PIPADOR REVISION

MRCOG Part 1 Revision Notes

Inversions

CELL BIOLOGY • LECTURE 113

VISUAL EXAMINATION REVISION NOTES

2026 Edition

MRCOG Part 1 Revision Notes

Lecture 113: Inversions

Cell biology • Visual revision edition — follows Lecture 112 (translocations)

COLOUR CODE USED THROUGHOUT THESE NOTES

PERICENTRIC	PARACENTRIC	BENIGN VARIANT	UNBALANCED / RISK	GENE (F8) / TESTING

LEARNING OBJECTIVES — tick off as you go

- ☐ Distinguish pericentric and paracentric inversions.
- ☐ Recognise common benign inversion variants.
- ☐ Explain the inversion loop and the products of crossing over.
- ☐ Describe the F8 intron 22 inversion in haemophilia A.
- ☐ Counsel carriers and know detection methods and cancer inversions.

1 Types and Variants

IN ONE LINE: *Two breaks in one chromosome, middle piece flipped. Usually balanced and harmless — unless a breakpoint cuts a gene, or a crossover in meiosis makes an unbalanced recombinant.*

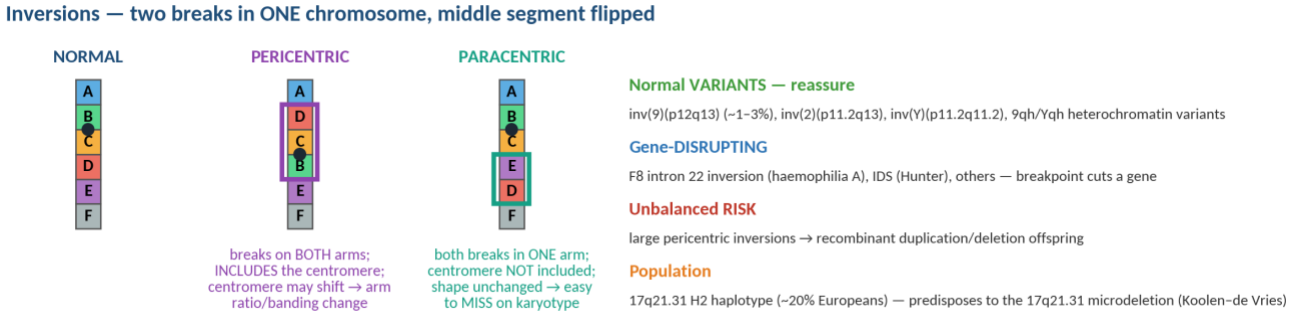


Figure 1. Pericentric vs paracentric; variants.

MNEMONIC / MEMORY HOOK

'PERI = Passes the cEntRomere (Includes it); PARA = Parallel, on ONE Arm'.

2 Meiosis and Risk

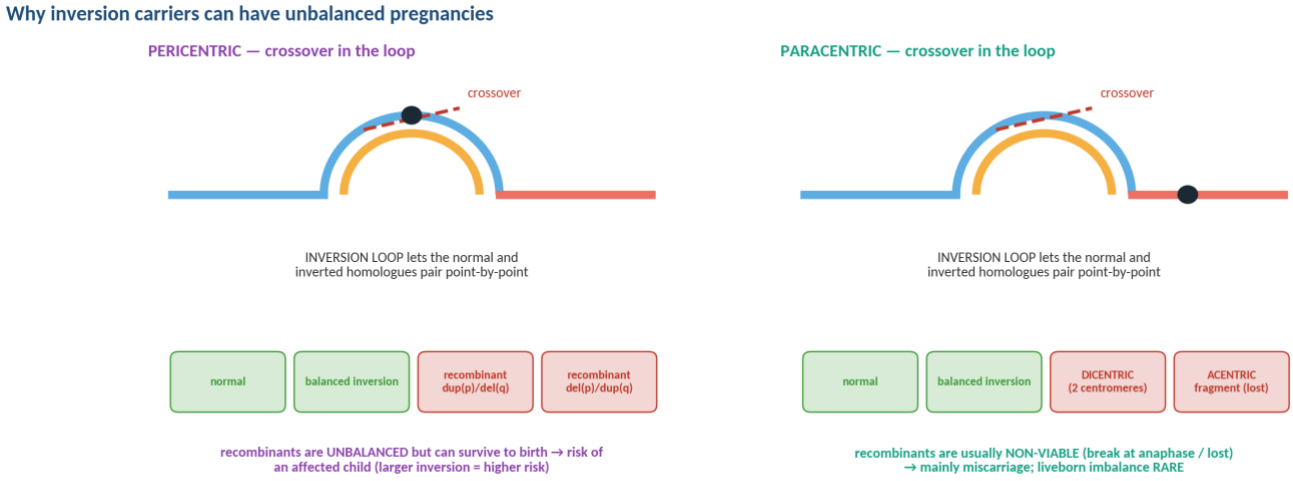


Figure 2. The inversion loop and recombinant products.



Figure 3. Risk depends on inversion size.

