nutrition of ca. >1 000 (m Osmol)
- Aggressive drugs (Note: pH > 9), e.g. cytostatic agents, some antibiotics.

Detailed information is provided in the script “Background Information on Venipuncture”.

8.2 Arterial Access

In arterial infusion or injection, the agents are administered in a specific artery with a defined distribution area (regional effect). The agents reach this area in a relatively undiluted form and come to other regions of the body in a highly diluted form only after passing through the capillary bed and the veins.

Attention should be paid to the following factors:

- **The pressure in the arteries allows infusions only to be made by way of pressure infusion or an infusion pump.**
- There is a risk of arterial spasms, which are difficult to subdue and result in a suspension of the supply of blood and/or necrosis (devitalisation of the affected tissue area).
- The development of an aneurysm (arterial dilation) following puncture of an artery has been frequently observed in patients suffering from arteriosclerosis (calcification of the arteries) and should be mentioned as a possible risk.

Important

Arterial infusion is performed relatively rare. Possible indications include measures to stimulate blood flow in the periphery or local chemotherapy.

8.3 Subcutaneous Infusion

Subcutaneous infusions make use of the slow diffusion of agents from the interstitial space into the vascular system to achieve a long-term effect (depot effect).

In exceptional cases infusions are made in the areas between the cells (interstitial space) e. g. if small fluid amounts are involved and if there is no puncturable vein available (as with infants and geriatrics). In those cases the subcutaneous adipose tissue in the abdomen or thigh is used for puncture.

Important

Solutions which are supplied subcutaneously must be histocompatible

8.4 Summary

Among the different methods of applying an infusion distinction is made between venous, arterial and subcutaneous access.

With venous infusion, the desired agents are infused directly into the vein by means of a cannula or catheter and conducted very quickly to the heart. From the heart they are evenly distributed throughout the whole body. Talking of venous access a distinction is made between peripheral venous access and central venous catheter access. Only isoosmolar and slightly hyperosmolar solutions should be infused peripherally because highly hyperosmolar solutions can damage or destroy the veins. In a state of shock, the peripheral veins collapse so that only a central access is possible. Central veins are those which are solidly fixed in the tissue of the chest and neck region.

In arterial infusion or injection, agents are administered into a specific artery with a defined distribution area. The agents reach this area in a relatively undiluted form and reach other regions of the body in a highly diluted form only after passing through the capillary bed and the veins. It should be noted that pressure in the arteries allows infusions to be made by way of pressure infusion or an infusion pump only.

Subcutaneous infusions make use of the slow diffusion of agents from the interstitial space into the vascular system to achieve a long-term effect. In exceptional cases infusions are made in the areas between the cells (interstitial space) e. g. when small fluid amounts are involved and there is no puncturable vein available. Solutions which are given subcutaneously must be histocompatible.

8.5 Comprehension Questions

- Describe the process of puncture using a peripheral venous access and a central venous catheter access.
- Which infusion solutions can/must be infused peripherally or centrally?
- Describe the course of arterial and subcutaneous infusion.
- What is to be considered when an arterial infusion is performed?
- What is to be considered when a subcutaneous infusion is performed?