

Case study: anti-D/C/G

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Outline

- Basic overview of anti-G
- Obstetric case study
- Should there be a change in recommended practice?

G antigen

- Present whenever C and/or D are present – some rare exceptions
- Serine 103, encoded by *RHD* and the C allele of *RHCE*, is the key to G reactivity

Anti-G

- Is often present in addition to anti-C and/or anti-D i.e.
 - anti-C+D+G
 - anti-C+G
 - anti-D+G
- Or may be found on its own
 - anti-G

Anti-C/D/G

Cell	Rh	D	C	E	c	e	C ^w	Anti-D	Anti-C	Anti-C+D	Anti-C+D+ G
1	R ₁ ^w R ₁	+	+	0	0	+	+	+	+	+	+
2	R ₁ R ₁	+	+	0	0	+	0	+	+	+	+
3	R ₂ R ₂	+	0	+	+	0	0	+	0	+	+
4	r'r	0	+	0	+	+	0	0	+	+	+
5	r''r	0	0	+	+	+	0	0	0	0	0
6	rr	0	0	0	+	+	0	0	0	0	0
7	rr	0	0	0	+	+	0	0	0	0	0
8	rr	0	0	0	+	+	0	0	0	0	0
9	rr	0	0	0	+	+	0	0	0	0	0
10	rr	0	0	0	+	+	0	0	0	0	0

Anti-C/D/G

Cell	Rh	D	C	E	c	e	C ^w	Anti-D	Anti-C	Anti-C+D	Anti-C+D+G	Anti-D+G
1	R ₁ ^w R ₁	+	+	0	0	+	+	+	+	+	+	+
2	R ₁ R ₁	+	+	0	0	+	0	+	+	+	+	+
3	R ₂ R ₂	+	0	+	+	0	0	+	0	+	+	+
4	r'r	0	+	0	+	+	0	0	+	+	+	+
5	r''r	0	0	+	+	+	0	0	0	0	0	0
6	rr	0	0	0	+	+	0	0	0	0	0	0
7	rr	0	0	0	+	+	0	0	0	0	0	0
8	rr	0	0	0	+	+	0	0	0	0	0	0
9	rr	0	0	0	+	+	0	0	0	0	0	0
10	rr	0	0	0	+	+	0	0	0	0	0	0

Anti-C/D/G

Cell	Rh	D	C	E	c	e	C ^w	Anti-D	Anti-C	Anti-C+D	Anti-C+D+G	Anti-D+G	Anti-C+G
1	R ₁ ^w R ₁	+	+	0	0	+	+	+	+	+	+	+	+
2	R ₁ R ₁	+	+	0	0	+	0	+	+	+	+	+	+
3	R ₂ R ₂	+	0	+	+	0	0	+	0	+	+	+	+
4	r'r	0	+	0	+	+	0	0	+	+	+	+	+
5	r''r	0	0	+	+	+	0	0	0	0	0	0	0
6	rr	0	0	0	+	+	0	0	0	0	0	0	0
7	rr	0	0	0	+	+	0	0	0	0	0	0	0
8	rr	0	0	0	+	+	0	0	0	0	0	0	0
9	rr	0	0	0	+	+	0	0	0	0	0	0	0
10	rr	0	0	0	+	+	0	0	0	0	0	0	0

