INDIAN IMMUNOHEMATOLOGY INITIATIVE
CASE OF THE MONTH: November, 2010
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History: A 60 year old man was admitted for coronary artery bypass grafting. The patient had been asymptomatic, but a cardiac stress test, performed because of a strong family history of coronary artery disease as well as other cardiac risk factors, had been positive. A nuclear perfusion study was abnormal. Coronary angiography demonstrated multi-vessel coronary artery disease.

The patient had a history of peptic ulcer disease and had undergone Bilroth I and Bilroth II partial gastrectomy surgery 20 and 15 years previously respectively. He remembered donating autologous blood for at least one of these surgeries, but was unsure whether he had previously received allogeneic RBCs.

The patient underwent 5 vessel coronary artery bypass grafting. On the 3rd post-operative day he received 1 unit of RBCs. His blood group antibody detection test at that time was negative. His 5 day post-operative course was otherwise uneventful.

Nineteen days after surgery the patient came to the emergency department (ED) with right upper quadrant pain and tenderness, nausea, vomiting, malaise, and fatigue. He was afebrile on arrival but within an hour developed a rectal temperature of 105.1^{O}F associated with rigors. Ultrasound examination of the abdomen showed "sludge" and multiple stones as well as thickened walls in the gallbladder. The impression was of acute cholecystitis. He was started on antibiotics and scheduled for an open cholecystectomy. A "type-and-screen" was performed with the following results.

ABO and Rh Typing

Anti-A	Anti-B	A1 cells	B cells	6% alb	Anti-D	Anti-D/AHG	CCC	Interp
4+	4+	0	0		3+			AB pos

Antibody Detection Test ("Screen") by gel column agglutination

	Gel
OI	2+
OII	2+

Direct Antiglobulin Test

	Poly	IgG	Anti-C3
AHG	0	0	0
CCC	2+	2+	2+

Initial antibody identification panel

Lot# 8RA187		Rh system						Kell						Duffy		Kidd		Xg	Lewis		MNSs				P	Lutheran		Other Typings			
Cell	**Rh**	**D**	**C**	**E**	**c**	**e**	**V**	**K**	**k**	**Kp^a**	**Kp^b**	**Js^a**	**Js^b**	**Fy^a**	**Fy^b**	**Jk^a**	**Jk^b**	**Xg^a**	**Le^a**	**Le^b**	**S**	**s**	**M**	**N**	**P1**	**Lu^a**	**Lu^b**		**Cell**	**Gel**	
1	**R1wR1**	+	+	**0**	**0**	+	**0**	**0**	+	**0**	+	**0**	+	+	+	+	+	+	**0**	+	**0**	+	**0**	+	+	+	+	C^w	**1**	**3+**	
2	**R1R1**	+	+	**0**	**0**	+	**0**	**0**	+	**0**	+	**0**	+	**0**	+	+	**0**	+	+	**0**	+	+	+	**0**	+	**0**	+		**2**	**3+**	
3	**R2R2**	+	**0**	+	+	**0**	**0**	**0**	+	**0**	+	**0**	+	**0**	+	**0**	+	+	**0**	+	**0**	+	**0**	+	**0**	**0**	+		**3**	**2+**	
4	**Ror**	+	**0**	**0**	+	+	+	**0**	+	**0**	+	**0**	+	**0**	**0**	+	+	+	**0**	**0**	+	**0**	+	+	**+s**	**0**	+		**4**	**3+**	
5	**r'r**	**0**	+	**0**	+	+	**0**	**0**	+	**0**	+	**0**	+	+	+	+	**0**	+	**0**	+	**0**	+	+	+	+	**0**	+		**5**	**3+**	
6	**r"r**	**0**	**0**	+	+	+	**0**	**0**	+	**0**	+	**0**	+	+	**0**	**0**	+	+	**0**	**0**	**0**	+	+	+	**0**	**0**	+		**6**	**2+**	
7	**rr**	**0**	**0**	**0**	+	+	**0**	+	+	**0**	+	**0**	+	**0**	+	**0**	+	+	+	**0**	+	**0**	+	**0**	+	**0**	+		**7**	**2+**	
8	**rr**	**0**	**0**	**0**	+	+	**0**	**0**	+	**0**	+	**0**	+	+	**0**	+	**0**	+	**0**	+	+	+	+	+	**0**	**0**	+		**8**	**3+**	
9	**rr**	**0**	**0**	**0**	+	+	**0**	**0**	+	**0**	+	**0**	+	**0**	+	+	+	+	**0**	+	+	+	**0**	+	+	**0**	+		**9**	**3+**	
10	**rr**	**0**	**0**	**0**	+	+	**0**	+	+	**0**	+	**0**	+	+	+	+	+	+	**0**	+	**0**	+	+	**0**	**+s**	**0**	+		**10**	**3+**	
11	**R1R1**	+	+	**0**	**0**	+	**0**	+	+	**0**	+	**0**	+	**0**	+	+	**0**	+	**0**	+	**0**	+	**0**	+	+	**0**	+		**11**	**3+**	
Patient																													**AC**		

