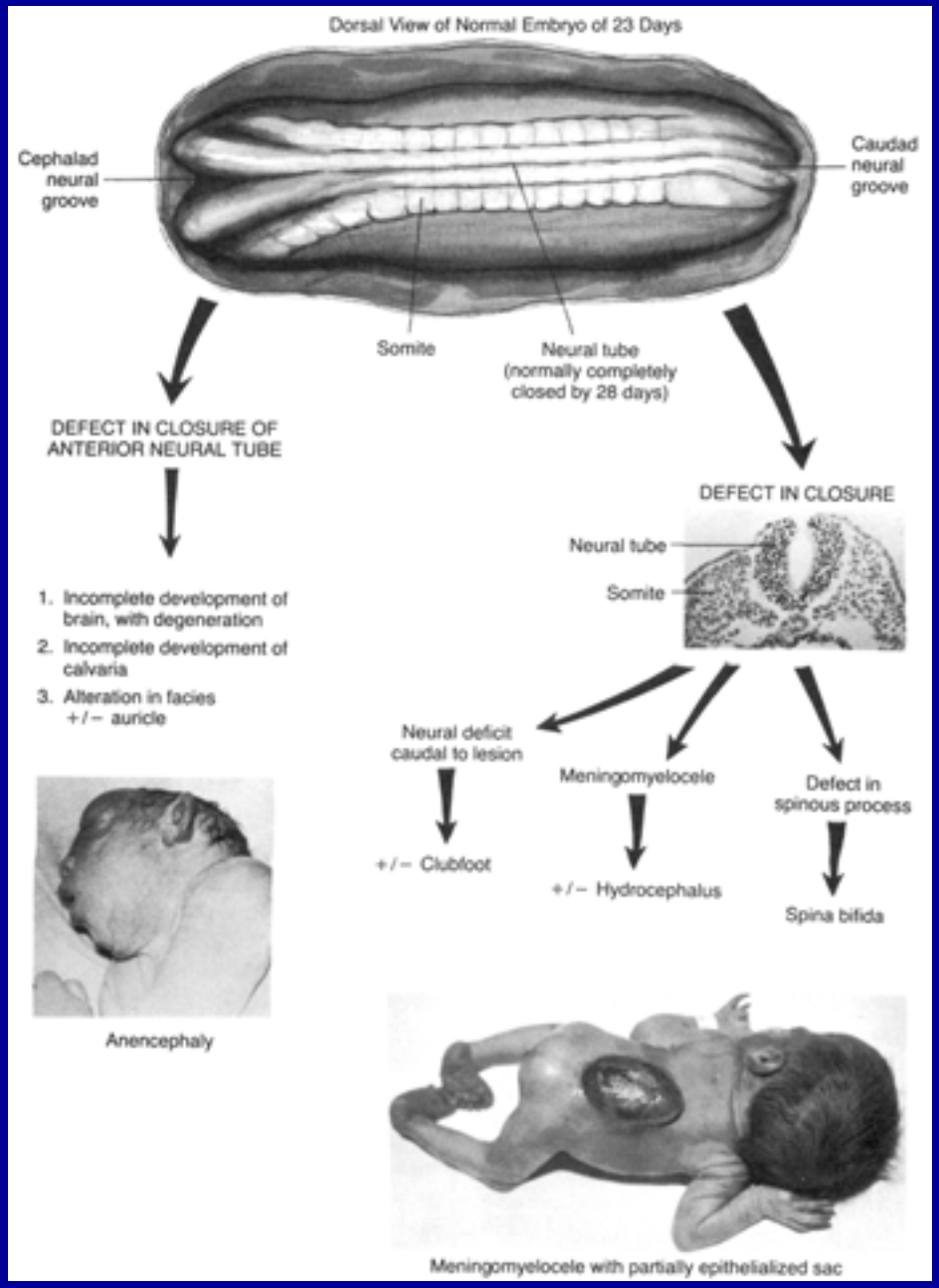
Neural Tube Defect


Dorsal View of Normal Embryo of 23 Days
Cephalad neural groove
Caudad neural groove
Somite
Neural tube (normally completely closed by 28 days)
DEFECT IN CLOSURE OF ANTERIOR NEURAL TUBE
1. Incomplete development of brain, with degeneration
2. Incomplete development of calvaria
3. Alteration in facies +/− auricle
Anencephaly
DEFECT IN CLOSURE
Neural tube
Somite
Neural deficit caudal to lesion
+/− Clubfoot
Meningomyelocele
+/− Hydrocephalus
Defect in spinous process
Spina bifida
Meningomyelocele with partially epithelialized sac

Definition

- Failure of closure of the neural tube.
- Can occur at various levels.
- Can have widely varying severity.
- Most severe is anencephaly.
- Least severe is spina bifida occulta.
- Most clincally challenging is lumbo-sacral myelomeningocele.

Basic Epidemiology

- Varies widely depending on ethnicity and socio-economic status
- ~1% in some places in UK
- 1:1000 in US
- High in Mexican/Amer-Indian populations.
- Virtually all cases are sporadic, isolated malformations.

Folate

- Low serum folate correlated with NTDs
- Folate supplementation with 400-800 ug per day reduces incidence by ~75%.
- Clearly, a sub-set of NTDs are not “folate dependent”.

MHTFR

- 5,10-methylenetetrahydrofolate reductase is in a pathway for recycling folate
- Catalyses a critical step in methionine biosynthesis.
- Several common variants of this enzyme exist.
- Between 5 and 15% of caucasians are homozygous for the variant form.

