SPECIFICATION SPN215/2

Selecting Appropriate Blood Products for Recipients of ABO/Rh Mismatched Stem Cell Transplants

This Specification replaces
SPN/DDR/RC/023/05 (SPN215/1)

Copy Number

Effective **18/10/11**

Summary of Significant Changes

Change to new document reference numbers.

Removal of ABO titres from sections 3.1 and 3.2 as included in SPN251.

Restructuring of section 4 for clarity.

Section 4.2. Change in policy for major ABO incompatibility to specify recipient-group red cells or group O (previously group O only) in line with guidance in ESH-EBMT Handbook.

Section 4.2. Change in policy for minor ABO incompatibility to specify donor-group red cells (previously group O only) in line with guidance in ESH-EBMT Handbook .

Purpose

To ensure that NHSBT provides consistent advice to transplant units and hospital blood banks re selecting the ABO/Rh group of blood products for recipients of ABO/Rh mismatched allogeneic stem cell transplants.

Definitions

PBSC – peripheral blood stem cell

Applicable Documents

SPN251 - SCI policy for Processing of stem cell products in ABO/Rh mismatched allogeneic stem cell transplants

Selecting Appropriate Blood Products for Recipients of ABO/Rh Mismatched Stem Cell Transplants

1. BACKGROUND

Approximately 15-25% of HLA identical sibling donor/recipient pairs differ for ABO blood groups. The figure is higher for alternative donor transplants. Haemolysis may occur immediately on stem cell infusion or be delayed and may be life-threatening. Delayed haemolysis in cases of minor ABO mismatch occurs because of secondary (anamnestic) immune response mediated via memory B cells in the graft against recipient ABO antigens, the so-called passenger lymphocyte syndrome. Maximum haemolysis usually occurs between 9 and 16 days post-transplant and is occasionally severe and intravascular. This phenomenon may be commoner when PBSCs rather than bone marrow are the source of stem cells (higher number of lymphocytes infused) and is rarely, if ever, seen when grafts are T-cell depleted using strategies such as alemtuzumab (CAMPATH-1H) antibody or CD34 positive cell selection since B cells are also depleted.

ABO incompatibility probably does not affect transplant outcome although not all reports agree.[1,2,3] ABO incompatibility does not affect either graft rejection or graft-versus-host disease (GVHD) since ABO antigens are not expressed on primitive stem cells.

This policy provides guidance on the appropriate investigations before and after transplant, potential complications and the selection of appropriate blood products. This policy does not cover the processing of stem cell products in ABO incompatibility which is detailed in a separate SCI policy SPN251.

2. INVESTIGATIONS

Pre-transplant: Samples from both donor and recipient for:
ABO and D grouping and antibody screen
Anti-A and anti-B titres by IAT (where indicated)
Direct antiglobulin test (DAT)

Post-transplant: Monitor for haemolysis – immediate and delayed as appropriate

3. ABO INCOMPATIBILITY

3.1 Major ABO incompatibility:

3.1.1 *Definition:* the presence in the recipient's plasma of anti-A, anti-B or anti-A,B antibodies incompatible with donor red cells, eg gp A donor, gp O recipient.

3.1.2 *Risks:*
- Acute haemolysis at time of stem cell infusion
- Delayed haemolysis due to production of antibodies by residual host lymphocytes

Risk of both complications depends on the volume of red cells infused and the titre of antobody present (see SPN251).

3.2 Minor ABO incompatibility:

3.2.1 *Definition:* the presence of anti-A, anti-B or anti–A,B antibodies in the donor's plasma reactive with the recipient's red cells eg donor group O and recipient group A.

3.2.2 *Risks:*
- Acute haemolysis at time of marrow infusion caused by anti-A or anti-B in the plasma of the donor product (see SPN 251).
- Delayed haemolysis of recipient cells due to passenger lymphocyte syndrome.

3.3 **Major plus minor ("bidirectional") ABO incompatibility**:

3.3.1 *Definition:* the presence in both the donor and recipient's plasma of anti-A, anti-B or anti-A,B antibodies reactive with recipient and donor cells respectively eg donor group A and recipient group B.

3.3.2 *Risks:* as for major and minor mismatches.

