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# ABO incompatibility: A cause for neonatal alloimmune thrombocytopenia

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**Abstract:**

ABO antibodies are naturally occurring antibodies. The ABO antibodies found in the Group O individuals include anti-A and anti-B. In Group O individuals, it tends to be predominantly immunoglobulins G (IgG), although immunoglobulins M and IgA components are also present. Infants of Group O mothers are at higher risk for hemolytic disease of the fetus and new-born than those born to mothers with Group A or B because IgG readily cross the placenta. At the same time, abnormal high concentration of ABO antibody in mother can lead to destruction of platelets in neonates and leads to development of neonatal alloimmune thrombocytopenia as human platelets carry detectable quantities of A and B blood group antigens on their surface. Proper and early diagnosis combined with treatment with intravenous immunoglobulins or transfusion with compatible platelets, may be from mother, can save the neonate from bleeding episodes.

**Keywords:**

Irradiation, neonatal alloimmune thrombocytopenia, platelet count increment, posttransfusion platelet increment

## Introduction

Neonatal alloimmune thrombocytopenia (NAIT) is caused by maternal antibodies raised against alloantigen carried on fetal platelets. Antigens capable of triggering NAIT are usually platelet specific human platelet antigens (HPA) antigens in 95% of the cases. The attributing factor of 5% of NAIT cases may be ABO incompatibility, human leukocyte antigen (HLA), etc.

It has been known for many years that human platelets carry detectable quantities of A and B blood group antigens on their surface,[1] but it is widely thought that the quantity of antigen expressed is varied among different blood groups and different people. Platelets express on their surface antigens of the ABO system while they do not express any antigens of the Rhesus system. The ABH antigens expressed on the platelet surface are a mixture of intrinsic molecules.[2] ABH expression on PLTs varies dramatically among individuals, approximately 5% of A1 and B individuals express very high levels of ABH antigens on their PLTs (high expressors).[3-5]

Unusually, high expression of A and B antigens on platelets was found in about 7% of the Japanese population who were positive for A1 or B.[4] The similar finding was also observed by Curtis *et al*. with 4% of B and 7% of A1 are high expressors.[4]

## Case Report

An 8-days-old male baby was evaluated for persistent refractory thrombocytopenia. His antenatal history is suggestive of (?) viral exanthema in mother in first trimester which was associated with fever and rash

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and no other systemic features and responded well to symptomatic treatment. During the antenatal follow-ups through ultrasonography, the baby was found to have intrauterine growth retardation (IUGR) at the age of 28 weeks, since then, he was on continuous monitoring in view of inappropriate growth and elective cesarean section was done at 33 weeks of gestation due to severe IUGR.

Birth weight was 1480 g. On day 1 of life, he had bluish maculopapular rashes over the chest, trunk, arms, limbs, and face which disappeared after 3–4 days. The first complete blood count was suggestive of normal hemoglobin (17.7 m%) with leukopenia (2670/cu.mm) and thrombocytopenia (41,000/cu.mm). There is no history of bleeding from any site or thrombocytopenia in mother/in the closed family members or history suggestive of any organ involvement/sepsis. Leukopenia was responding to granulocyte colony-stimulating factor with count of 4980/cu.mm on day 4 but even after repeated platelet transfusions (both random and Single donor platelets), there was no increment in platelet counts. On the contrary, a continuous fall in the platelet count was observed from 41,000/cu.mm on day 1 to 12000/cu.mm on day 4 of life.

On routine testing of baby and mother's samples, mother found to be O positive and baby was B positive. Mother's sample was tested for anti-B antibodies and tire was done (immunoglobulins G + C3d). Mother was having very high titer of anti-B antibodies to as high as 16,384 [Figure 1]. The facility for platelet antigen, antibody or cross matching was not available in the state.