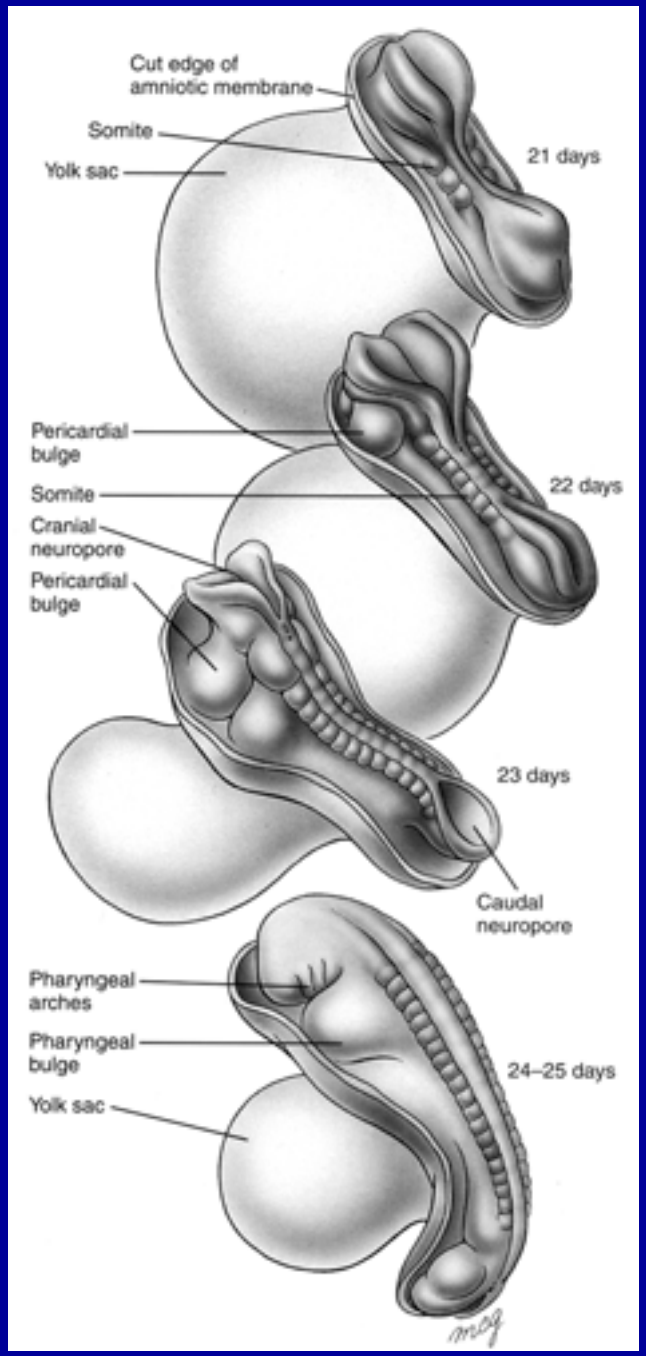
- Homozygotes are thought to be at risk for NTD and higher than normal folate supplementation has been recommended.

