# Successful surgical procedure in a patient of aplastic anemia with platelet refractoriness, using cross-match compatible platelets

**Ritam Chakrabarty, Sudipta Sekhar Das**

**Abstract:**

This case marks the beginning of issuing cross-matched platelet products in Eastern India. A known case of aplastic anemia, on regular transfusion support, now presented with obstructed ventral periumbilical hernia requiring urgent surgical intervention. Platelet count at presentation was 13,000/μL. Platelet cross-matching was done by solid phase method. Ten units of random donor platelets were crossmatched. Five units were compatible and transfused. Counts rose to 84,000/μL after 1 h. Surgery was completed successfully. Thus, 50% units were compatible. This indicates possible underlying alloimmunization. Rapid count rise enabled completion of this urgent surgery. This rapid rise of platelet count would not have been possible without cross matching. We conclude that platelet cross matching is a powerful tool for alloimmunized patients.

**Keywords:**

Corrected count increment, platelet cross matching, platelet refractoriness, random donor platelet

## Introduction

Platelet refractoriness is diagnosed by measuring corrected count increment (CCI).[1] CCI may be done at 10 min, 1 h, or 24 h after platelet transfusion. CCI is defined as platelet count increment taking into account the body surface area of the patient and number of platelets transfused.[2]

Platelet refractoriness is defined as failure to achieve a CCI above 5000 within 1 h of platelet transfusion, on two successive occasions.[2] Poor 1 h CCI may be associated with alloimmunization.[3] However, there are too many factors affecting the alloimmunization, and it may take up to 24 h to develop.[4]

The immune response is usually against the human leukocyte antigen (HLA) Class I antigens on the platelets. It may also be directed against the human platelet antigens (HPA). The donor lymphocytes present in blood products incite this immune response. Hence, if a patient has been previously sensitized through pregnancy, transplant, or nonleukoreduced blood component transfusion, transfusion of these Class I antigens on platelets can create an anamnestic response and development of platelet refractoriness.[2] Platelet cross matching is a simple solution to this problem. Here, donor platelets are reacted with patient serum. If patient's serum contains antibodies directed against donor HLA or HPA on platelets, then cross match will be incompatible. It ensures that the transfused platelets have maximum survival *in vivo*.

## Case History

Here, we present a known case of aplastic anemia. She was on cyclosporine 50 mg,

*Department of Transfusion Medicine, Apollo Gleneagles Hospitals, Kolkata, West Bengal, India*

**Address for correspondence:**
Dr. Ritam Chakrabarty, 1582/2, Rajdanga Main Road, Purba Abasan, GD Block, Flat No. Type III - B1, Kolkata - 700 107, West Bengal, India.
E-mail: dr_ritam@yahoo. co.in

twice daily. Antithymocyte globulin was not affordable. Frequent transfusions were required over the years to keep the blood parameters within acceptable range. During the course she developed abdominal pain. Ultrasonogram revealed ventral abdominal wall defect of 3.6 cm × 4.5 cm × 6 cm, hernial sac containing omental fat and fluid, and no bowel strangulation. The surgeon diagnosed it as obstructed ventral periumbilical hernia. Platelet count was 13,000/μL. Surgery was planned next day. Target platelet count was 50,000/μL. In a patient who has been heavily transfused in the past and who needs an urgent operation, the selection of platelet units and rapid count rise is crucial. Hence, a decision was taken to issue cross-matched platelets; 1 h before operation. Blood group of the patient was AB + ve. Ten units of random donor platelets were matched using the Capture-P Solid Phase System (Galileo, Immucor Inc., USA).

Cross-match results are shown in Table 1.

Five units were found to be compatible and transfused. The patient particulars and count increment following transfusion are summarized in Table 2.

Posttransfusion 1 h platelet count was 84,000/μL. Open multiloculated ventral hernia repair was performed without any complication. There was no excess bleeding. Hemostasis was achieved perfectly. No postoperative complications occurred. Posttransfusion 24 h platelet count was 26,000/μL. Surgical intervention must be considered while interpreting this count. No further transfusions were required. Patient was discharged in healthy condition with a platelet count of 20,000/μL.

