Retrospective analysis of ABO discrepancies among patients and blood donors in a tertiary care hospital

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Introduction

✓ ABO blood group typing – simplest test performed to determine an individual’s blood group.

✓ Accurate ABO typing - ensure patient safety and good transfusion practices.

✓ Risk of AHTR due to transfusion of ABO incompatible blood is 100 to 1000 times higher than the risk of TTI.
Introduction

✓ ABO discrepancy - mismatch between the forward (cell) grouping and reverse (serum) grouping

✓ Most common cause –

✓ Other causes – problems related to red cells or serum and procedure/technique related problems
ABO discrepancy
Mismatch between forward and reverse grouping

Group I discrepancy
Weak or missing antibody
- Extremes of age
- Immunodeficient states
- BMT/HSCT recipients
- Hypogammaglobinemia
- Agammaglobinemia
- Immunosuppressive drugs

Group II discrepancy
Weak or missing antigen
- ABO subgroups
- Hodgkin’s disease
- Acquired B phenomena

Group III discrepancy
Rouleaux
- Multiple myeloma
- Waldenstrom’s macroglobulinemia
- Plasma expanders
- Cord blood samples (wharton’s jelly)
- Excess of fibrinogen

Group IV discrepancy
Miscellaneous
- Unexpected ABO isoagglutinins
- Unexpected non ABO alloantibodies
- Cold reactive autoantibodies
- Polyagglutinable cells
Aims and objectives

✓ To determine the incidence and the cause of ABO discrepancies among patients and blood donors in our centre
Materials and Methods

✓ **Study design** – retrospective observational

✓ **Study participants** – patients and blood donors

✓ **Study period** - March 2013 to December 2015

✓ All blood samples received during the study period were analysed for ABO discrepancies

✓ **Exclusion criteria** - deferred/rejected donors and haemolysed samples.

✓ **Initial ABO typing** – Neo/Galielo, Immucor Inc., Norcross, GA, USA

✓ **Further workup for discrepancy** was performed by conventional tube technique which included lectin study, DAT, testing at different temperatures (4°C, room temperature and 37°C), antibody screening/identification, adsorption/elution, etc wherever applicable
Algorithm for resolving ABO discrepancy

ABO discrepancy noted

Wash patients/donor RBC’s and repeat testing

Discrepancy resolved

ABO group reported

Discrepancy not resolved

1. Check records: age, diagnosis, drugs, H/O pregnancy, transfusion and transplant
2. Categorize the type of discrepancy
3. Workup according to type of discrepancy

Error identified

Repeat testing with new sample

Discrepancy resolved

ABO group reported

ABO discrepancy resolved, document and report the final ABO group
Results

Blood donors

✓ 62,080 donor samples analyzed
✓ Incidence – 0.02% (14/62,080)
  » All were male donors
  » Age range – 19 to 39 years

<table>
<thead>
<tr>
<th>Type of discrepancy</th>
<th>Cause of discrepancy</th>
<th>Number of donors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>Weak antibody</td>
<td>1 (7%)</td>
</tr>
<tr>
<td>Type II</td>
<td>Weak antigen (subgroup A)</td>
<td>4 (29%)</td>
</tr>
<tr>
<td>Type III</td>
<td>Rouleaux</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Type IV</td>
<td>Alloantibody (Anti-M) Cold autoantibodies</td>
<td>1 (7%)</td>
</tr>
</tbody>
</table>

8 (57%)
Results

Patients
✓ 1,35,853 patient samples analyzed
✓ Incidence – 0.1% (143/1,35,853)
  » Age range – 1 month to 87 years
  » 83 males (58%) and 60 females (42%)

<table>
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<th>Cause of discrepancy</th>
<th>Number of donors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>Weak antibody*</td>
<td>22 (15.4%)</td>
</tr>
<tr>
<td>Type II</td>
<td>Weak antigen (subgroup A, B, AB)</td>
<td>25 (17.5%)</td>
</tr>
<tr>
<td>Type III</td>
<td>Rouleaux</td>
<td>2 (1.4%)</td>
</tr>
<tr>
<td>Type IV</td>
<td>Alloantibody (Anti-M, -N, -E, -c, -Lea)</td>
<td>11 (7.7%)</td>
</tr>
<tr>
<td></td>
<td>Cold autoantibodies</td>
<td>69 (48.2%)</td>
</tr>
<tr>
<td></td>
<td>Warm autoantibodies</td>
<td>14 (9.8%)</td>
</tr>
</tbody>
</table>
*Interesting case*

Initial grouping revealed

<table>
<thead>
<tr>
<th>Forward grouping</th>
<th>Reverse grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti – A</td>
<td>Anti – B</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Resolution
History revealed 33 year old male
historical blood group – A positive
Post stem cell transplant recipient (blood group of the donor – O positive)

Conclusion
Blood group *chimerism* resulting in ABO discrepancy
# Discussion

## Blood donors

<table>
<thead>
<tr>
<th>Published literature</th>
<th>Number of samples</th>
<th>ABO discrepancy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Incidence</td>
</tr>
<tr>
<td>Alireza Moafi (2006)</td>
<td>75,066</td>
<td>0.054%</td>
</tr>
<tr>
<td>Kaur et al (2013)</td>
<td>44,425</td>
<td>0.06%</td>
</tr>
<tr>
<td>Sharma et al (2014)</td>
<td>1,04,010</td>
<td>0.04%</td>
</tr>
<tr>
<td>Esmaie et al (2016)</td>
<td>30,254</td>
<td>1.4%</td>
</tr>
<tr>
<td>Present study</td>
<td>62,080</td>
<td>0.02%</td>
</tr>
</tbody>
</table>
## Discussion

### Patients

<table>
<thead>
<tr>
<th>Published literature</th>
<th>Number of samples</th>
<th>ABO discrepancy</th>
<th>Incidence</th>
<th>Most common cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chaironi et al (2004)</td>
<td>4,07,769</td>
<td></td>
<td>1 in 3400</td>
<td>Phlebotomy errors</td>
</tr>
<tr>
<td>Esmaili et al (2014)</td>
<td>100</td>
<td></td>
<td>-</td>
<td>Weak or missing antibody</td>
</tr>
<tr>
<td>Present study</td>
<td>1,35,853</td>
<td>0.1%</td>
<td></td>
<td>Cold autoantibodies</td>
</tr>
</tbody>
</table>
Conclusion

✓ Irrespective of the type of ABO discrepancy seen, correct typing of blood group is essential to ensure patient safety and minimize the chance of transfusion of incompatible blood as such a transfusion is associated with serious consequences.
Acknowledgements

- Dr (Prof.) RN Makroo
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