Presence of Isohemagglutinins in Group O Neonates: Potential Implications for ABO Incompatible Heart Transplants

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Background

A major barrier for heart transplantation in younger patient populations aside from the significant scarcity of supply is the determination of ABO compatibility between donor and recipient.

Type O neonates requiring heart transplants have the longest wait time on the transplant list due to the risk of hyperacute rejection secondary to the anti-A and anti-B isohemagglutinin titer levels, whether passively acquired from maternal source or naturally occurring.

Due to neonatal immunologic naivety, the outcome of transplanting ABO incompatible hearts as early as possible are favorable for survivability of the organ due to the process of accommodation.

Historically, performing reverse type on neonates < 4 months has been deemed unnecessary due to immunologic immaturity.

However, this investigation shows that group O neonates will demonstrate variable titers of ABO antibodies and earlier detection can better determine transfusion protocols for patients awaiting heart transplants and reduce the wait time for an available heart.

Study Design/Methods

Using retained blood bank samples, 25 randomly selected group O neonates were tested for the presence of ABO antibodies.

Isohemagglutinin titers were performed on patient samples that antibody presence was detected using standard tube method.

Passive maternal anti-A and –B were tested by indirect anti-globulin test (IAT). Patients with a history of maternal alloantibody were excluded from the study to avoid antibody interference in testing.

Recollection of the neonate was avoided in order to minimize iatrogenic blood loss and therefore testing was determined by quantity of serum available.

Results

Pt	Age at collection	anti-A at IS	anti-A 4C	anti-B IS	anti-B 4C	Passive anti-A	Passive anti-B	IgM anti-A_1 Titer	IgG anti-A_1 Titer	IgM anti-B Titer	IgG anti-B Titer
1	8 wks	3+	4+	w+	1+	2+	3+	NT	NT	NT	NT
2	0 days	3+	4+	0	1+	2+	3+	NT	NT	NT	NT
3	6 days	2+	3+	w+	2+	2+	3+	NT	NT	NT	NT
4	3 months	w+	2+	0	2+	2+	3+	NT	NT	NT	NT
5	0 days	4+	NT	1+	NT	2+	3+	NT	NT	NT	NT
6	0 days	0	0	0	1+	1+	0	NT	NT	NT	NT
7	0 days	3+	3+	0	1+	2+	3+	NT	NT	NT	NT
8	0 days	0	0	0	2+	1+	0	NT	NT	NT	NT
9	0 days	3+	NT	1+	NT	3+	3+	NT	NT	NT	NT
10	3 months	3+	NT	3+	NT	3+	3+	NT	32	NT	NT
11	32 days	1+	3+	0	1+	1+	3+	NT	NT	NT	NT
12	0 days	4+	NT	3+	NT	3+	4+	NT	NT	4	32
13	0 days	0	w+	0	w+	2+	4+	NT	NT	NT	NT
14	15 days	2+	3+	0	1+	2+	3+	8	64	2	4
15	0 days	3+	4+	0	1+	NT	NT	NT	NT	NT	NT
16	6 days	1+	3+	0	1+	2+	3+	4	16	2	4
17	0 days	2+	NT	1+	NT	3+	3+	NT	NT	NT	NT
18	1 day	1+	NT	3+	NT	3+	3+	NT	NT	NT	NT
19	0 days	4+	NT	2+	NT	3+	3+	NT	NT	NT	NT
20	59 days	1+	NT	1+	NT	2+	3+	2	16	2	8
21	0 days	0	0	0	1+	2+	2+	NT	NT	< 2	8
22	9 days	3+	4+	0	0	2+	0	2	2	NT	NT
23	0 days	0	1+	0	0	2+	2+	2	2	NT	NT
24	0 days	NT	NT	NT	NT	NT	NT	4	16	4	16
25	7 days	NT	NT	NT	NT	NT	NT	16	128	< 2	8

Table 1. Ages and isohemagglutinin and IgM & IgG titers for all infants studied.
NT=Not tested due to quantity of sample

- Group O neonates (N=25)
- Mean age 14.5 days (2 hrs-12 weeks)
- 92% of non-specific isohemagglutinins were detected by either immediate spin tube technique (72%) or demonstrated after 30 minutes at 4°C (48%).
- Patients who had enough serum remaining were tittered for anti-A and anti-B.
  - Anti-A titers (*N*=8) - range was 2-128
  - Anti-B (*N*=8) titers range was 4-32.

Conclusion

- The strength in ABO isohemagglutinins is variable in many group O neonates and thus may have significant implications for this patient population awaiting heart transplants.
- The critical value for eligibility is a titer of 16 however, the establishment of a lower cutoff titer for neonates could reduce the wait time to find a heart to transplant while simultaneously yielding similar outcomes for patients that receive ABO compatible transplants.
- More studies are required, with the potential for a similar algorithm to be utilized at other facilities that perform pediatric ABO incompatible heart transplants.