Plasma Volume Expanders

Disclaimer

All the content material provided here is only made for teaching purpose.

Plasma expanders

Plasma expanders are high mol. Wt. substances which when infused IV exert osmotic pressure and remain in the body for a long time to increase the volume of circulating fluid.

a. Colloids

1. Dextran
2. Polyvinylpyrrolidine
3. Gelatin polymers
4. Hydroxyethyl starch

b. Crystalloids

1. Normal saline
2. Dextrose
3. Dextrose Saline

Requirements of an ideal plasma expander:

1. Oncotic pressure comparable to plasma.
2. Remain in the circulation for an adequate period and
3. Disposed of either by metabolic degradation or by excretion.
4. Not antigenic or pyrogenic.
5. Not interfere with grouping and cross matching of blood.

Use of plasma expanders:

- Hypovolemic shock.
- Burns.
- Severe trauma.
- Endotoxin shock.

Contraindications:

- Severe anaemia.
- Cardiac failure.
- Pulmonary oedema.
- Renal insufficiency.

Colloidal Plasma Expanders

- Substances of high Mol.Wt.
- Remain long time in blood stream
- Augment the volume of circulating fluid
- By increasing the osmotic pressure

Dextran:

- It is a Polysaccharide[made of many glucose molecules].
- Dextran 70 (MW – 70,000) & Dextran 40 (MW – 40,000).
- Oncotic pressure similar to plasma proteins and expands plasma volume for about 24 hours.
- Large doses do not induce antibody formation.
- They may interfere with coagulation and platelet function and also blood grouping.
- Dextran – 70: Excreted very slowly by glomerular filtration and some amount deposited in RE cells.

Dextran-40: Reduces blood viscosity.

- Excreted through renal tubules and occasionally may produce acute renal failure. Precautions should be taken.

Caution:

- Dextran does not provide necessary electrolytes and can cause hyponatremia or other electrolyte disturbances

Dextran- other uses:

- Antithrombotic in microsurgeries
- In some eye drops as a lubricant
- To solubilize other factors, e.g. iron (=iron dextran)
- Used in laboratory tests

Contraindications:

- Allergy.
- Heart failure.
- Acute oliguric renal failure.
- Hypofibrinogenemia.
- Thrombocytopenia

Hydroxyethyl starch[HES]:

Compared to dextrans –

- Maintains blood volume longer.
- Does not cause acute renal failure or coagulation disturbances.

Adverse effects:

- Anaphylactoid reactions
- Mild fever, Chilling, periorbital edema, urticaria, itching and chills.

Polyvinylpyrrolidone[PVP]:

- Synthetic polymer,MW- 40,000.
- Interferes with blood grouping and cross matching.
- Releases histamine.
- Binds to penicillin and insulin.

Gelatin polymer:

- Does not interfere with grouping and cross matching.
- Expands plasma volume for about 12 hours.
- Not antigenic
- Hypersensitivity and hypotension can occur.

Crystalloids

Normal saline:

Very limited duration of action.

Dextrose:

- Osmolality is lower than serum.
- Useful when kidney function is impaired.
- **Human albumin:**
- Obtained from pooled human plasma.
- Crystalloid solutions must be infused concurrently for better action.
- Does not interfere with coagulation.
- Used as a vehicle for transfusing packed red cells.

Pharmacotherapy of shock

- Drug therapy aims at:
- Managing specific causes: Volume, cardiac function, relieving obstruction etc.
- Managing associated hemodynamic alterations
- Dopamine or dobutamine, glucocorticoids, volume replacements &expanders
- Undertaking life saving & life sustainable measures

References

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