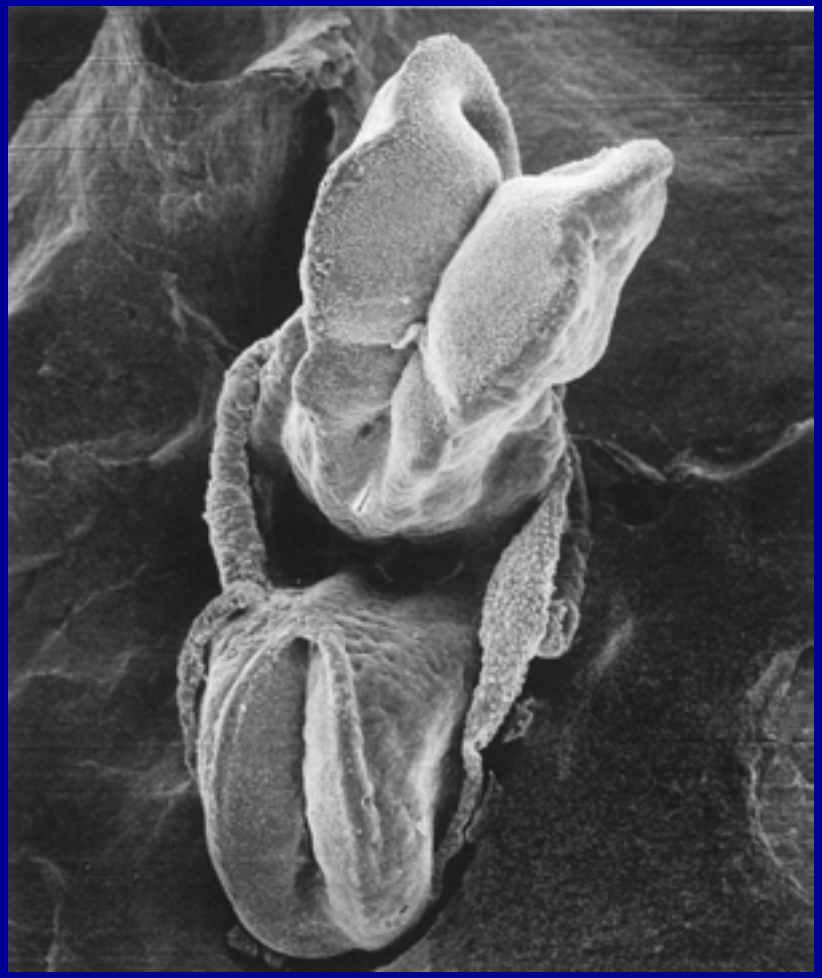
Prenatal Detection

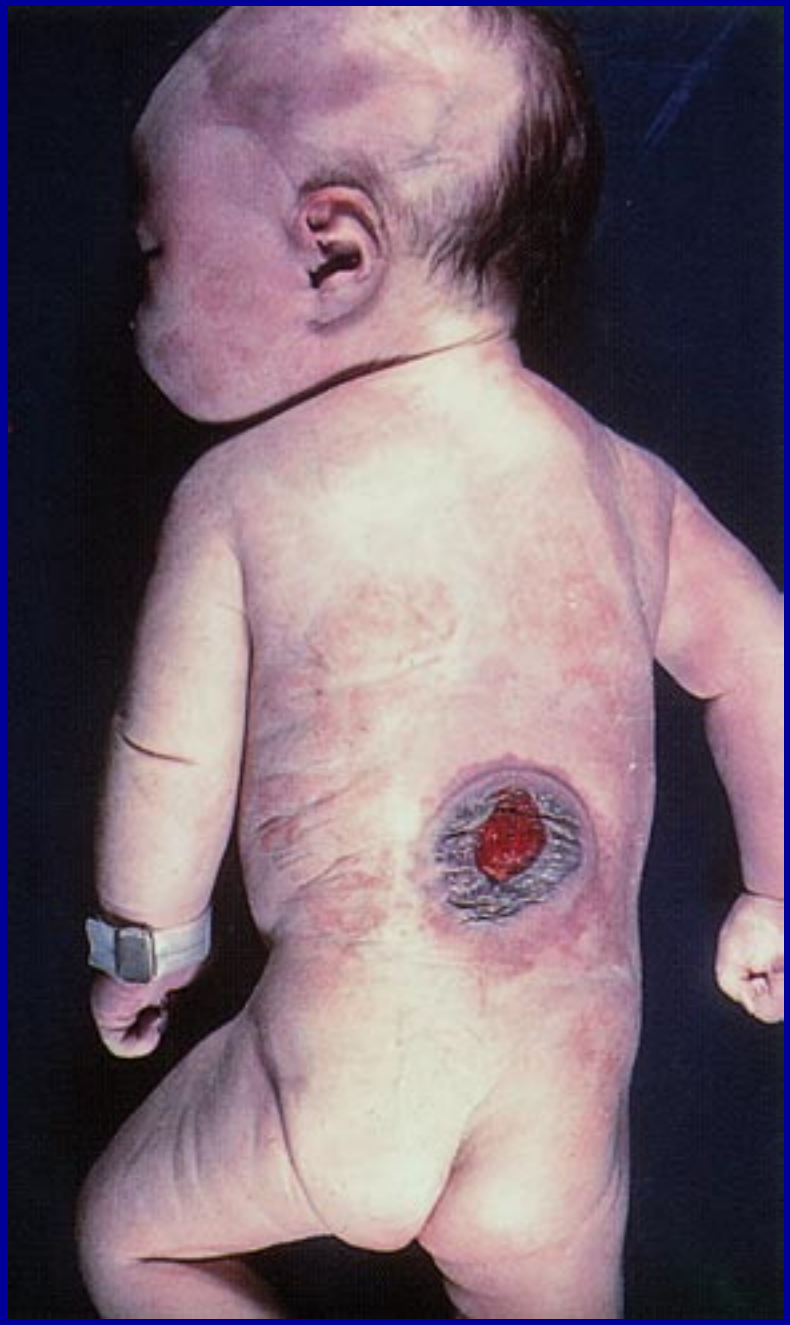
- In developed countries, prenatal detection of severe NTD should approach 100%.
- Maternal serum AFP screening is efficient as a screening tool.
- Sonography is efficient at both screening and diagnosis.

