



Platelet transfusion

Thrombocytopenia/transfusion goals

Prophylactic $\geq 10K/mL$ to prevent serious bleeding (prophylactic)

Therapeutic $\geq 40-50K/mL$ to treat bleeding or before invasive procedure
 $\geq 75-100K/mL$ for CNS bleeding/procedure

Northwestern
Medicine

2

Patient with multiple myeloma

Received allogeneic stem cell transplant and later developed sepsis and engraftment failure.

Platelet transfusion goal: $> 20,000/\mu L$ for bleeding

Corrected count increments were less than $5,000 M^2/\mu L$ following 2 platelet transfusions; 9 poor at 18-24 hours.

Platelet antibody screen positive 10/13 cells
 Compatible units obtained with testing: 4/6, 8/12, 6/6, 6/20
 HLA antibody screen – non-reactive
 HLA and crossmatched platelets provided.

Northwestern
Medicine

Platelet antibody screen and crossmatch

The diagram shows the process of platelet antibody screening. It includes steps for 'Pre-treatment', 'Washing' (removal of plasma), and 'Screening' (addition of platelets and antibody reagents). A 'CAPTURE-IP[®] READY-SCREEN[™] Master List' table is provided with columns for various antibody reagents (e.g., IgG, IgA, IgM, IgE, IgG2a, IgG2b, IgG3, IgA1, IgA2, IgM1, IgM2, IgE1, IgE2) and rows for different samples (e.g., IgG, IgA, IgM, IgE, IgG2a, IgG2b, IgG3, IgA1, IgA2, IgM1, IgM2, IgE1, IgE2). The table contains numerical data representing the results of the screening process.



HLA antibody testing methods

Lymphocytotoxicity

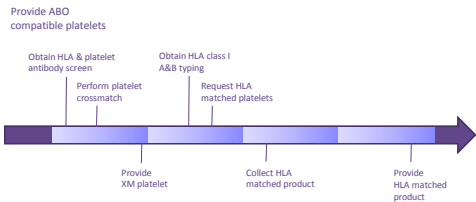
Luminex technology

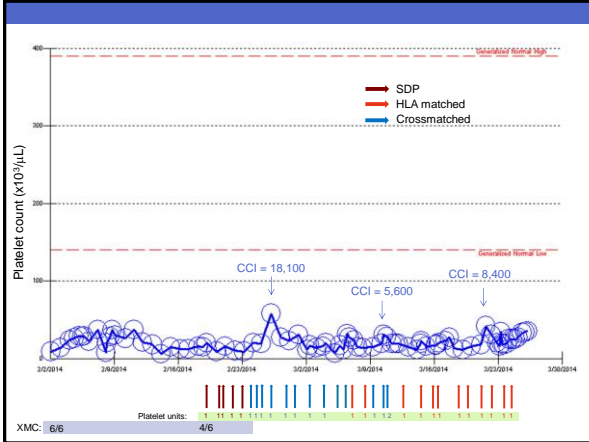
The diagram compares two methods for HLA antibody testing. On the left, 'Lymphocytotoxicity' is shown with steps: '+ antibodies' (HLA-A1, HLA-A2, HLA-A3, HLA-A4), '+ C' (complement), and '+ vital dye'. On the right, 'Luminex technology' is shown with steps: 'Bead Mix', 'Sample' (antibodies), 'Label Mix' (fluorescently labeled antibodies), 'Multi-Analyte Profile', and 'Medscape.com'. A graph shows 'Mean Length of Heterophilic Resonance' for 'anti-HLA antibody' and 'anti-HLA antibody'.



N Hellman, Renal Fellow Network, 2010.

