A case of subgroup of A (Ax) in a Renal Transplant Recipient and Donor - an unusual Mother-son pair

Dr Pooja Modi
Dr Amit Prajapati

Smt G.R.Doshi and K.M.Mehta Institute of Kidney Diseases and Research Centre

BACKGROUND

Two different samples of a 34 year old male and another 49 year old woman for Blood grouping from OPD were received. Discrepant result in cell and serum blood grouping through automated blood grouping system (Immucor Neo and Diagast Qwalys) were found in the samples of both the Patient. Both the patient had similar pattern of reactions in blood grouping as seen on the automated systems. Upon further history it was revealed that there is a familial relation between both the patients, and actually it was a pair of mother and son. The mother was impending kidney donor for his son, who was registered for renal transplant at IKDRC.

METHODS:

On further serological test using the manual method for blood grouping i.e. the Test Tube Method, following results were obtained:

PATIENT	REACTION OF RED CELLS WITH ANTISERA (FORWARD BLOOD GROUPING)							REACTION OF SERUM WITH CELLS (REVERSE BLOOD GROUPING)			INTERPRETATION
	Anti-A	Anti -B	Anti-AB	Anti-A1	Anti-H	Anti-D1	Anti-D2	A cells	B cells	O cells	
SON	Weak	0	2+	0	4+	4+	4+	1+	4+	0	Subgroup of A (Ax) Rh positive
MOTHER	Weak	0	2+	0	4+	4+	4+	1+	4+	0	Subgroup of A (Ax) Rh positive
TYPICAL A POSITIVE BG	4+	0	4+	4+	4+	4+	4+	0	4+	0	A Rh POSITIVE

RESULT AND DISCUSSION:

ABO subgroups are phenotypes that differ in the amount of A and B antigen carried on red cells and present in secretions (for individuals who have the secretor phenotype). Out of all A and AB persons, 80 % are subgroup of A1 and A1B respectively. The other 20% of these blood groups are nonA1 subgroup. Most often the subgroups is A2 (or A2B), but occasionally it may be a more rare subtype like Ax, A3, etc. Blood group A, non-A1 individuals express only about 20% of the normal level of group A antigen on their RBCs and organs. Due to variation in reagents and techniques used, these weaker phenotypes are often mistyped as O group. Anti-A1 is present as an alloantibody in the serum of 1% to 8% of A2 individuals and 22% to 35% of A2B individuals, and is sometimes present in the sera of individuals with other weak A subgroups. Anti-A1 can cause ABO discrepancies during routine testing and lead to incompatible crossmatches with A1 and A1B red cells. Weaker subgroups of A give weaker reactions or are nonreactive serologically with anti-A antisera. The weaker phenotypes can be differentiated from each other using A) Serological testing: Testing with Anti-A1 lectin, B) Secretor status for the presence of H and/or A antigen in saliva and C) Molecular genotyping of ABO gene, especially exons 6 and 7 as they encode for 77% of glycosyltransferase activity.

Serological testing:
Determination of a donor's A1 RBC subtype is performed with Anti-A1 lectin, an FDA- approved test reagent. Lectins are non-antibody proteins, which bind with high specificity to a particular carbohydrate structure. Anti-A1 lectin is extracted from the lentil-like seeds of the plant Dolichus biflorus (horse gram).

Anti-A1 lectin binds to the A1 carbohydrate and agglutinates A1 or A1B RBCs in a suspension. When group A or AB RBCs are not agglutinated by anti-A1 lectin, the RBCs are negative for A1.

In the present case, based upon the serological pattern of reactions seen on Test Tube Blood group, both were labelled as Subgroup Ax of A. Since the donor and recipient were of the same ABO blood group, transplant can be performed owing to ABO compatibility.

Phenotype	Forward typing						Reverse typing	
	Anti-A	Anti-B	Anti-AB	Anti-A1	Anti-H	A1 cells	A2 cells	B-cells
A1 (typical)	4+	-	4+	4+	-	-	-	4+
A1	3-4+	-	4+	-	2-3+	+/-	-	4+
A3	2+/mf	-	mf/wk	-	3-4+	+/-	-	4+
Ax	wk/-	-	1-2+	-	4+	1+	-	4+
Axint	mf/-	-	mf	-	4+	+/-	-	4+
Ael	-	-	-	-	4+	+/-	-	4+

PCV TRANSFUSION/SOLID ORGAN TRANSPLANT IN CASE OF SUBGROUP OF A

BLOOD GROUP	AS A RECIPIENT	AS A DONOR
A2	Can receive A2, O blood group	Can donate to A2, B, O recipients
A2B	Can receive A2B, A2, B,O blood group	Can donate to A2B, B, O recipients

A study by nelson et al in the journal TRANSPLANTATION found that the A2 subgroup represents a small but important minority of A donors, and that transplantation into non- A recipients can generally be safely accomplished. One component of the new national kidney allocation system (KAS) in the United States that was implemented on December, 2014, was the allocation of kidneys from A2 and A2B (A, non-A1 and AB, non-A1B) deceased donors into blood group B candidates (A2/A2B to B). This is component of the new KAS that has the potential to further increase the access to transplantation for blood group B candidates on the waiting list, most of whom are minority candidates. KAS put use of subtyped deceased donors into policy to help promote greater access to kidneys for blood type B candidates. Allocation of kidneys using subtyped donors has increased.

SIGNIFICANCE OF SUBGROUPS IN SOLID ORGAN TRANSPLANTATION

The amount of blood group A antigen expression on the vasculature of kidneys from A1 and A2 donors is consistent with the relative level of A antigen found on A1 and A2 red blood cells (RBCs). In A2 kidneys, blood group A antigen expression is consistently low in the renal cortex and the entire vascular bed endothelium. Proximal and distal tubule and glomerular epithelial staining for A antigen expression ranges from very low to not present in kidneys from A2 donors. Histologically, livers from A2 individuals express much less A antigen in the bile duct, artery, and lymphatic capillaries than do livers from A1 individuals. Therefore, An ABO subgroup (non-A1) allows organs to be allocated to additional recipients for both deceased and living donor transplants. A person who is primary blood type A normally could not donate their organ to a candidate who is blood type B. If the person who is blood type A also has a non-A1 subtype, then they could possibly donate a kidney to a person who is primary blood type B (or O) depending on other factors (Low Anti-A titer; titer to be performed prior to 60 days prior to transplant).

CONCLUSION

Molecular blood grouping can be incorporated as standard method of blood grouping for rare and discrepant cases, to determine the actual ABO group and thus aiding in subsequent allocation for transfusion/ transplant. Where a subgroup of A is detected, provisions can be made by policy makers in allocations to non-A recepients; thus, leading to widening of donor pool for such recipients as required.