Immediate spin cross match in comparison to the conventional AHG cross match as a part of pre-transfusion testing in antibody screen negative patients

Dr. Geet Aggarwal
(Dr. Aseem K Tiwari)
Associate Director, Transfusion Medicine,
Medanta-The Medicity, Gurgaon
1. Background
2. Review of Literature
3. Aims and Objectives
4. Materials and Methods
5. Results
6. Conclusion
7. References
Background
Pre-transfusion testing: Background

- Pre-transfusion testing has undergone considerable modification over last many years. Anti-human globulin (AHG) cross match, discovered by Coombs et al in 1945, remained standard compatibility test for many years.

- Antibody screening was introduced as part of pre-transfusion testing in late-1950’s. Allows detection of allo-antibodies, against common and clinically significant antigens. Advantages:
  - Identify the presence of weak allo-antibody
  - Negative antibody screen, rules out clinically significant allo-antibody
  - Earlier detection of these allo-antibodies in the recipient gives enough time to the blood bank staff to arrange corresponding antigen negative compatible blood for the recipient.
Pre-transfusion testing: Background

American Association of Blood Banks (AABB) introduced Immediate spin cross match Test (IST) - a method of compatibility testing for patients with antibody screen negative recipients in 1980's.

- **IST is abbreviated form of cross match since it takes less time for the compatibility testing**
- **With IST method, blood can be cross matched at the time of issue**
- **The pre-requisite for IS cross match is the presence of negative antibody screen in patients and donors**
Review of Literature
One of the first studies conducted by Oberman et al. to estimate the risk of abbreviating the major cross-match in urgent or massive transfusion.

Initial screening for unexpected antibodies was negative for all 13950 patients.

However, 148 patients showed agglutination beyond the immediate-spin cross-match phase.

Anti-P1 was the most common (30/85) antibody revealed on further work-up.

Authors concluded that issuance of blood in urgent situations after an immediate-spin phase cross-match has a low level of risk.

Transfusion 1978;18(2):137-141
• **Shulman** stated that even if use of IS-CXM did result in modest increase in risk of DHTR, patient safety would not be compromised. Further, IS-CXM allows for significant simplification and streamlining of compatibility testing.

• Later, **Pinkerton et al** concluded that use of AHG-CXM offers no significant advantage over using only IS-CXM with respect to delayed hemolytic transfusion reactions (DHTR).

• Recently, **Lee et al** concluded that use of IS-CXM is appropriate for patients with auto-antibodies and patients with high titer low avidity (HTLA)-like antibodies provided that allo-antibodies have been excluded.
A prospective study to determine the safety of omitting the antiglobulin crossmatch from pre-transfusion testing.

Nancy M. Heddle, Pamela O’Hoski, Joel Singer, John A. McBride, Mahmoud A. M. Ali and John G. Kelton Departments of Pathology and Laboratory Medicine, McMaster University Medical Centre, Henderson Hospital, and St Joseph’s Hospital, Hamilton, Ontario, and The Canadian Red Cross Blood Transfusion Service, Hamilton Centre

Received 19 September 1991; accepted for publication 24 March 1992

- First prospective study to conclude that AHG-CXM can be safely omitted from pre-transfusion testing. Although 0.6% patients had incompatible AHG-CXM post-transfusion due to presence of certain antibody; most of these antibodies were clinically non-significant.
Pathak et al didn't find a single case in 45373 patients where the AS was negative and AHG-CXM was incompatible and concluded that AS adequately detected the clinically significant antibodies in the population under study and that T&S method can be safe, cost-effective and beneficial to transfusion services in India.
Author concluded good safety level of T&S policy in high-risk category patients. He also advocated that T&S policy could be implemented in Indian settings with no compromise on blood safety provided sufficient technical and infrastructural support is available at the center.
In their study, Chaudhary and co-worker reported 91.6% safety levels of T&S policy. They also reported usefulness of the policy through the detection of unexpected antibodies in 0.75% (15 out of 2026) of cases, which would have been missed otherwise with AHG-CXM.
Primary Aim: To establish safety of T&S policy in comparison with conventional AHG cross-match

Secondary Aim: To evaluate secondary advantages of T&S policy that included C/T ratio, RBC issue TAT, man-hour savings, monetary savings and inventory management

- Study design: Prospective, longitudinal study
- Study site: Conducted at Transfusion Medicine department of tertiary care multi-super specialty hospital
- Study period: Over a period of three months from Jan to March 2014.
- Study population: Patients admitted to hospital during study period requiring red blood cell transfusion
Existing department protocol to issue RBC unit (AHG cross-match protocol)

all patients requiring RBC transfusion admitted in the hospital

ABO Rh grouping and antibody screen is done

Antibody screen: Negative  No

Yes

sample received for repeat blood group and cross match

along with request for number of units

Blood group matches with previous blood group in database

Stipulated number of AHG cross-match compatible units is found and reserved for the patient

As and when requested, the required number of reserved units are issued to the patient

Even if after 72 hours, the reserved units are not issued to the patient, these units will be added back to the “in-stock” inventory
New study protocol to issue RBC units (Immediate-spin cross-match protocol)

all patients requiring RBC transfusion admitted in the hospital

\[\text{ABO Rh grouping and antibody screen is done}\]

\[\text{Antibody screen: Negative} \rightarrow \text{No (1)}\]

\[\text{Yes}\]

\[\text{Sample received for repeat blood group and cross match along with request for number of units}\]

\[\text{Blood group matches with previous blood group in database}\]

\[\text{As and when requested, the required number of IS cross-match compatible unit will be issued to the patient}\]

\[\text{Immediate-spin cross-match: compatible} \rightarrow \text{No (2)}\]

\[\text{Yes}\]

\[\text{Unit(s) issued to the patient}\]

\[\text{Protocol AHG cross-match performed within next 24 hours}\]

\[\text{AHG cross-match: Compatible} \rightarrow \text{No (3)}\]

\[\text{Yes}\]

\[\text{Step-wise work-up initiated to resolve the case}\]

\[\text{primary end point of the study}\]
Results

- 2402 patients with negative antibody screen were enrolled in the study and formed the study cohort. 2396 patients were transfused a total of 5012 RBC units. Each RBC unit transfused to the patient was considered as separate ‘episode’ of transfusion.