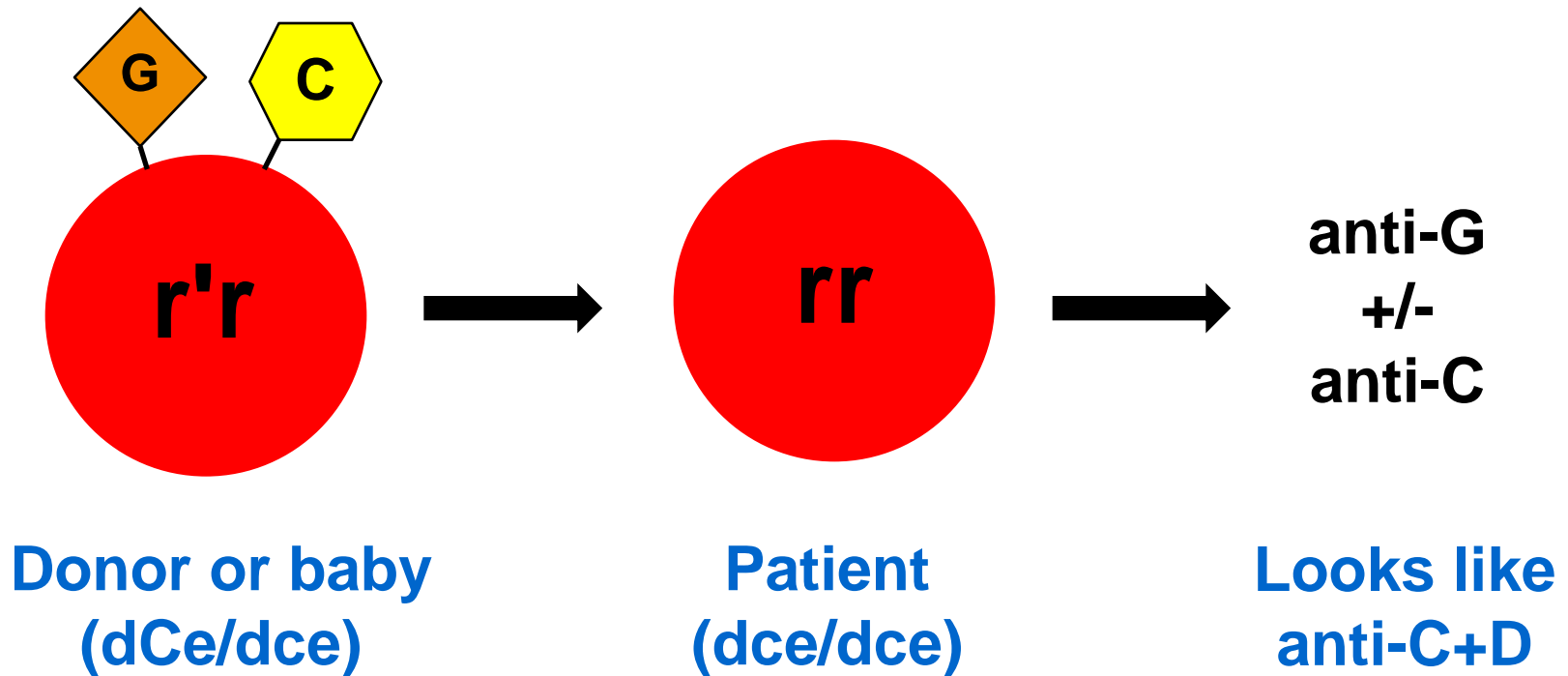
Anti-C/D/G

Cell	Rh	D	C	E	c	e	C ^w	Anti-D	Anti-C	Anti-C+D	Anti-C+D+G	Anti-D+G	Anti-C+G	Anti-G
1	R ₁ ^w R ₁	+	+	0	0	+	+	+	+	+	+	+	+	+
2	R ₁ R ₁	+	+	0	0	+	0	+	+	+	+	+	+	+
3	R ₂ R ₂	+	0	+	+	0	0	+	0	+	+	+	+	+
4	r'r	0	+	0	+	+	0	0	+	+	+	+	+	+
5	r''r	0	0	+	+	+	0	0	0	0	0	0	0	0
6	rr	0	0	0	+	+	0	0	0	0	0	0	0	0
7	rr	0	0	0	+	+	0	0	0	0	0	0	0	0
8	rr	0	0	0	+	+	0	0	0	0	0	0	0	0
9	rr	0	0	0	+	+	0	0	0	0	0	0	0	0
10	rr	0	0	0	+	+	0	0	0	0	0	0	0	0

Serological puzzle solved

- The presence of anti-G explains why patients immunised by pregnancy or transfusion with Rh D negative RBCs can apparently produce anti-D

Immunisation by r'r RBCs



Anti-G: does it matter?

1. Transfusion

- Rh D negative patients with any combination of anti-C/D/G should not be transfused with C-D- units
- Rare examples of (r) donor units should be detected by serological crossmatch

NO

Anti-G: does it matter?

2. Pregnancy

4.3.3. Women with apparent anti-C+D, possible anti-G
..... Since women without anti-D,
should be eligible for every anti-D
immunoglobulin it is a centre
should confirm example anti-C+D specificity.

YES

BCSH guideline for blood grouping and antibody testing in pregnancy 2006

Anti-G – does it matter?