QUESTION:

1. What is your impression from the initial test results? (Hint: what is the differential diagnosis when all of the cells on the antibody identification panel are reactive?) What would you do next?

The following additional cells were tested.

Additional antibody identification panel

Lot #32549		Rh system						Kell						Duffy		Kidd		Lewis		P	MNSs				Lutheren		Xg	Other Typings		LISS/tube			
Cell	Rh	D	C	c	E	e	V	K	k	Kp^a	Kp^b	Js^a	Js^b	Fy^a	Fy^b	Jk^a	Jk^b	Le^a	Le^b	P1	M	N	S	s	Lu^a	Lu^b	Xg^a		Cell	IS	37°	AHG	CC
1	R1wR1	+	+	0	0	+	0	0	+	0	+	0	+	+	+	+	0	0	+	0	+	0	+	+	0	+	+	C^w	1	0	0	2+	
2	R1R1	+	+	0	0	+	0	+	+	+	+	0	+	0	+	0	+	+	0	+	+	+	+	+	0	+	+	Co(b+)	2	0	0	0	2+
3	R1R1	+	+	0	0	+	0	0	+	0	+	0	+	+	0	+	+	+	0	+	+	0	+	0	0	+	+		3	0	0	2+	
4	R1R1	+	+	0	0	+	0	+	+	0	+	0	+	+	0	+	0	0	+	0	+	+	0	+	0	+	+		4	0	0	2+	
5	RzR1	+	+	0	+	+	0	0	+	0	+	0	+	+	+	+	0	+	0	+	+	+	0	+	0	+	+		5	0	0	2+	
6	RzR2	+	w	+	+	0	0	0	+	0	+	0	+	0	+	+	0	0	+	+	+	+	0	+	0	+	0	Lu:14	6	0	0	2+	
7	R2R2	+	0	+	+	0	0	+	+	0	+	0	+	+	0	+	+	+	0	+	+	0	+	0	0	+	0		7	0	0	2+	
8	R2R2	+	0	+	+	0	0	0	+	0	+	0	+	0	+	0	+	0	+	+	+	+	0	+	0	+	+		8	0	0	1+	
9	R2R2	+	0	+	+	0	0	0	+	0	+	0	+	+	0	+	+	0	+	+	+	0	+	0	0	+	+		9	0	0	1+	
10	R1R2	+	+	+	+	+	0	+	0	0	+	0	+	+	+	+	+	0	+	+	0	+	0	+	0	+	+		10	0	0	2+	
11	r'r	0	+	+	0	+	0	0	+	0	+	0	+	+	0	+	0	+	0	+	+	+	+	+	0	+	0		11				
12	r"r	0	0	+	+	+	0	0	+	0	+	0	+	0	+	+	+	0	+	0	0	+	0	+	0	+	0		12				
13	rr	0	0	+	0	+	0	+	+	0	+	0	+	+	+	+	+	0	+	0	+	0	0	+	0	+	+		13				
14	rr	0	0	+	0	+	0	0	+	0	+	0	+	+	+	0	+	+	0	0	+	+	+	+	0	+	+	Co(b+)	14				
15	rr	0	0	+	0	+	0	0	+	0	+	+	+	0	0	0	+	0	+	+	0	+	0	+	0	+	+		15				
16	rr	0	0	+	0	+	0	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	0	+	+		16				
17	rr	0	0	+	0	+	0	0	+	0	+	0	+	0	+	+	0	+	0	0	+	0	0	+	0	+	+		17				
18	rr	0	0	+	0	+	0	+	+	0	+	0	+	+	0	+	+	0	+	+	+	+	0	+	0	+	+		18				
19	rr	0	0	+	0	+	+	0	+	0	+	0	+	0	0	+	+	0	0	+	+	+	+	0	0	+	+		19				
20	Ror	+	0	+	0	+	+	0	+	0	+	0	+	0	0	+	+	0	0	+	+	+	+	0	0	+	+		20				
Patient																													AC				