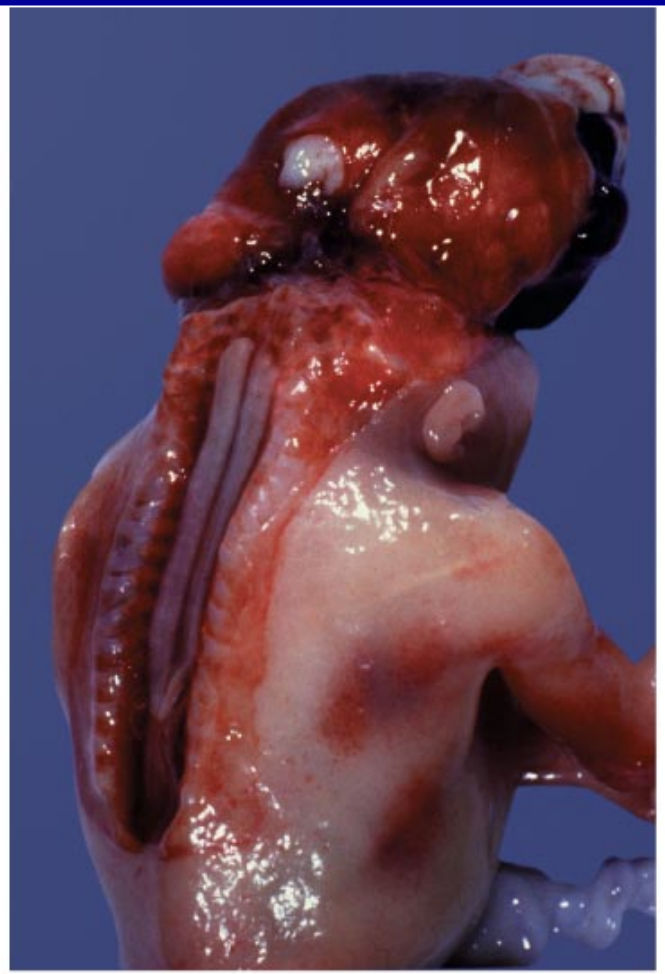
Counseling

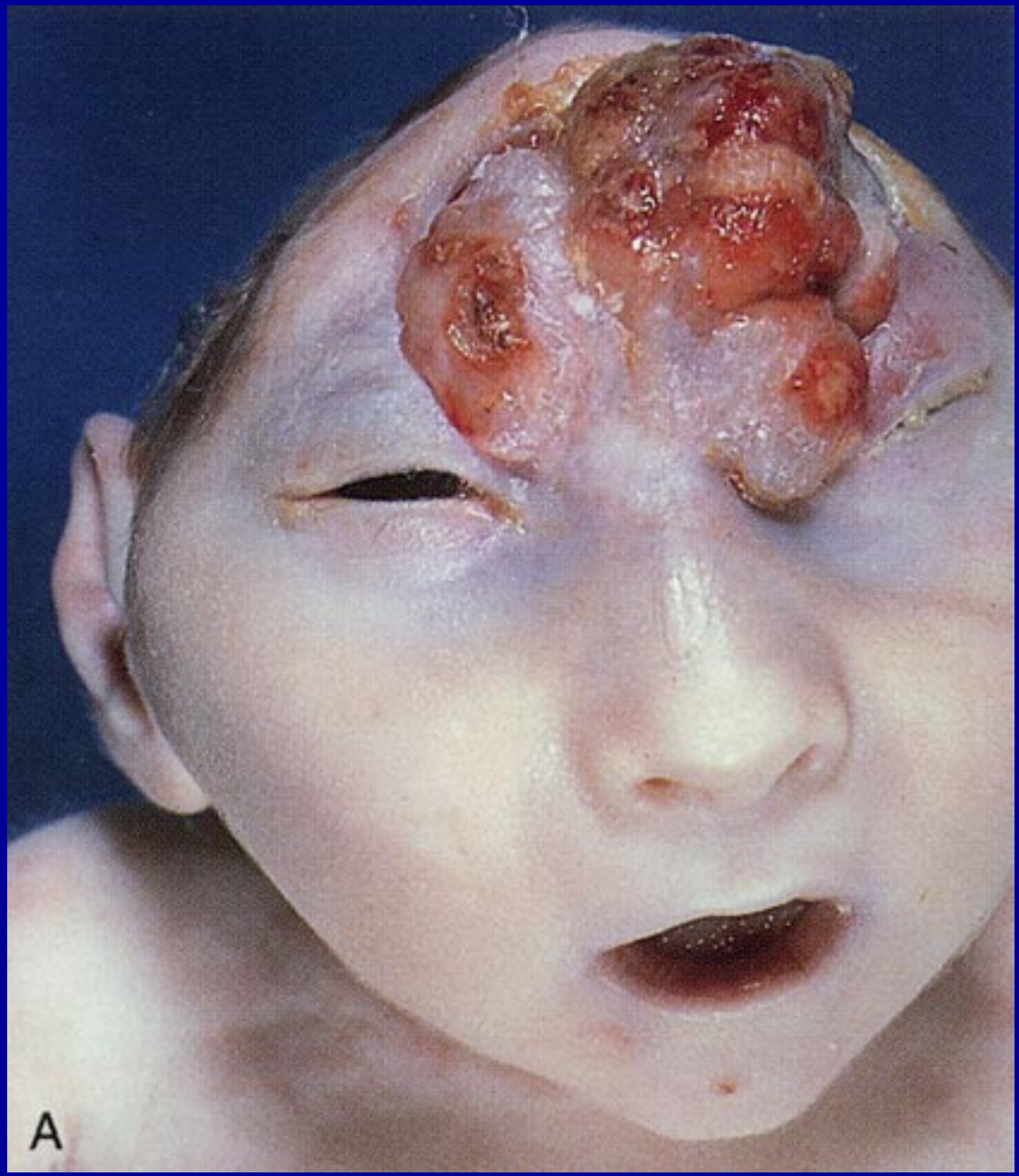
- Outcome depends a lot on level.
- Lower lesions may result in relatively mild defecits.
- Another issue is the related hydrocephalus, cerebellar malformation and long-term cognitive dysfunction.