- Without anti-D prophylaxis, a pregnant woman with anti-G (+/-C) is at risk of producing anti-D which carries a much greater risk of HDN to the fetus
- Rare cases of high titre anti-G have been misidentified as anti-C+D and lead to severe HDN because the D neg fetus was not thought to be at risk (fetus was r'r, i.e. G positive)

Antenatal screening sample

- Booking sample received by Hospital A, Oct 2014
 - 34 year old female, 8 weeks gestation
- Tested on only one previous occasion at Hospital A
 - Referred to NHSBT in 2012 as ?anti-C+D
 - NHSBT issued report and blood group card stating anti-C+D present

Antibody ID panel Oct 2014

Cell	Rh	Rh						MNSs				P ₁	Lu		Kell			Le		Fy		Jk		Results	
		D	C	E	c	e	C ^w	M	N	S	s		a	b	K	k	Kp ^a	a	b	a	b	a	b	IAT	Enz
1	R ₁ ^w R ₁	+	+	0	0	+	+	+	0	+	0	0	0	+	0	+	0	+	0	+	0	+	0	4	4
2	R ₁ R ₁	+	+	0	0	+	0	+	0	0	+	2	0	+	+	0	0	0	+	+	0	0	+	4	4
3	R ₂ R ₂	+	0	+	+	0	0	0	+	0	+	3	0	+	0	+	0	0	+	0	+	0	+	4	4
4	r'r	0	+	0	+	+	0	0	+	+	0	0	+	+	0	+	0	+	0	0	0	0	+	4	4
5	r''r	0	0	+	+	+	0	0	+	+	+	3	0	+	0	+	0	0	+	+	0	+	0	0	0
6	rr	0	0	0	+	+	0	+	0	+	0	1	0	+	0	+	0	+	0	0	+	+	+	0	0
7	rr	0	0	0	+	+	0	0	+	0	+	0	0	+	+	+	0	0	+	0	+	+	0	0	0
8	rr	0	0	0	+	+	0	+	+	0	+	0	0	+	0	+	+	+	0	+	0	0	+	0	0
9	rr	0	0	0	+	+	0	+	0	+	+	1	0	+	0	+	+	0	+	+	0	+	0	0	0
10	rr	0	0	0	+	+	0	+	0	+	0	4	0	+	+	+	0	0	+	0	+	0	+	0	0
Auto																								0	

Antenatal monitoring 2014-15

- Referred to NHSBT
- Anti-C+D confirmed, 0.2 IU/mL
- Patient not eligible for anti-D prophylaxis
- Antibody levels to be monitored in accordance with antenatal screening guidance

Antenatal monitoring 2014-15

- Repeat sample sent to NHSBT 4 weeks later
- Absorption studies showed **only anti-G** present, no anti-C or anti-D present
- Patient eligible for anti-D prophylaxis
- **Had there been any missed opportunities for anti-D prophylaxis?**

Obstetric history

- 2011 full term pregnancy Hospital B
- RAADP declined at 28weeks
- Antibody screen negative 3 days pre-delivery
- Post-delivery samples not taken for FMH estimation as patient 'certain' she would have no more pregnancies
- Infant readmitted at 3 days due to jaundice:
O Positive, DAT negative

Obstetric history

- 2011-2014. Medical notes indicated two miscarriages. Dates and locations uncertain
- Not known whether anti-D prophylaxis had been given
- Could the 2012 blood group card stating anti-C+D have affected the offer of prophylaxis?

Current pregnancy

- Shared care between two hospitals
 - antenatal care at Hospital A
 - booked to deliver at Hospital C
- Liaison required to correct records and emphasize need to offer prophylaxis
 - antenatal screening co-ordinators at both hospitals
 - transfusion laboratories at both hospitals
 - attempt to retrieve blood group card

Learning points

- Hospital A has long-standing policy of referring apparent anti-C+D in females of child bearing potential to NHSBT for differentiation from anti-G.
 - NB This applies to both pregnant and non-pregnant females
- Hospital A wrongly assumed NHSBT had a similar policy

Learning points

- The first sample referred in Oct 2014 was insufficient for adsorption studies
- NHSBT made only an internal note to perform anti-C/D/G differentiation on next sample and inadvertently sent out the report with the historic specificity of anti-C+D

Learning points

- The blood group card could not be re-issued with the amended specificity of anti-G as Hematos software does not allow removal of previous antibodies

Question

- Should the recommendation to perform anti-G differentiation be extended to non-pregnant females of child-bearing potential?
- NHSBT adopted this principle earlier this year

Case study - outcome

- Patient subsequently developed anti-C+D in addition to anti-G during the pregnancy
- Quantification of anti-D indicated moderate risk of HDN
 - Infant born at 37 weeks, DAT positive, Hb 114g/L, bilirubin 87 μ mol/L
 - Bilirubin peaked at 272 μ mol/L at 4 days
 - Managed without transfusion
 - Hb 88g/L at 3 month review