

9 Platelets

Platelet transfusions are required in a number of conditions to control bleeding episodes. The decision to transfuse should be based on a combination of clinical and laboratory findings rather than on empirical platelet levels. Response to platelet transfusions should be judged on clinical improvement, normalisation of bleeding time, and relative increase in circulating platelet count. Significant increases may not occur in the actively bleeding patient due to rapid utilisation.

1 INDICATIONS FOR PLATELET TRANSFUSIONS

- i. Bleeding due to thrombocytopenia, which is the result of defective platelet production (aplastic anaemia or leukaemia).
- ii. Defective function (congenital platelet disorders).
- iii. Increased consumption (disseminated intravascular coagulation).
- iv. Dilutional effect as in massive transfusion.

GENERAL NOTES:

Blood loss in excess of 5 ml/kg/h is unlikely to be due entirely to thrombocytopenia.

It is not appropriate to administer platelets to patients with Immune Thrombocytopenia unless there is life-threatening haemorrhage. This is because platelet survival is reduced to a few hours due to the platelet antibodies in the patient's circulation (see Table 4).

Prevention of febrile non-haemolytic transfusion reactions (FNHTR) associated with platelet transfusions can largely be brought about by the use of buffy coat preparations. If reactions occur, leucocyte depleted concentrates are recommended. These should be prepared in the blood bank. Platelets prepared from single donors using apheresis machines are leukodepleted as part of the process. Clinicians must consult with their local centres concerning the availability.

Table 3: Thrombocytopenia and bleeding

PLATELET COUNT	RISK OF BLEEDING
< 5 x 10 ⁹ /l	Life threatening bleeding is a strong possibility
5-20 x 10 ⁹ /l	Increased likelihood of spontaneous bleeding, particularly intracranial haemorrhage
20-50 x 10 ⁹ /l	Increased likelihood of bleeding with trauma, surgical procedures and specific lesions such as gastric ulcers
> 50 x 10 ⁹ /l	Bleeding rarely occurs, even in major surgery. For surgery to the eye or brain a platelet level of 100 x 10 ⁹ /l is recommended

Clinical evidence of Thrombocytopenia or thrombopathy include:

- i. Diffuse oozing from surgical incision.
- ii. Oozing from venepuncture sites.
- iii. Scattered petechiae.
- iv. Ecchymoses in areas not associated with trauma or incisions.
- v. Mucocutaneous bleeding.
- vi. Retinal bleeding.

2 PLATELET PRODUCTS

a) *Random donor platelets*

- i. These platelet concentrates are prepared from whole blood within 8 hours of collection. The concentrates may be stored for 5 days in special satellite bags that allow for gaseous exchange at 22 °C with continuous agitation. Each single donor unit contains approximately 60–80 x 10⁹ platelets in 50 ml of citrated plasma.
- ii. To transfuse sufficient platelets for a therapeutic dose several of the individual units are pooled (see Table 4). In general, random donor platelets are recommended for acute disorders such as acute disseminated intravascular coagulation.

NOTE:

Although multiple units of random platelets may be required over a short period there is little danger of alloimmunisation as in continuous long-term therapy. In the latter situation (apheresis) single donor platelets concentrates are recommended.

b) Apheresis single donor platelet concentrate

- i. This is a unit of platelets from a single donor, prepared by using standardised protocols on a blood cell separator. Each unit contains at least 300×10^9 platelets in 300 ml of citrated plasma. Depending on the system used the product has a shelf life of 24 hours (open system) to 5 days (closed system). The product has fewer than 5×10^6 leucocytes in total, and is considered leucocyte depleted.
- ii. Apheresis products are particularly recommended in patients on long term platelet support (e.g. bone marrow transplant) to minimise exposure to alloantigens. The risk of exposure to latent donor infections is also reduced, and is therefore probably preferable to random donor platelets. However, they are more costly and time consuming to produce.

3 GENERAL RULES REGARDING PLATELET TRANSFUSION

- i. Platelets should be transfused through a platelet giving set and over 15-30 minutes. Longer transfusion times may negate the effect particularly in the actively bleeding patient. Transfusion through a standard 170 micron filter will reduce the amount of platelets received by the patient.
- ii. Apheresis units are usually obtained from a donor with the same ABO and Rh group as the patient and are red cell free. Random donor units are usually prepared from group A and group O Rh-positive and Rh-negative units. Use of Rh-positive units in Rh-negative patients is permitted provided the clinician agrees. Because the random units contain very small amounts of red cells Rh immunisation is unlikely to occur. However in premenopausal women of child bearing age the use of Anti-D immunoglobulin prophylaxis is recommended. The same dosage as for prevention of Haemolytic disease of the newborn is suggested. *Dosage suggested is 500 iu of anti-D immunoglobulin per 6-8 pooled random platelets.*

NOTE:

Anti-D immunoglobulin is an intramuscular preparation and should only be given once the bleeding parameters have returned to suitable levels.

Table 4: Platelet information and dosage guidelines

PLATELET PRODUCT	VOLUME	NUMBER OF PLATELETS IN PRODUCT	DOSAGE		EXPECTED INCREMENT
			Adults	Paediatric	
Random platelet *	50 ml	60 - 80 x 10 ⁹	1 unit per 10 kg	1 unit per 10 kg For infants under 10 kg 5 ml/kg	30 - 50 x 10 ⁹ /l
Apheresis platelet unit	200 - 300 ml	>300 x 10 ⁹	1 unit per average adult	34 ml of an Apheresis unit per kg	50 - 60 x 10 ⁹

* Some services pool random platelets and these pools are equivalent to apheresis platelets for dosage purposes

4 MONITORING PATIENT

The response to platelet transfusion may be assessed either by an improvement in the clinical situation in the actively bleeding patient, or may be calculated in the stable patient receiving prophylactic transfusion. Various formulae are available:

- i. **Platelet recovery (R)** is calculated from platelet increment (PI) x 10⁹/l, the blood volume (BV) in litres, and the platelet dose (PD) transfused (x 10⁹).

$$R(\%) = \frac{PI \times BV}{PD}$$

Although a successful transfusion may produce a platelet recovery of 67% in a stable patient, the minimum standard for a successful transfusion may be considered as a platelet recovery of greater than 30% at 1-hour post transfusion and greater than 20% after 20 hours.

- ii. **Corrected platelet increment.** The corrected increment (CI) x 10⁹/l is calculated from the platelet increment (PI), the body surface area in square metres (BSA) and the number of platelet concentrates (n) transfused:

$$CI(x10^9/l) = \frac{PI \times BSA}{n}$$

- A CI of less than $7,5 \times 10^9/l$ indicates an unsuccessful platelet transfusion. In practice, an increase in the patient's platelet count of less than $20 \times 10^9/l$ at 20-24 hours after transfusion is considered a poor response.
- A poor response may be due to alloimmunisation, infection, DIC, splenomegaly, and treatment with antibiotics and amphotericin. In such cases higher dosage regimes, of 1-2 apheresis units per average adult, or 2 units of random platelets per 10 kg are recommended. If a good clinical response is obtained, despite a poor increment, further or increased dosages of platelets may not be required.