## Discussion

HLA sensitization is the most common immune cause of refractoriness. When HLA antibodies are present, patients may be transfused with apheresis platelets from donors whose Class I HLA matches closely with the patient. However, a pool of 1000–3000 or more donors are required to support one patient through multiple episodes of transfusion.[5] Furthermore, we will miss donors whose HLA type, despite being different, is still suitable for transfusion to the patient. The degree of matching is also important as these are never fully matched. The second method is to determine the specificity of patient's HLA antibody and select donors who lack the corresponding antigens. This method is as good as cross matching, and many more potential donors can be identified.[6] The other method is to cross match the platelets with patient's serum using SPRCA technique. There has been a good correlation between cross-match results and posttransfusion platelet count.[7] Compared to HLA matching, this method is more convenient and

**Table 1: Platelet cross-match results**

| Blood group | Reaction strength | Result |
|---|---|---|
| AB+ | 36 | Negative |
| AB+ | 35 | Negative |
| A+ | 35 | Negative |
| A+ | 36 | Negative |
| A+ | 36 | Negative |
| AB+ | 45 | Positive |
| AB+ | 51 | Positive |
| A+ | 44 | Positive |
| B+ | 41 | Positive |
| B+ | 40 | Positive |
| Positive control | 54 | Positive |
| Negative control | 32 | Negative |

40 or above = Positive/incompatible

**Table 2: Count increment and transfusion outcome**

| Transfusion parameters | Transfusion outcome |
|---|---|
| Height (cm) | 150 |
| Weight (kg) | 57 |
| BSA (m$^2$) | 1.54 |
| Platelet dose transfused (×10$^{11}$) | 2 |
| Pretransfusion platelet count (/μL) | 16,000 |
| 1-h posttransfusion platelet count (/μL) | 84,000 |
| 24 h posttransfusion platelet count (/μL) | 26,000 |
| CCI | |
| 1 h | 52,360 |
| 24 h | 7700 |

BSA = Body surface area, CCI = Corrected count increment

cost-effective. It avoids the exclusion of HLA-mismatched but compatible donors and has an added advantage of selecting compatible units when platelet-specific antibodies are present.[7] However, platelet cross matching will fail in a highly alloimmunized patient, where it will be difficult to obtain a match.

In our case, 5 out of 10 units (50%) were compatible. The platelet count increased by 68,000 after 1 h of transfusion. This corresponded to a CCI of 52,360. Even after 24 h of transfusion and completion of surgery, platelet count was 10,000 above pretransfusion level. At the time of discharge, 4 days after transfusion and surgery, platelet count was 6000 above baseline value.

Salama *et al.* reported a mean 1 h CCI of 13,980 and 24 h CCI of 10,460 after giving cross-matched platelets compared to 2720 and 1470, respectively, when transfusing uncross-matched platelets.[8] In a study in India,[9] 24-h CCI (mean ± standard deviation) was significantly higher for cross-match-compatible platelets (9250 ± 3026.6) than for cross-match-incompatible ones (6,757.94 ± 2,656.5) ($P < 0.0001$).

We had initially performed platelet cross matching on a pilot basis. Proper standardization was done. This patient being multitransfused was expected to have

alloantibodies to platelet. Thus, a decision to transfuse cross-matched platelets was taken. The successful rise in counts points to the fact that such techniques can be lifesaving. Time taken for the procedure is about 90 min. Hence, even in emergency situation, with adequate trained staff, platelet cross matching is feasible. However, cost is a hinderance for most patients in India. Patients who show refractoriness to platelets or are multitransfused with nonleukoreduced components and present for emergency surgical intervention may be chosen as recipients. The judicious use of this novel technique can help us tide over many difficult situations. More centers should start this facility so that more data are generated about its effectiveness.

## Conclusion

This case shows us that, when we are facing a transfusion challenge for multitransfused patients, cross matching of platelets can be highly effective for rapid count rise. This case marks the successful transition of the process from laboratory to bedside. We hope that it will gain popularity in coming days so that more patients get benefit of this novel technique.

### Acknowledgment

### Conflicts of interest
There are no conflicts of interest.

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