- Mean age was 53 ± 18 years with male to female ratio of 2.04 : 1.

- Most common indication for Tx was anemia 58% (1359), followed by surgery 35.3% (826), blood loss 8.8% (208).

- 55.5% of recipients were in surgical specialties, 40.3% recipients were admitted in medical specialties and 4.2% recipients were admitted under critical care.

- 8.4% had previous transfusion history and 68.9% females had history of pregnancy.
Exclusions: Incompatible IS-CXM

- Total of six patients were excluded from the study because they had incompatible immediate-spin cross-match after negative antibody screen
- On further work-up all the six patients had clinically insignificant cold-reacting allo-antibody or auto-antibody

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-M</td>
<td>2</td>
</tr>
<tr>
<td>Anti-Le(a)</td>
<td>1</td>
</tr>
<tr>
<td>Anti-Le(b)</td>
<td>1</td>
</tr>
<tr>
<td>Cold-reacting autoantibody</td>
<td>2</td>
</tr>
</tbody>
</table>
5010 (99.9%) RBC units transfused to 2395 patients were compatible on AHG-CXM as well.

Only one patient, was identified who was issued two RBC units after compatible IS cross-match and negative antibody screen, where incompatible on post-transfusion AHG-CXM.

Immediate work-up was initiated and a weak reacting Anti-P1 allo-antibody identified. Clinical and serological follow-up of the patient revealed no immediate or delayed transfusion reaction.
1. **C/T Ratio:**

There was a dramatic decrease in the C/T ratio (1.0 vs. 2.01; p <0.0001) with use of IS-CXM as compared to AHG-CXM

<table>
<thead>
<tr>
<th>Parameter</th>
<th>AHG-CXM</th>
<th>IS-CXM</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBCs cross-matched</td>
<td>46680</td>
<td>5012</td>
</tr>
<tr>
<td>RBC transfused</td>
<td>23159</td>
<td>5012</td>
</tr>
<tr>
<td>C/T ratio</td>
<td>2.01</td>
<td>1.0</td>
</tr>
</tbody>
</table>
2. RBC issue TAT:
There was a significant reduction in TAT from 58.5mins to 19.8 mins (p = 0.07, 95% CI).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>AHG-CXM</th>
<th>IS-CXM</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBC cross-matched</td>
<td>46680</td>
<td>5012</td>
</tr>
<tr>
<td>RBC issue</td>
<td>23909</td>
<td>5012</td>
</tr>
<tr>
<td>TAT per RBC crossmatch</td>
<td>45 min</td>
<td>19.8min</td>
</tr>
<tr>
<td>TAT per RBC issue</td>
<td>13.5 min</td>
<td></td>
</tr>
<tr>
<td>Total TAT</td>
<td>58.5 min</td>
<td>19.8min</td>
</tr>
</tbody>
</table>
3. Outdating of RBC units:
There was significant reduction in outdating of RBC units when IS-CXM is compared with AHG-CXM (p = 0.00013 CI >95%) since there is no repeated reservation and unreservation of RBC units.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>AHG-CXM</th>
<th>IS-CXM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total RBC prepared</td>
<td>24532</td>
<td>25786</td>
</tr>
<tr>
<td>Total RBC expired</td>
<td>81</td>
<td>23</td>
</tr>
<tr>
<td>Expiry due to reservation</td>
<td>35</td>
<td>0</td>
</tr>
</tbody>
</table>
4. Manpower savings:
   - Total man-hours saved for issuing 5012 units using IS-CXM was 3399.7 hours.
   - This was because extra RBC units were not cross-matched and reserved for patients.
   - Further, repeated unreservation was also not required using IS-CXM policy.
5. Monetary savings:
   - There was almost 55% reduction in cost using IS-CXM technique.
   - This also included decreased outdating of RBC units.
Conclusion

- In antibody screen negative patients, immediate-spin cross-match is as safe as conventional AHG X-match
- Type and screen policy resulted in reduction of C/T ratio and TAT to issue blood
- No reservation of blood units results in decreased outdating of blood units and less number of unnecessary cross-match
- Implementation of type and screen policy also saved human and financial resources
Thank You
• Oberman HA, Barnes BA, Friedman BA. The risk of abbreviating the major crossmatch in urgent and massive transfusion. Transfusion 1978;18(2):137-141
• Pinkerton PH, Coovadia AS, Goldstein J. Frequency of delayed hemolytic transfusion reactions following antibody screen and immediate-spin crossmatching. Transfusion 1992;32(9):814-817
• Shulman IA, Odono V. The risk of overt acute hemolytic transfusion reaction following use of an immediate-spin crossmatch. Transfusion 1994;34(1):87-88
Lee E, Redman M, Burgess G, Win N. Do patients with autoantibodies or clinically insignificant alloantibodies require an indirect antiglobulin test crossmatch. Transfusion 2007;47:1290-1295


Agrawal A. Type and screen policy: Is there any compromise on blood safety. Transfusion and Apheresis Science 2014;50:271-273

Chow EYD. The impact of the type and screen test policy on hospital transfusion practice. HKMJ 1999;5:275-9