8/4/25

Blood grouping

DR, Arwa Rawashdeh

Immune hemolytic anemia

3 أنواع

1

- Autoimmune hemolytic anemia ; idiopathic reason.

Type II hypersensitivity

IgG warm 37C

IgM cold 23 C

] أسباب مرض.

2

- Drug induced hemolytic anemia → allergy penicillin.

3

- Alloimmune hemolytic anemia

↳ non-self

↳ external pathogen / condition.

Alloimmune Hemolytic Anemia

- Hemolytic disease of the newborn

Rh Disease severe Rhesus

less common.

ABO incompatibility "the most common"

not sever or dangerous in newborn

- Transfusion Reactions

عند عدم الإتزان والتداخل .

أهم ثنين

→ Rh
→ ABO

* There are hundreds of antigens on RBC surfce
→ molecule capable of inducing immune response → produce antibodies.

AB / B / A ما عندي on surface.

ABO (2 antigens)

Rh (6 antigens) → ① C ② D ③ E ④ c ⑤ d ⑥ e

D → most common.

no D ← negative لو ما كان موجود

لا أعمل الـ Ag

you have 1 of each of the 3 pairs of Rh antigens

if you have D antigen → you're Rh-positive

if you do not → Rh-negative

Ag that synthesis AB

Ab تصنيع

ABO system : antigens (agglutinogen) triggers → antibody (agglutinin)

genesis — AB — Protein

generation of Anti-Body.

2 antigens "A & B" : you can have either, neither or both.

4 blood types : A , B , AB , O (phenotypes)

dominant. → recessive.

Genetic locus : 3 alleles : I^A , I^B , I^O ← Immunoglobulin

الموقع — ↳ different gene forms (شكل.)

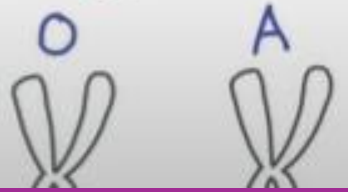
A is dominant , B is dominant, O is recessive

A & B together : Codominance → Both alleles contribute to the phenotype of the heterozygote

بيغلبو على ال O .

2 chromosomes
× 3 alleles : 6 possible combinations of alleles (Genotypes)

OA, OO, OB, AA, AB, BB



genotype : A , B.

phenotype & genotype
4 6

هون الدكتورة حكت؟

Genotypes	Blood types	Antigens	Anti-A	Anti-B
OO	O	—	+	+
OA / AA	A	A	−	+
OB / BB	B	B	+	−
AB	AB	A & B	−	−

بحاربوهم.

prevalence: O 47% , A 41% , B 9% , AB 3%

Agglutinins (Gamma Globulins) → plasma "MAGnED"

IgM IgG

- At birth: you have ZERO agglutinin.
  - baby is subjected to antigen: finger in mouth / Breastfeeding / food
- 2-8 months later:- agglutinins

- Antibody concentration in plasma peaks at 10 years of age, then gradually declines.

Antigen + Antibody = Agglutination

Ab من نفس نوع Ag.

Lock & key process.

no agglutination → O

Both agg → AB

A agg → A

B agg → B

D factor

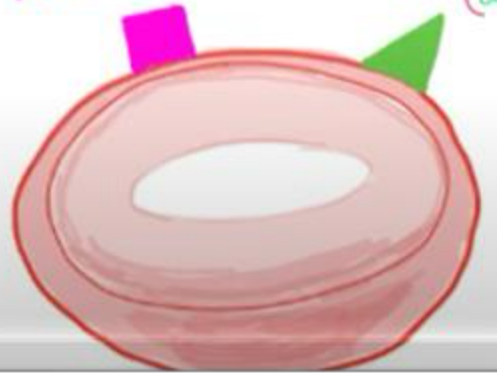
anti-A	anti-B	∴ Blood group
✓	–	A
–	✓	B
✓	✓	AB
–	–	O

Blood Typing

Blood matching

ABO (2 antigens)

Rh (6 antigens)



لو تبرعت بالدم بدون ما أفحص النوع.

ABO incompatibility "more common, less severe" → can trigger DIC

- MCC of neonatal jaundice in the first day. < Phy: Never 1st day / Path: 1st day.
- MCC of hemolysis due to mismatched blood transfusion.
- MCC of HDN "~25% of all pregnancies – only 10% anemia req. ttt

less common / less sever.

mother		baby
O		A or B
IgG anti A & Anti B		anti B / anti A

مثلاً الأم O والأب A
والطفل A بصير
فيصير Placenta عبر Perfusion
وحيصير عندي hemolysis.