Matched platelet timeline





Platelet refractoriness

Immune refractoriness

- Majority HLA Class I A and B
- Platelet-specific antibodies
- ABO compatibility
- Patients may have both immune and nonimmune factors

Non-immune refractoriness

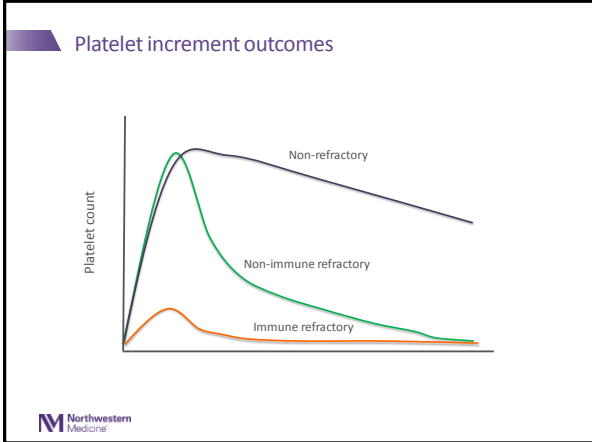
- Splenomegaly (sequestration)
- Sepsis
- Fever
- Bleeding
- DIC
- Medications
- Venoocclusive disease
- Graft-versus-host disease
- Platelet storage age

Northwestern Medicine 8

Clinically important factors affecting transfusion outcomes

Factor	1 hour platelet increment/ μ L	18 to 24 hour platelet increment/ μ L	Days to next transfusion
Overall response	24,900	12,000	1.75
Clinically Important change	$\geq 5,000$	$\geq 2,400$	≥ 0.35
Improved platelet response			
Splenectomy	+ 24,800	+12,400	-
ABO compatible	+4,600	+6,300	-
Decreased platelet response			
Lymphocytotoxic antibody*	-9,300	-4,000	-0.36
Female ≥ 2 pregnancies* or male	-8,900	-5,700	-0.40
Palpable spleen	-3,500	-4,400	-0.23
Heparin*	-	-3,800	-0.37
Bleeding*	-1,700	-3,100	-0.33
Fever*	-1,600	-2,000	-0.25
Amphotericin B	-2,700	-2,500	-0.28
DIC	-	-	-0.40

Northwestern Medicine * Factor also affected platelet refractory rate. SS Slichter et al. Blood 105(10): 4106-4114, 2005.



Patient with end-stage liver disease

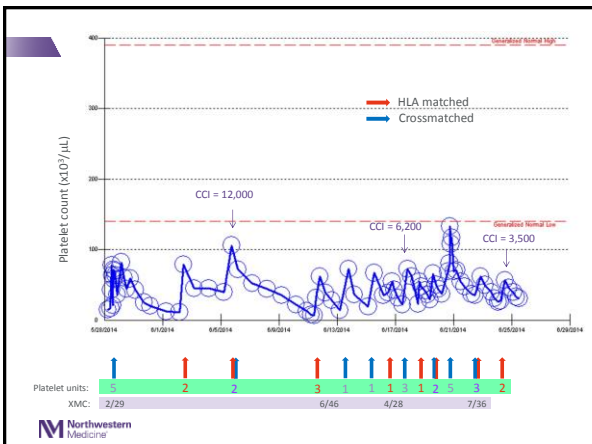
Patient with cirrhosis, splenomegaly, ascites and hydrothorax developed pancytopenia and refractoriness to platelet transfusions

Platelet transfusion goal: > 50,000/ μ L for bleeding and procedures

Corrected count increments were less than 5,000 M^2/μ L following 7 consecutive platelet transfusions

Platelet antibody screen positive 10/13 cells
 1 platelet unit compatible of 6 tested
 HLA antibody screen – 100% PRA
 HLA type performed and matched platelets provided


Northwestern Medicine



Summary


Our first patient with platelet specific antibodies had one excellent response to crossmatched platelets followed by intermittent modest responses with matched platelets.

Our second patient had had highly reactive HLA and platelet antibody screens and obtained initial excellent responses that decreased over time, partly compensated by large platelet doses.