4. CHOICE OF ABO BLOOD GROUPS FOR TRANSFUSION SUPPORT[4,5]

4.1 PRE-TRANSPLANT: recipient-type red cells and platelets should be given.

4.2 POST-TRANSPLANT IMMEDIATE PHASE (PRE-ENGRAFTMENT): the guidance below applies to the immediate post-transplant period until all of the following criteria are fulfilled:

1. ABO antibodies to the donor ABO group are undetectable in the 'standard' reverse group and by indirect antiglobulin test using A1 and/or B cells using either polyspecific AHG or anti-IgG (major ABO incompatibility only).
2. The direct antiglobulin test is negative using polyspecific AHG.
3. Conversion to donor group is complete, with no mixed field seen using the patient's cells in standard serological tests with anti-A or anti-B (in practice this can only be demonstrated if there have been no red cell transfusions in the last 3 months).

Major ABO incompatibility:

- **For red cells:** red cells of recipient's ABO group or group O should be given.

- **For platelets and FFP:** give platelets and plasma of donor ABO group.

Where donor is group AB use group A high-titre negative platelets when the recipient is group A and group B high-titre negative platelets when the recipient is group B (see table below). It is not necessary to give platelets resuspended in platelet suspension medium in either of these scenarios.

Minor ABO incompatibility:

- **For red cells:** red cells of donor ABO group should be given.

- **For platelets and FFP:** give platelets and plasma of recipient ABO group.

Where recipient is group AB, group A high titre-negative platelets may be used when the donor is group A and group B platelets when the donor is group B (see table below). It is not necessary to give platelets resuspended in platelet suspension medium in either of these scenarios.

Major plus minor ("bidirectional") ABO incompatibility:

- **For red cells:** red cells of group O should be given.
- **For platelets and FFP:** give group AB plasma and recipient group platelets.

4.3 POST-TRANSPLANT AFTER ENGRAFTMENT (when all criteria 4.1-4.3 fulfilled): give donor group red cells and donor group-compatible platelets and plasma.

4.4 GRAFT REJECTION: following graft rejection, revert to recipient-type red cells and platelets.

APPROPRIATE ABO GROUPS FOR TRANSFUSION, IMMEDIATELY POST-TRANSPLANTATION

	Donor	Recipient	Red cells	Platelets	FFP
Major ABO incompatibility	A	O	O	A	A
	B	O	O	B	B
	AB	O	O	A	AB
	AB	A	A*	A	AB
	AB	B	B*	B	AB
Minor ABO incompatibility	O	A	O	A	A
	O	B	O	B	B
	O	AB	O	A	AB
	A	AB	A*	A	AB
	B	AB	B*	B	AB
Bidirectional ABO Incompatibility	A	B	O	B	AB
	B	A	O	A	AB

* group O red cells may also be used

5. RhD INCOMPATIBILITY

5.1 *Definition:* Major Rh incompatibility exists where a donor is RhD positive and a recipient RhD negative. Minor Rh incompatibility occurs where a donor is RhD negative and the recipient is RhD positive.

5.2 *Risks*: In cases of minor Rh incompatibility delayed haemolysis can occur due to donor lymphocyte-derived anti-D. The risk is higher if the donor has been previously sensitised to the RhD antigen and in recipients of non-selected PBSCs.

6. CHOICE OF Rh BLOOD GROUPS FOR TRANSFUSION SUPPORT

Pre-transplant: recipient-type red cells and platelets should be given.

Post-transplant:

- major RhD incompatibility - give RhD negative blood components until RhD positive red cells are detected. Thereafter give donor RhD positive products.

- minor RhD incompatibility – give RhD negative blood components indefinitely.

7. OTHER BLOOD GROUP SYSTEMS

If a transplant recipient has other clinically significant red cell alloantibodies detectable at the time of transplantation the donor should be phenotyped for the relevant blood group antigen and the donor marrow red cell depleted where indicated. If advice is required, discuss with a transplant or red cell immunohaematology consultant.

References

1. Rowley SD (2001). Hematopoietic stem cell transplantation between red cell incompatible donor-recipient pairs. *Bone Marrow Transplant* **28**: 315-321.

2. Kimura F et al (2008). ABO-incompatible bone marrow transplantation: a GITMO survey of current practice in Italy and comparison with the literature. *Haematologica* **93**: 1686-93.

3. Klumpp TR (1991). Immunohematologic complications of bone marrow transplantation. *Bone Marrow Transplant* **8**: 159-170.

4. Murphy MF and DH Pamphilon (2001). *Practical Transfusion Medicine*. Blackwell Science.

5. Pawson R and Pamphilon D.H. Transfusion Support in Patients Undergoing Stem Cell Transplantation. ESH-EBMT Handbook (in draft 2011).

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