- Antigen – Antibody reaction → agglutination

∴ No need for previous exposure "sensitization"

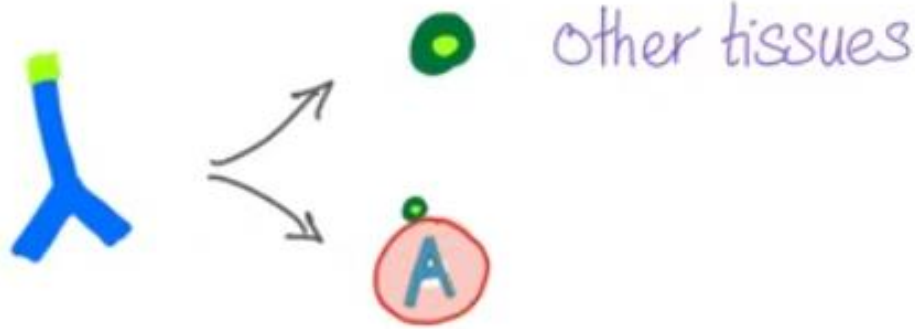
∴ (1) ABO HDN can occur during first pregnancy & subsequent pregnancies

(2) you cannot prevent it.

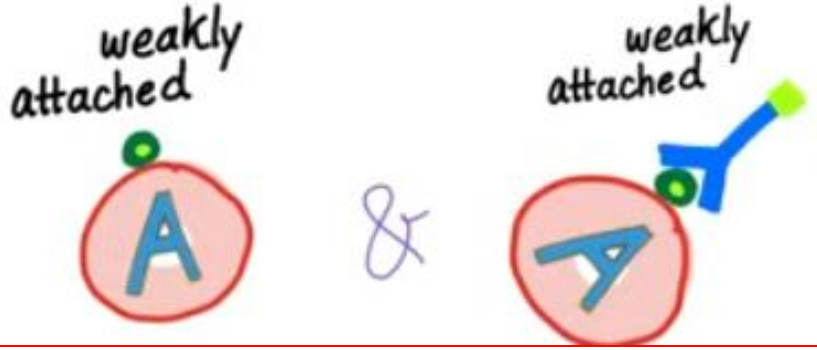
Rh comp
↳ From the 2nd preg and after (3rd, 4th)

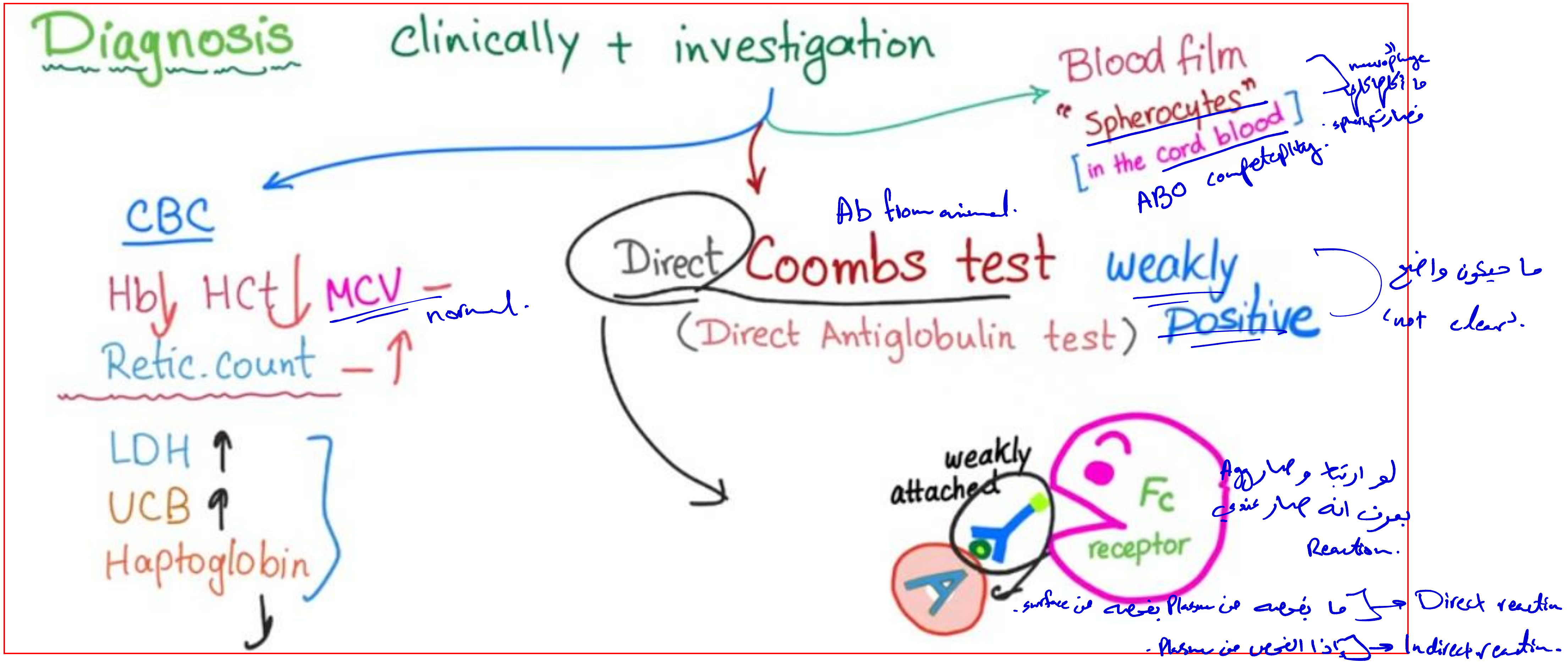
In ABO incompatibility, anemia is mild or non-existent.