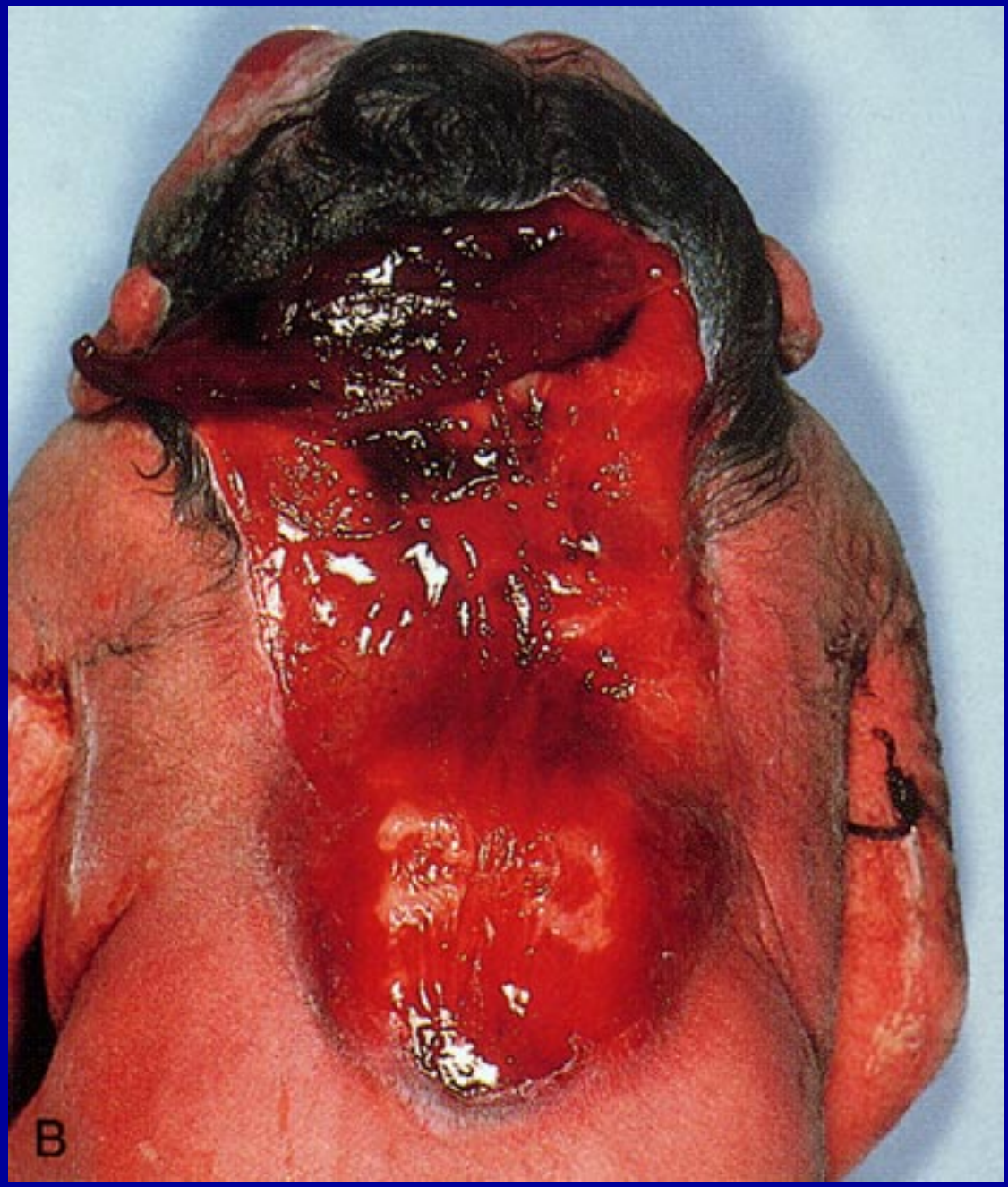

Cut edge of amniotic membrane
Somite
Yolk sac
21 days
Pericardial bulge
Somite
22 days
Cranial neuropore
Pericardial bulge
23 days
Caudal neuropore
Pharyngeal arches
Pharyngeal bulge
Yolk sac
24–25 days