Northwestern platelet refractoriness study


- Retrospective review, 2 years (2012, 2014)
- Platelet refractoriness studies had both anti-HLA and platelet antibody screen/crossmatch
- Review platelet count increments for all XM or HLA-matched platelet transfusions.
 - Prophylactic response, to $\geq 10K/\mu L$
 - Therapeutic, to $\geq 40K/\mu L$
- Best transfusion responses determined for XM/HLA in each case

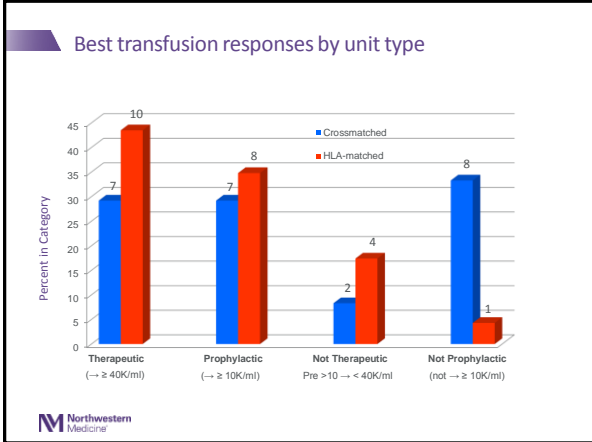


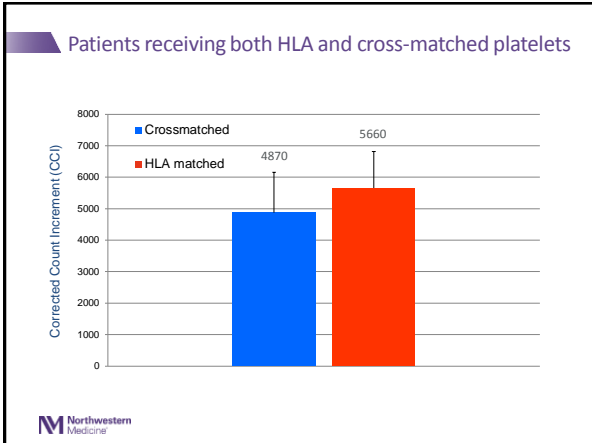
Platelet refractoriness test results

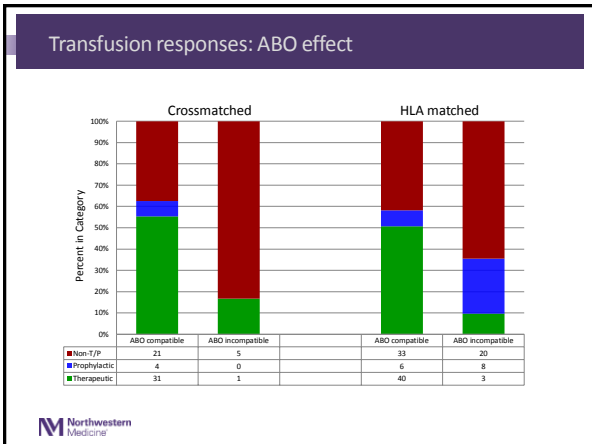
HLA Antibody	Platelet antibody screen	
	Negative	Positive
Negative	35 (41%) No special units needed	15 (18%) Crossmatch-compatible units
Positive PRA > 20%	12 (14%) HLA-matched units	23 (27%) Crossmatched or HLA-matched units

85 samples in 83 patients









Meta-analyses of HLA and crossmatched platelet transfusions

HLA: 30 studies selected, 1 randomized control trial
HLA-matched platelets led to better 1-hour post-transfusion platelet count increments than crossmatched or unmatched
K Pavenski and ICTMG Collaborators. Transfusion 2013

Crossmatched platelets: 20 studies selected
Cross-matched platelets improved platelet count increments versus random or pooled platelets
RR Vasallo and ICTMG Collaborators. Transfusion 2014

Effect of matched platelets on bleeding and mortality outcomes not available

Studies heterogeneous – prospective trials needed



Conclusions

Almost 60 percent (50/85) of platelet-refractory studies were positive by solid-phase or HLA antibody screen.

Crossmatched platelets were readily available and useful for patients with platelet antibodies.

HLA-matched platelets tended to yield higher platelet increments.

Prophylactic or therapeutic responses were obtained with 61% of ABO compatible matched units versus 36% not receiving ABO compatible.