why?



- بس يرتبط الـ Ab الجاي من الأم على Ag من الطفل على RBC أو على tissue فبقلل نسبة Agg.
- وحتى لو ارتبط بتكون طبيعة الارتباط ضعيفة




Diagnosis
clinically + investigation
CBC
Hb↓ HCt↓ MCV –
normal.
Retic. count – ↑
LDH ↑
UCB ↑
Haptoglobin ↓
Direct Coombs test weakly Positive
(Direct Antiglobulin test)
Ab from animal.
ما حيكون واضح
(not clear).
Blood film
"Spherocytes"
[in the cord blood]
ABO
weakly attached
Fc receptor
A
لو ارتبط وصار Agglutination
بعرف انه صار عندي Reaction.
ما بفحصه من Plasma بفحصه من surface. → Direct reaction
اذا الفحص من Plasma. → Indirect reaction.

Normal

أول حمل:
الأم (-) والطفل (+).
← Ab D
Ab → (+)

during labor
breaking vessels ← to placenta.
(انفصال المشيمة).

الحمل الثاني:
مع نفس الحالة

extravascular hemolytic anemia

Rh compat ← Anti D sensitized mother. ← macrophage رح تبلعها كلها → Strong Reaction → There is no spherocytes

diffusion [attachment → agg → hemolysis]
انتقال.

free of Ab of the serum of the baby. ⇐ Dangerous fatal.
من الأم لا يتم التصاق بشكل جنوني.

Strongly Positive appearance
(بيظهر الحالة).