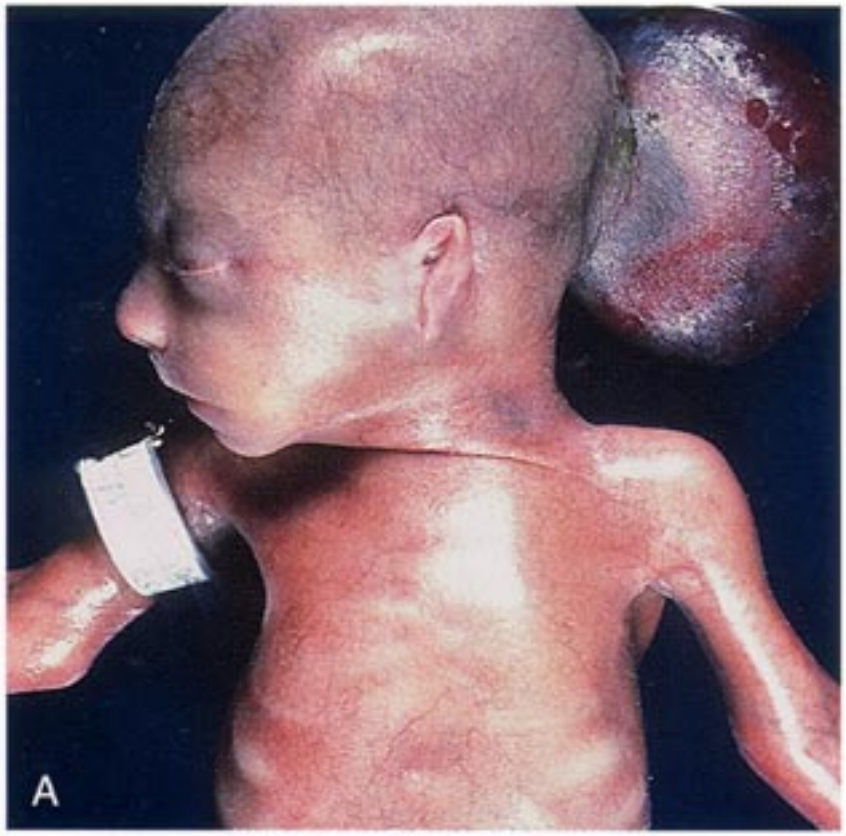


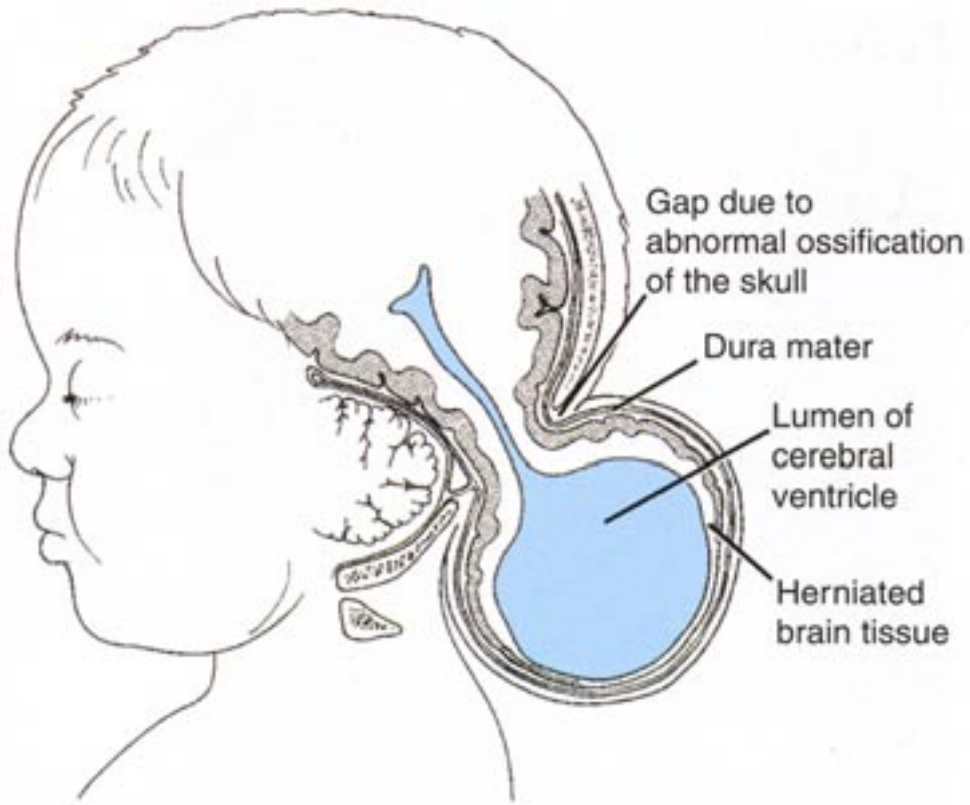




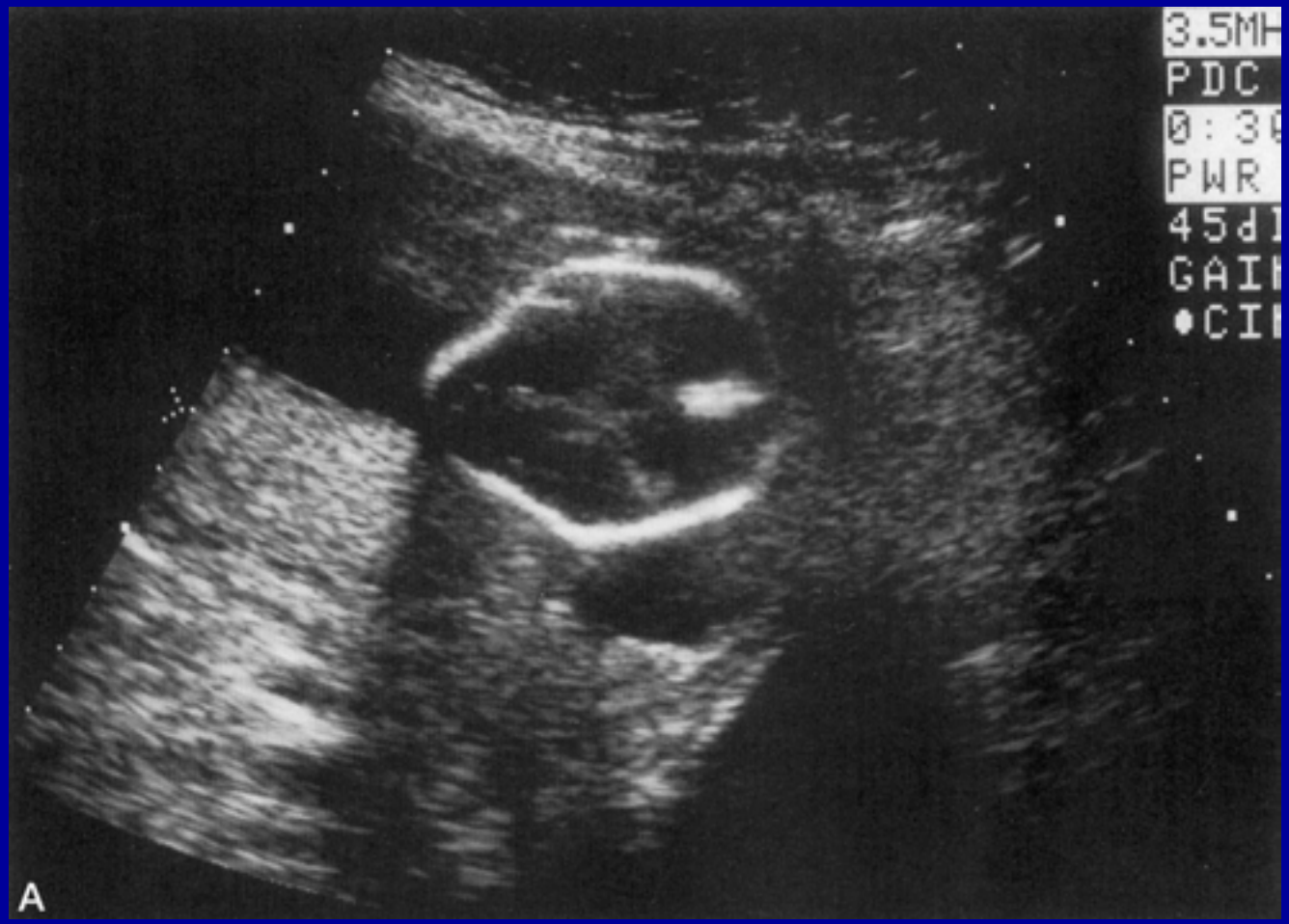

A

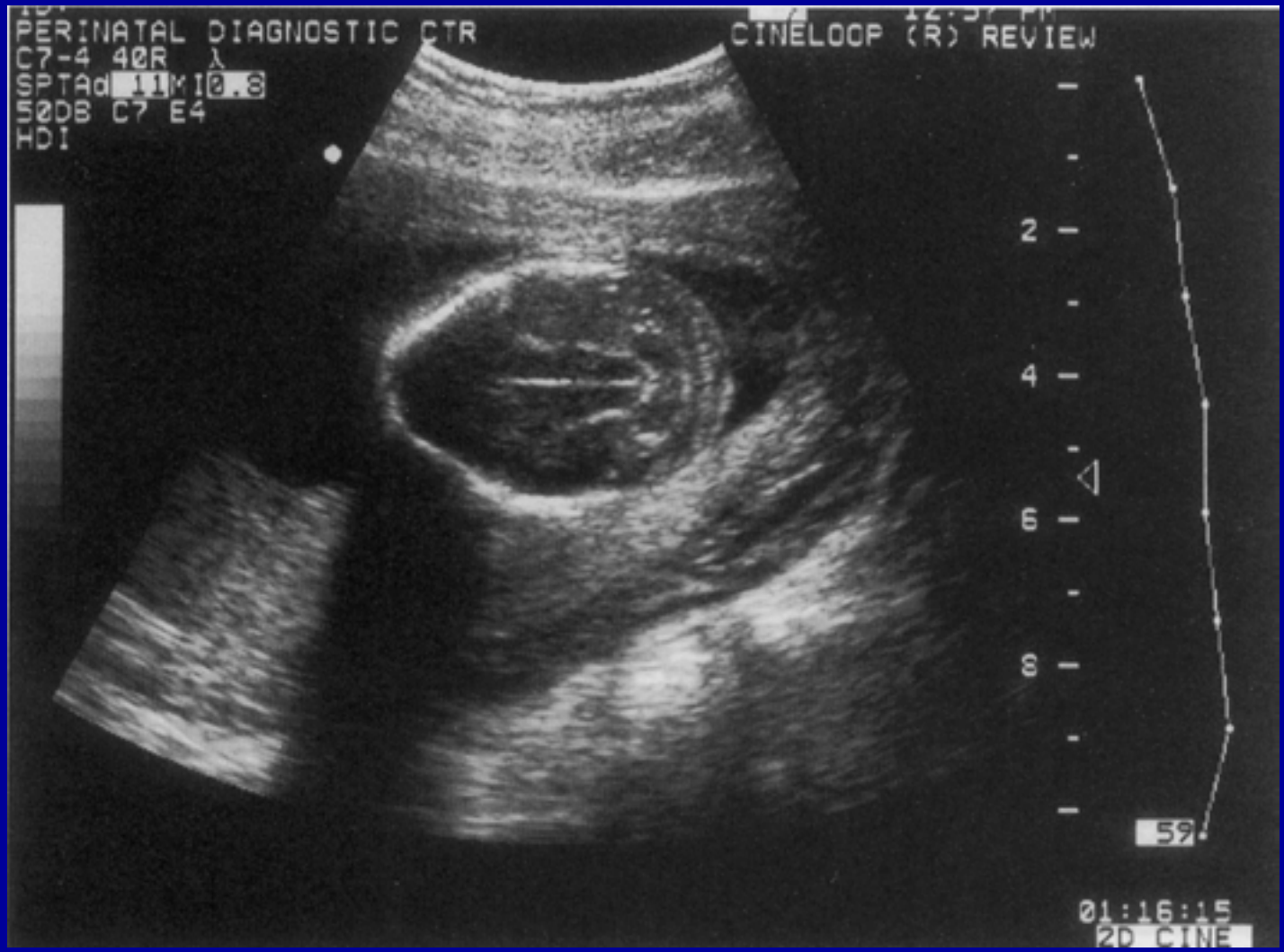

B

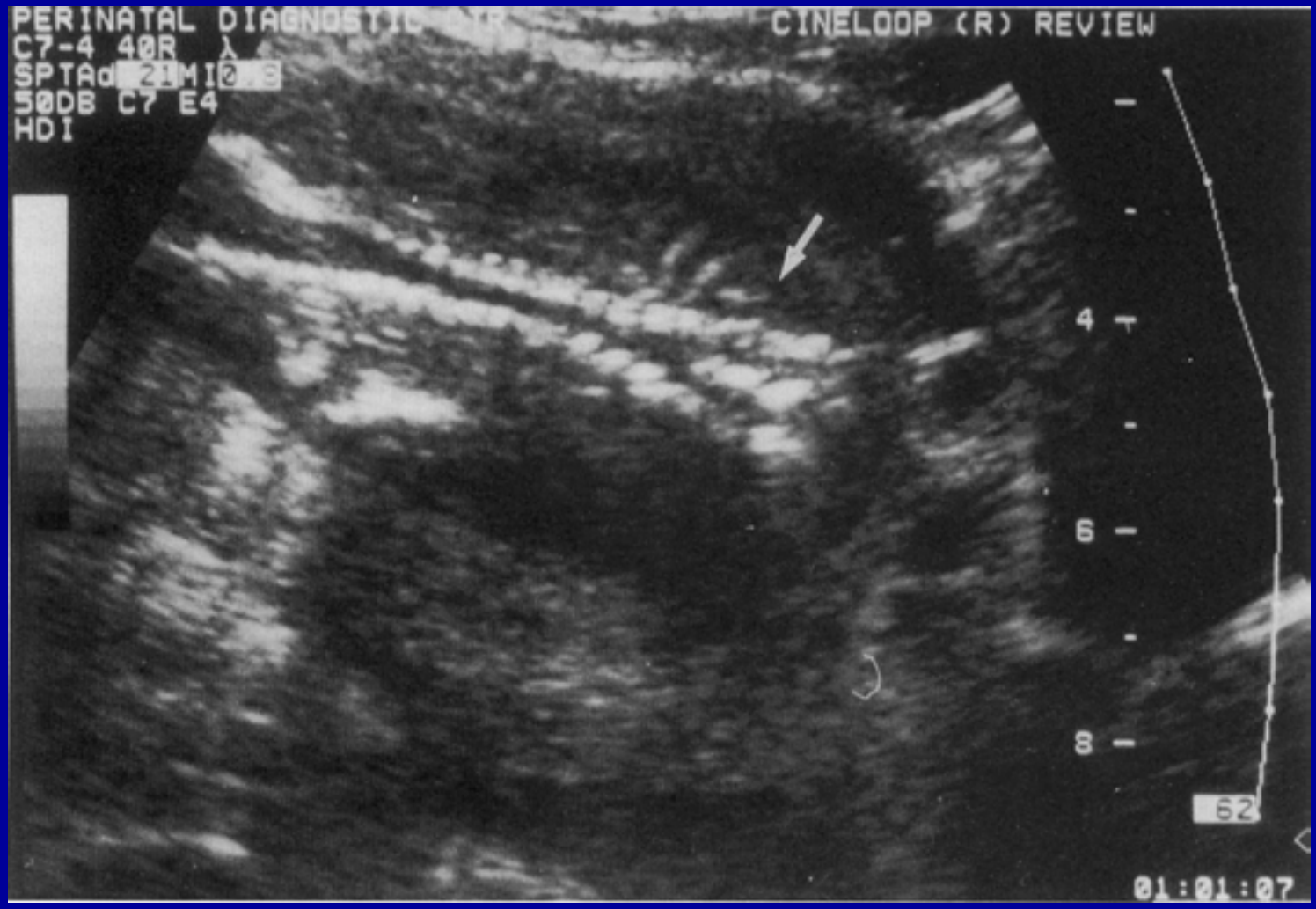


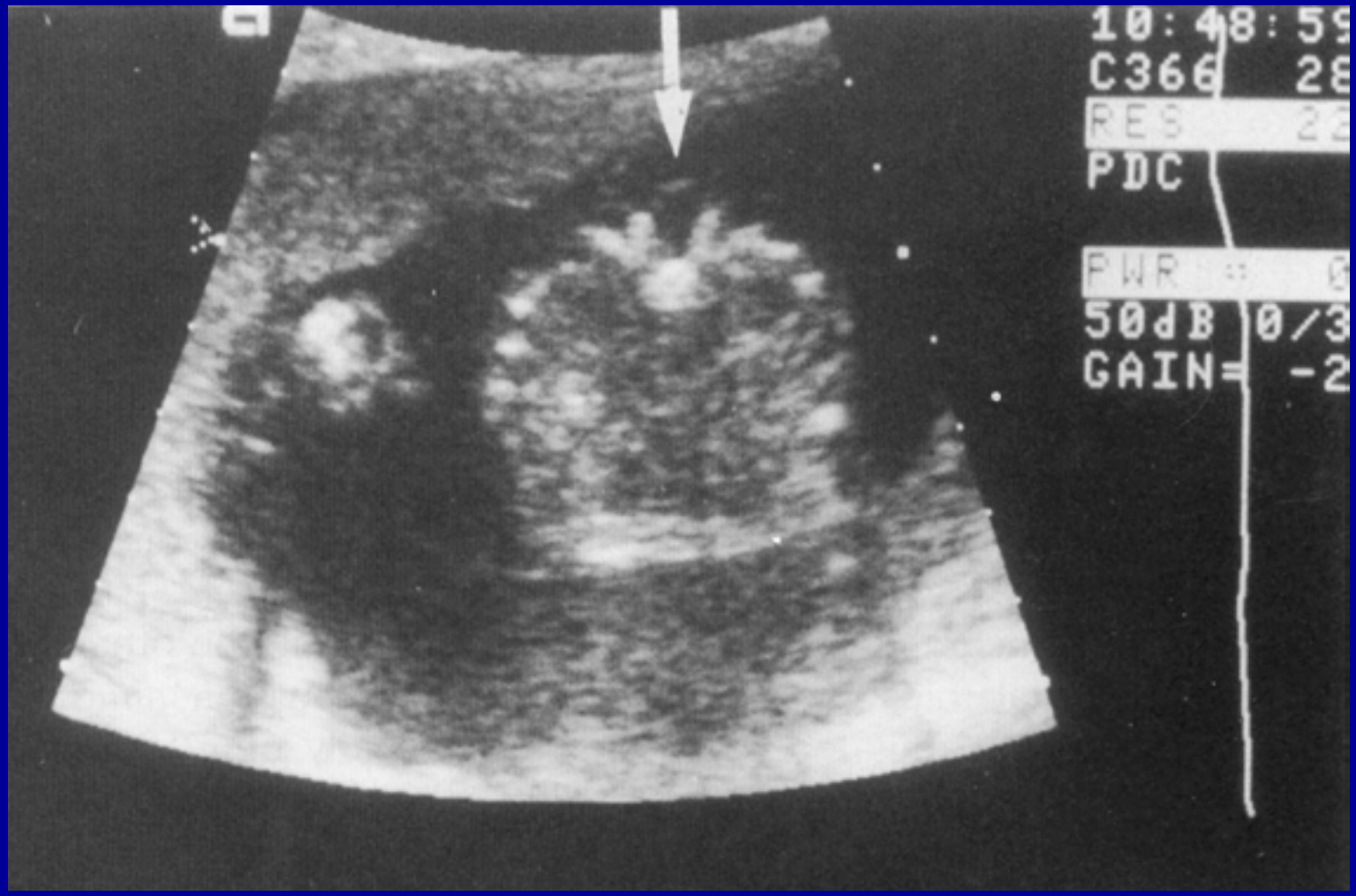


B **Meningohydroencephalocele**


3.5MH
PDC
PWR
A


PERINATAL DIAGNOSTIC CTR
C7-4 40R λ
SPTAd 11 MI 0.8
50DB C7 E4
HDI
CINELOOP (R) REVIEW
2
4
6
8
59
01:16:15
2D CINE


PERINATAL DIAGNOSTIC
CINELOOP (R) REVIEW
C7-4 40R
SPTAd 21 MI 0.8
50DB C7 E4
HDI
4
6
8
62
01:01:07


10:48:59
C366 28
RES 22
PDC
PWR
50dB 0/3
GAIN= -2

Summary

- Generally not genetic
- Recurrence risk is elevated over background but still low
- Prenatal detection is excellent but some cases can present a big counseling challenge.