A trial of intravenous immunoglobulins (IVIG) with platelet transfusion was considered with monitoring till platelet starts rising, there is no bleed and patient is stable with counts of more than 30,000/cu.mm. He was given a repeat dose of IVIG and more platelet transfusions. Considering impending risk of intracranial hemorrhage with no response of IVIG and platelet transfusions and in the absence of platelet cross match facility, it was decided to go for transfusion of platelets collected from mother. On day 10 of life, one unit of single donor platelets was collected from mother and baby was transfused with the same unit in divided volume. To avoid hemolysis due to the presence of high titer antibodies in mother's plasma, platelet additive solution was used as suspending medium instead of. To further safeguard from graft versus host disease, the unit was irradiated before transfusion. The transfusion was uneventful. Platelet count improved up to 44,000/cu.mm on day 14 of life and the patient was discharged from hospital on full feed and on regular follow-up.

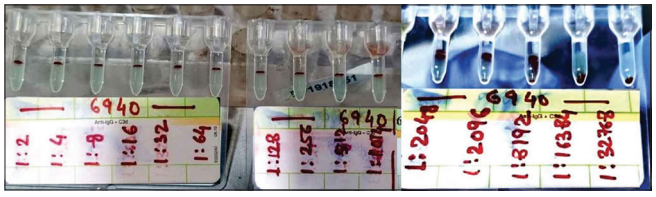


**Figure 1:** Anti-B titer of mother

## Discussion

Platelet refractoriness is simply defined as less than expected posttransfusion platelet count increment producer price index (PPI) and is due to the shortened survival of the transfused platelets in the recipient's circulation. It is also defined as a lack of adequate response in PPIs after two or more consecutive platelet transfusions of an adequate dose of allogeneic platelets.[6]

Immune-mediated platelet refractoriness may be due to alloimmune HLA, alloimmune HPA or ABO incompatibility.[7] NAIT should be considered in any nonseptic neonate who presents with severe thrombocytopenia at birth or shortly thereafter.

Transfusion is indicated in term neonates with signs of bleeding or if the platelet count is <30,000/μL during the first 24 h of life. In preterm infants or those with evidence of ICH, transfusion should be considered at a higher platelet count.[8,9] The aim of treatment is to maintain acceptable platelets levels, especially within the first 72–96 h of life. This is generally defined as <30,000/μL without active bleeding, and >100,000/μL if there is evidence of bleeding. There are various options available for platelet transfusion. Ideally, antigen matched platelet transfusion is the treatment of choice, but it is not available universally like red blood cell transfusion.

As transfused platelets should be compatible with the maternal antibody specificity, they are not destroyed in the circulation of the new-born, which is why the mother platelet is considered the second-best option. Platelets must first be washed or devoid of incompatible plasma and irradiated to remove maternal antiplatelet antibodies and to prevent graft-versus-host disease.[8,10,11]

Due to unavailability of latest techniques, a basic testing and platelets from mother can be lifesaving. However, platelet antigen studies can help in reaching a diagnosis, which is further confirmed by the presence of alloantibodies to platelets in neonates. However, due

to delay in the availability of results of platelet antigen studies as it is done by genotyping at selected centers and unavailability of tests for platelet antibodies in India. Transfusion of platelets crossmatched and compatible with the mother's plasma helps in better management and can be life-saving the most common presentation of NAIT is intracerebral hemorrhage.

## Conclusion

A suspicion of NAIT comes in any neonate who presents with severe thrombocytopenia at birth or shortly thereafter. Exclusion of other causes of thrombocytopenia and early suspicion is critical for the diagnosis and prompt treatment for NAIT.

A normal platelet count in the mother rules out autoimmune thrombocytopenia. In some cases, ABO incompatibility can also cause NAIT. A titer of mother's sample can be of much help. In case of unavailability of platelet crossmatch, this can help in making diagnosis and proper treatment.

Proper and early diagnosis combined with treatment with IVIG or transfusion with compatible platelets may be from mother is the key for better management of NAIT in absence of latest technology for platelet antigen antibody and platelet cross match.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.

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