PATHOGENESIS

(1) Diffusion

(2) Attachment

(3) Agglutination

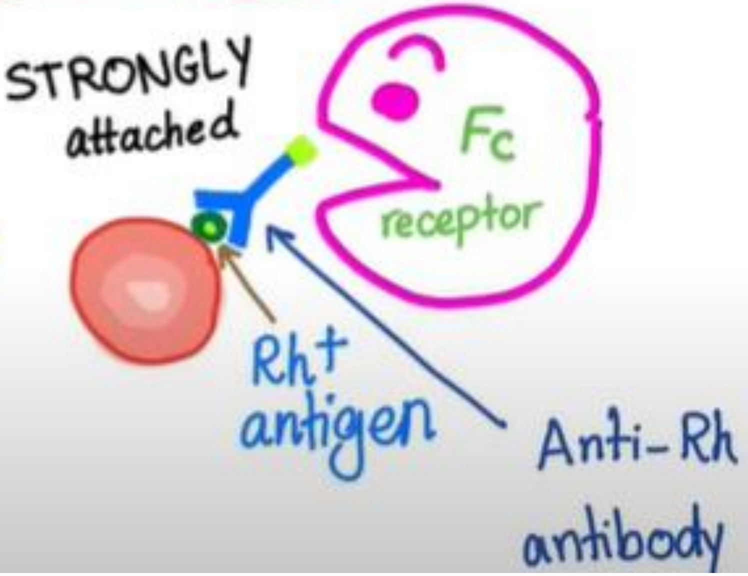
(4) Lysis

(5) Phagocytosis : whole RBC → NO spherocytes

(6) UCB → CB

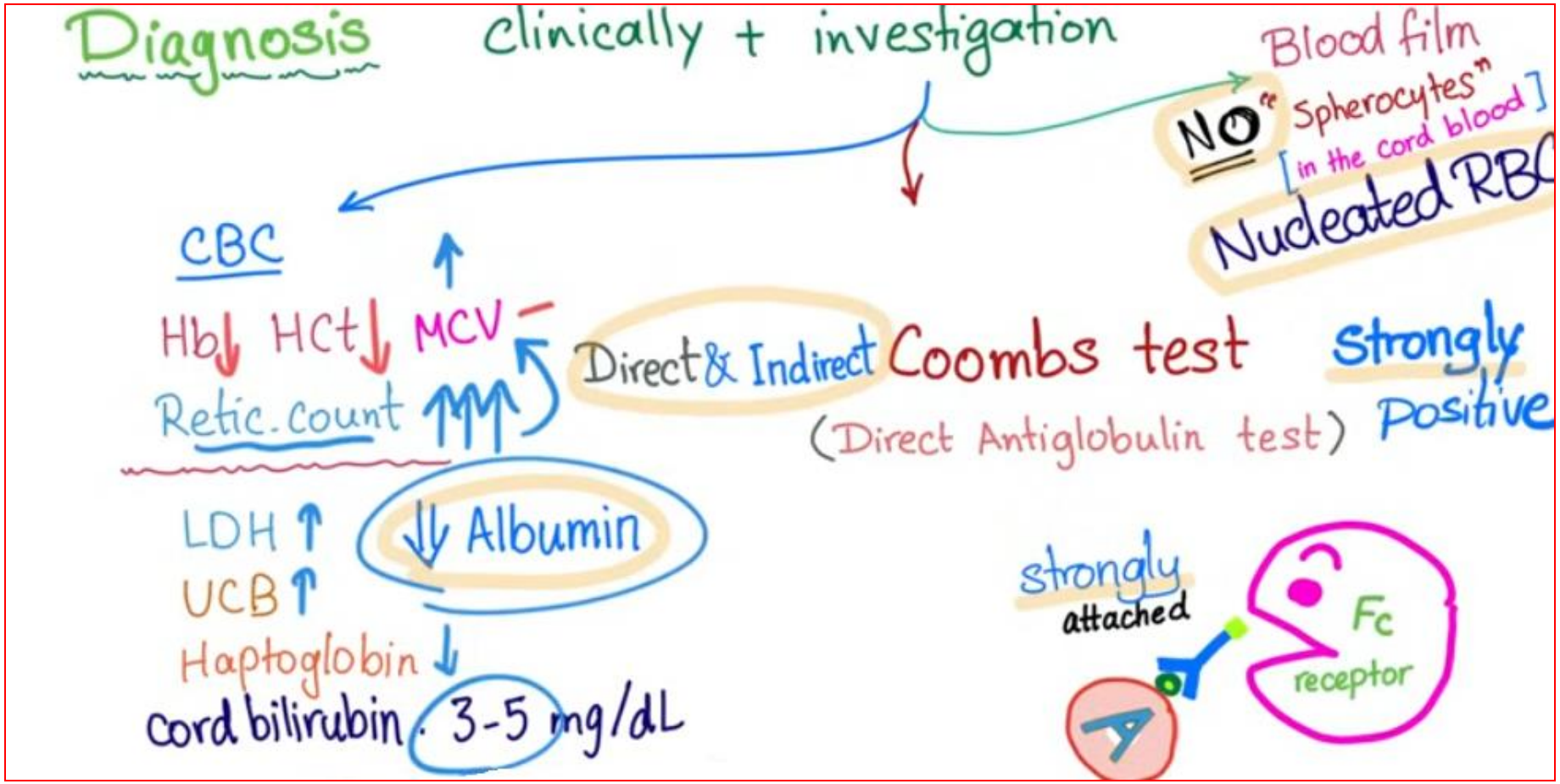
(7) Extramedullary Hematopoiesis

2nd PREGNANCY



Hydrops fetal.

death



من الأول أعرف انها (-) من الحمل الأول ،

PREVENTION :- "in the unsensitized mother"

بعطيها بالعضل مريض .

Rho(D)immunoglobulin [RhoGAM] — 28-30 weeks of gestation

- Do Atypical Antibody Test at 28 weeks

ذي كأنه بقنع الجسم انه (+) فعا في دمي بجسم ويصنع بدافع

Rho(D)immunoglobulin [RhoGAM] — when mum delivers an Rh+ baby. #prevent_sensitization

like a hacking process to the mother.

We give her the antibody, so she doesn't have to make it :> #analogy

إذا كانت sensitized .

غسيل دم الطفل ← بعير + .

By Catheter.

مقارنة ومراجعة

ABO system	Rh system
• Spontaneous agglutinins	• No spontaneous agglutinins
Not require previous exposure	• Requires previous exposure ⋮ SENSITIZED ⋮ 2nd response will be faster and stronger