Blood transfusion

Indications for administration of blood derivatives

- Anemia (Usually with hemoglobin below 80 g/l with overt Anemic syndromem),
- Severe Thrombocytopenia,
- Some immunodeficiencies,
- Hemophilia and some other coagulopathy.

Types of transfusion

- **Allogeneic transfusions** – The use of other people's blood product.
- **Autologous transfusion** – The patient's own stored blood during planned operations (lower risk of infection).

Blood products used in transfusions

- **Transfusion products** (Prepared at a local transfusion station)
  - Blood
  - Erymass (red blood cells)
  - Plasma or frozen plasma
  - platelet – (*These 3 fractions can be obtained from whole blood by centrifugation*),
- **Blood derivatives** (Supplied by pharmaceutical companies from mass-processed plasma)
  - albumin ,
  - Cryoprecipitate *(Prepared from frozen blood plasma. j. „Freezing“ – some proteins; contains f. VIII, Fibrinogen, von Willebran factor, f. XIII; possible use eg . in Hemophilia, von Wilebrand´s disease, Hypofibrinogenemia)*,
  - Precipitating factor concentrates
  - Fibrinogen concentrate
  - Immunoglobulin .

Blood group

The most important and well-known blood groups belongs **system AB0** (Incompatibility causes post-transfusion hemolysis; The antibodies of the ABO system are IgM and are therefore a large enough to cause agglutination – Erythrocyte erythrocytes). Another important type of blood group is **Rh faktor** (maternal negativity in terms of the so-called D antigen – t.j. Rh factor – and the positive child can cause hemolytic disease of newborns). However, there are more than thirty different groups of variable antigen on the surface of red blood cells, ie. which means that its more than thirty different groups of variable types(systems) of blood groups. *Examples: MNS system, where in particular the presence of anti-S antibodies in a recipient can cause post-transfusion hemolysis. Kell antigen system (incompatibility may cause autoimmune haemolytic anemia and haemolytic disease of the neonate).* The presence of plasma antibodies against these antigens (other than the AB0 and Rh systems) is **rare**, but if they do occur, it may cause severe post-transfusion reactions. We refer to these antibodies as **irregular antibodies**.

Compatibility of blood group systems AB0 and Rh

		DONOR							
		0-	0+	B-	B+	A-	A+	AB-	AB+
RECIPIENT	AB+								
	AB-								
	A+								
	A-								
	B+								
	B-								
	0+								
	0-								

Pre-transfusion tests performed in the laboratory

1. Examination of blood groups **AB0 or Rh system** in both **donor**, and **patient / recipient**.
2. Screening of the **recipient´s** for the presence of **irregular antibodies**. . *This is done by mixing the patient's serum with standardized erythrocyte mixtures that have all known irregular antigens on their surface (the so-called indirect Coombs test). Agglutination means the presence of irregular antibodies in the serum of the*

recipient and forces more detailed testing aimed at identifying irregular antibodies in the serum of the recipient and the donor blood cells. Screening is performed every day on which a transfusion is performed, as irregular antibodies may appear in response to a previous transfusion.
3. **Great Crusade**. Donor red blood cells are tested against recipient plasma . If agglutination occurs, it means the presence of antibodies in the serum against antigens on the surface of red blood cells. Agglutination means the incompatibility of the blood and the patient. The absence of an agglutination reaction is a prerequisite for transfusion.
4. **Screening for infectious diseases.** Many infectious diseases are transmissible by transfusion. Therefore, screening of potential risk factors and laboratory testing of the donor for certain infectious diseases(HIV, hepatitis A, B and C, treponema pallidum, malaria, cytomegalovirus aj.) are performed

Testing at the bedside

1. Examination of the recipient before transfusion**. Temperature, blood pressure, pulse are measured. Orientation tests of urine are also performed**
2. **Checking the documentation** at the recipient's bedside. We check whether the data on the applicant and the blood can agree and whether the recipient has been confused.
3. **Control of donor and recipient blood groups at the recipient's bedside:**

   It is performed using diagnostic kits from various manufacturers. The kit contains anti-A (usually stained blue) and anti-B (yellow) sera, pre-printed cards and plastic sticks for mixing the blood sample with the antiserum. The card is marked with the identification data of the recipient and the blood can. Drops of recipient blood and canned blood samples are applied to the red circles (taken from a "segment" on the can tube). Anti-A and anti-B sera are added to the blue and yellow circles (antisera should be in excess of the amount of blood). The blood is mixed and the agglutination is read in 1 minute with careful tilting of the card (see table)

4. **Biological experiment.** About 20 ml (about 300 drops) of blood is drained into a vein and then slowed to a minimum for 1 to 2 minutes. If the patient does not show an adverse reaction, the test is repeated 2 more times. Throughout the experiment (10 to 15 minutes), the doctor and the nurse observe the recipient. (According to the recommendation of the Society for Transfusion Medicine of the Czech Medical Association, the biological test is no longer **performed**).

Determination of blood group by agglutination with antisera

The clustering occurred:	**Donor and recipient group**
with anti-A serum	AND
with anti B-serum	B
with anti-A and anti-B	AB
did not happen anywhere	0

- The nurse then continues to follow throughout the transfusion. If subjective problems or objective deterioration of the condition are detected, the rider immediately stops the supply (leaves the needle in the vein) and immediately informs the doctor. The nurse ends the transfusion when 10 ml of blood remains in the bag. Recipients will measure heart rate, breath, blood pressure, TT, or examines urine (for protein and bile pigments). It writes the values again and adds the time when the transfusion ended. The can and the rest of the blood are stored in the refrigerator for 24 hours (measures in case of additional blood control in case of late post-transfusion reaction).
- Replacement of blood cans – each can is administered with a new sterile transfer kit, the original needle may remain in the vein from the original transfer, each can should be re-checked for blood groups with a sangvitest and a biological test.

Vital indications arise when there is a risk of delay. The cross-test is examined by orienting the blood on a slide. The laboratory tests are completed to verify the accuracy of the orientation test. The biological experiment is not performed.

Possible transfusion complications

- Acute haemolytic reaction - occurs when there is an incompatibility in the AB0 system, especially when the recipient's blood contains antibodies against the donor's erythrocytes,
- delayed hemolytic reaction
- febrile non-hemolytic post-transfusion reaction
- anaphylactic reaction,
- infections – HBV, HCV, HIV, Treponema pallidum, CMV, parvovirus B19,
- iron overload during repeated transfusions,
- transfusion acute lung injury (Transfusion Related Acute Lung Injury, TRALI) caused by leukocytes present in transfused
- Volume overload,
- Cardiac arrhythmia – transfusion of untempered fluid through a central venous catheter to the vicinity of the right atrium

- Transfusion-associated graft vs. host disease (Transfusion-associated graft vs. host disease, GvHD) – T-lymfocytes of the donors will react with recipient HLA antigens because; when transfusing blood from immunocompromised recipients or when transfusing from a blood relative.

Reference

external links

- Template:Akutně

Related articles

- Blood groups
- Exchange transfusion

References

- NEČAS, Emanuel, Karel ŠULC a Martin VOKURKA. *Patologická fyziologie orgánových systémů. Část I.* 1. vydání. Praha : Karolinum, 2006. ISBN 978-80-246-0615-6.