3 Gene-Disrupting Inversions

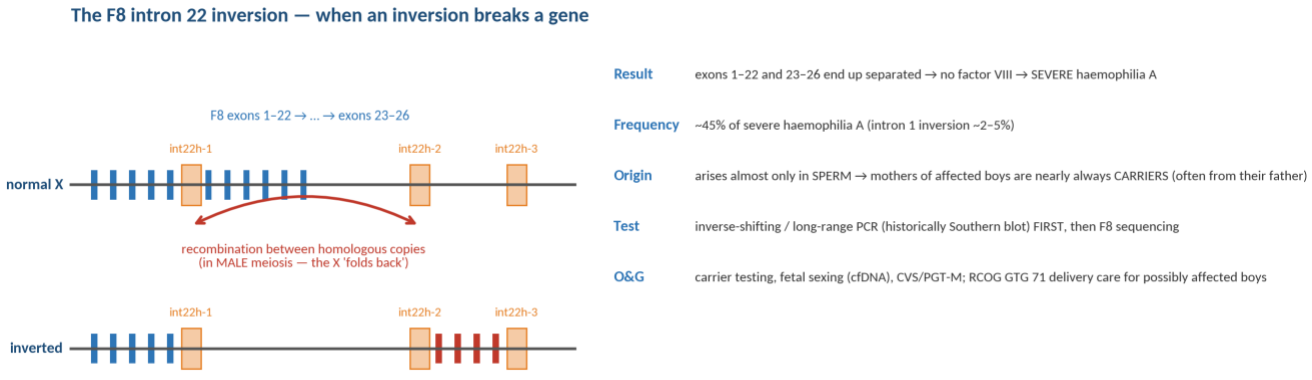


Figure 4. F8 intron 22 inversion.

4 Counselling, Detection and Cancer

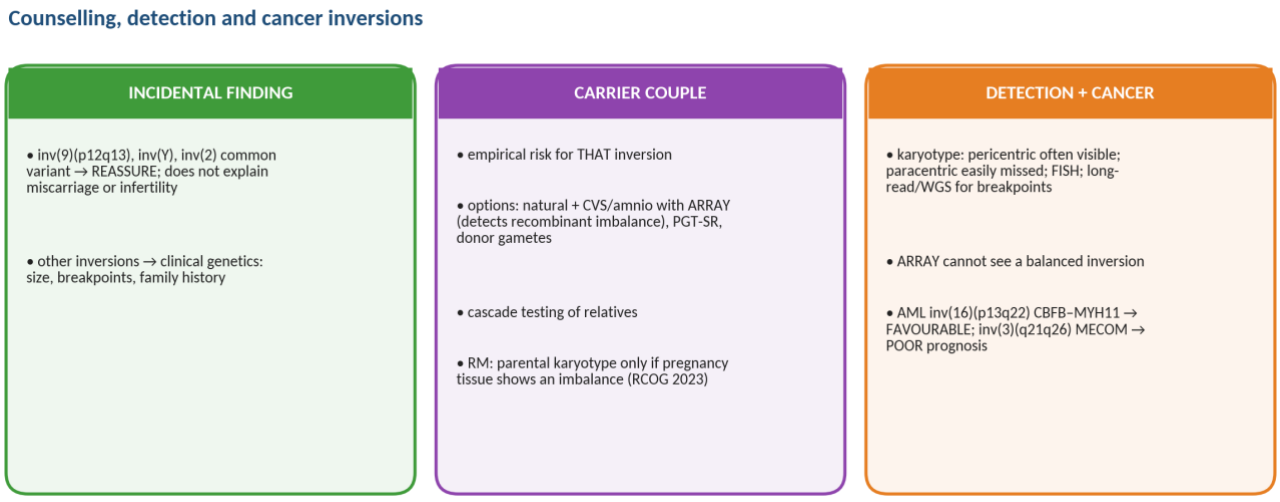


Figure 5. Counselling, detection and cancer inversions.

★ PEARL

inv(9)(p12q13) is a harmless common variant — reassure; it does not explain miscarriage. Large pericentric inversions carry real risk of an affected child; paracentric recombinants are usually lethal.

F8 intron 22 inversion = ~45% of severe haemophilia A; arises in male meiosis, so the mother of an affected boy is almost always a carrier.

5 MRCOG Exam Pearls — Last-Minute Page

Numbers to know

2 Breaks in an inversion	**~1–3%** People with inv(9)	**~45%** Severe haem A: intron 22 inv	**~2–5%** Intron 1 inversion
~5–10% Large pericentric (via affected child)	**~20%** Europeans with 17q21.31 H2	**inv(16)** AML — favourable	**inv(3)** AML — poor

HIGH-YIELD CHECKLIST

- ☐ Pericentric includes centromere; paracentric within one arm.
- ☐ Benign: inv(9)(p12q13), inv(2), inv(Y), heterochromatin variants.
- ☐ Inversion loop at pachytene; crossover inside → recombinants.
- ☐ Pericentric → dup/del recombinants (can be born).
- ☐ Paracentric → dicentric + acentric (usually lethal).
- ☐ Larger inversion → higher risk; empirical figures.
- ☐ F8 intron 22 inversion ~45% severe haem A; male-meiosis origin.
- ☐ Options: PND with array, PGT-SR, donor gametes; cascade.
- ☐ Array can't see balanced inversion; paracentric easily missed on karyotype.
- ☐ AML: inv(16) favourable, inv(3) poor.

Self-assessment — cover the right-hand column

Question	Answer
Which inversion includes the centromere?	Pericentric
Commonest benign inversion?	inv(9)(p12q13)
What forms at pachytene in a carrier?	An inversion loop
Recombinant products of a paracentric inversion?	Dicentric + acentric (usually lethal)
Which inversions risk a liveborn unbalanced child?	Large pericentric inversions
Commonest cause of severe haemophilia A?	F8 intron 22 inversion (~45%)
Why are mothers of these boys usually carriers?	The inversion arises in male (grandpaternal) meiosis
Can microarray detect a balanced inversion?	No
Prenatal test after a carrier is identified?	CVS/amnio with microarray
Prognosis of AML with inv(16)?	Favourable

6 References

- Gardner RJM, Amor DJ. Chromosome Abnormalities and Genetic Counselling. 5th ed. 2018.
- RCOG Green-top Guideline No. 71. Management of inherited bleeding disorders in pregnancy. 2017.
- RCOG Green-top Guideline No. 17. Recurrent miscarriage. 2023.