QUESTION:

2. Do these reactions help? What antibody(ies) do you think is(are) present now? What would you do to investigate your hypothesis?

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The following additional tests were performed.

Selected cell panel

Cell	Special type	Rh system					Kell				Duffy		Kidd		Xg	Lewis		MNSs				P	Lu		LISS/tube			
		D	C	E	c	e	K	k	Kp^a	Js^a	Fy^a	Fy^b	Jk^a	Jk^b	Xg^a	Le^a	Le^b	S	s	M	N	P1	Lu^a	Cell	IS	37^o	AHG	CC
1	R1R1	+	+	0	0	+	0	+	0	0	0	+	0	+	0	+	0	+	+	+	+	+	0	1	0	0	0	2+
2	R1R1	+	+	0	0	+	0	+	0	0	0	+	0	+	+	+	0	0	+	0	+	w+	0	2	0	0	0	2+
3	R1R1	+	+	0	0	+	0	+	0	0	+	0	0	+	+	0	+	0	+	0	+	+	0	3	0	0	1+	
4	R1R1	+	+	0	0	+	0	+	0	0	0	+	+	0	+	0	+	+	+	0	+	+	0	4	0	0	2+	
5	RzR1	+	+	+	0	+	0	+	0	0	0	+	0	+	+	+	0	0	+	0	+	0	0	5	0	0	0	2+
6	RzR1	+	+	+	0	+	0	+	0	0	0	+	+	0	0	0	+	0	+	0	+	+	0	6	0	0	2+	
7	rr	0	0	0	+	+	0	+	0	0	0	0	0	+	0	0	0	+	+	+	0	+	0	7	0	0	w+	
8	rr	0	0	0	+	+	0	+	0	0	0	+	0	+	0	0	+	+	+	0	+	+	0	8	0	0	w+	
9	rr	0	0	0	+	+	0	+	0	0	0	+	0	+	+	0	+	+	+	0	+	+	0	9	0	0	w+	

Antigen Phenotype

	Rh System				Kell		Duffy		Kidd		MNSs						
	Anti-C	-E	-c	-e	-K	-k	$-Fy^a$	$-Fy^b$	$-Jk^a$	$-Jk^b$	-M	-N	-S	-s			
Patient	3+	0	0	3+			0		0								
Pos Control	3+	3+	3+	3+			1+		w+								
Neg Control	0	0	0	0			0		0								

QUESTIONS:

3. What antibody(ies) do you think is(are) present now? Is your hypothesis proven? If not, what is missing?

4. How would you select RBCs for transfusion? How many units of blood would need to be screened to find two compatible units?

Additional history/discussion:

Cholecystectomy was performed successfully. During his hospitalization the patient received two units of RBCs lacking the c, E, Jk^a, and Fy^a antigens. A "type-and-screen" ordered 2-3 weeks after this transfusion prompted re-evaluation of the above results. Anti-c, anti-Jk^a, and anti-Fy^a were again demonstrated. Of note however, the DAT was very weakly positive (microscopic agglutination only) with anti-IgG. An eluate contained anti-c. We have no good explanation for this phenomenon since the transfused cells were c-negative. Suffice it to say that transfusion is immunomodulatory, and the immune system is fascinating!

Five years later the patient presented with anemia (hemoglobin level 7.9 gm/dL) and iron deficiency. Repeat investigation demonstrated anti-c and anti-E, but anti-Jk^a, and anti-Fy^a were not detectable. Without a history available of the latter antibodies he would be at risk of a delayed hemolytic transfusion reaction.