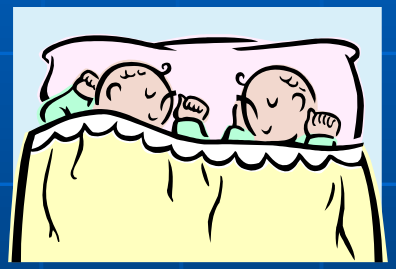
Twin Pregnancies and Complications of Monochorionic twins



Michael C Gordon
Intermountain Health
St Vincent Hospital

Case presentation

- IVF pregnancy: Diagnosed with twins
  - No Chorionicity done
  - “Too hard”, “we put back 2 eggs”
- Goes to the University initially
  - “sees full professor”
  - Diagnosed at 14 weeks Di/Di
  - 2 separate placentas, no comment on membrane
  - “no need to worry about TTTS”

Sees me at 16 weeks

- I see a thin membrane and I see one placenta with thin connection in corner of placenta
- " I went to the University"
- " they put back 2 eggs"
- I see: same sex, thin membrane, one placenta
- ??? Does it really matter. He was a full professor

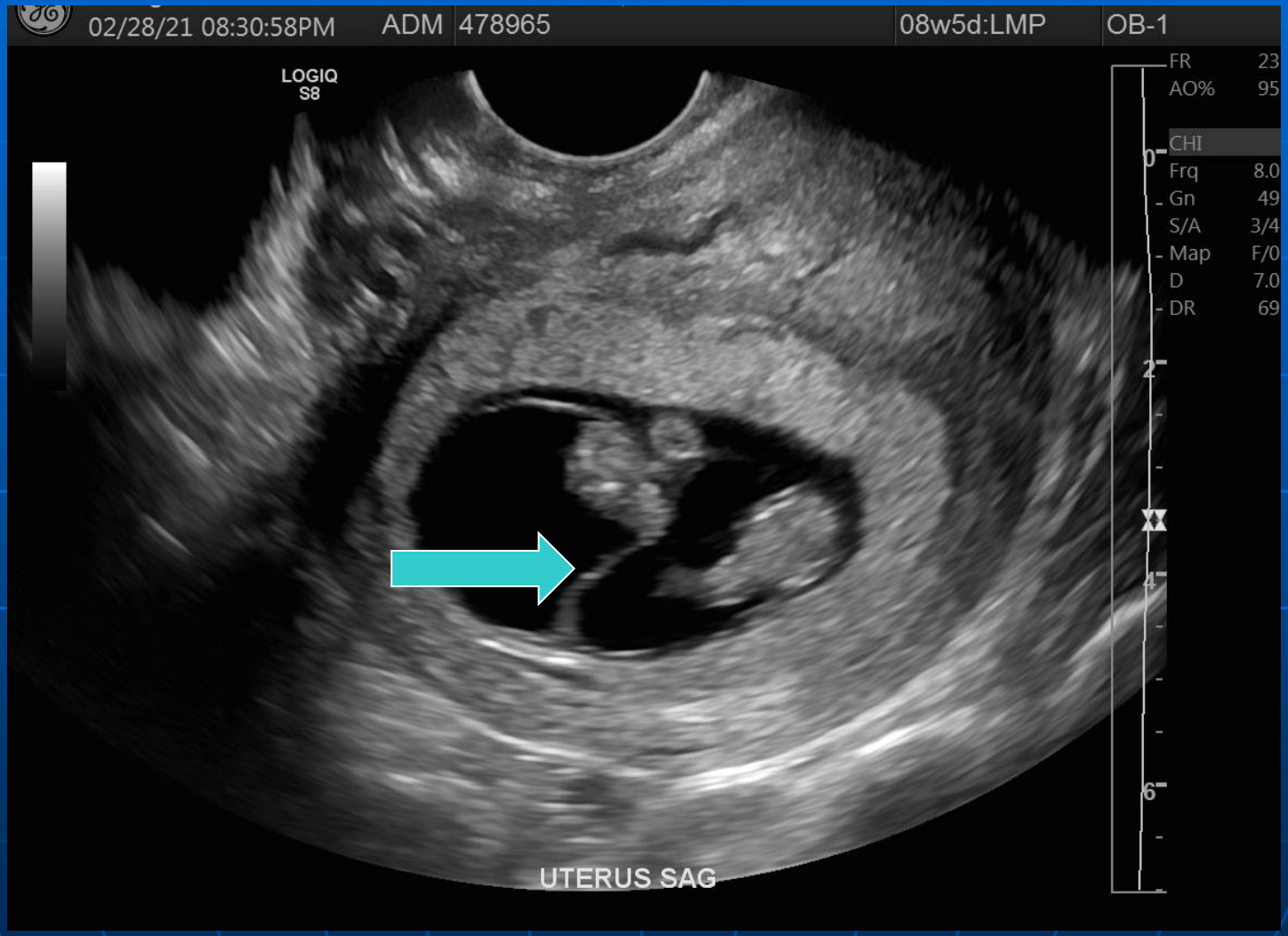
6C2
H5.0MHz
140mm
OB
DR GORDON
80dB
S1/+1/3/ 4
Gain=
4dB
Δ=3
Store in progress

What do I need to do

- Any ideas:
- I am pretty confident, Pt is not
- I call REI doctor: Unwilling to make a call

- I show up at his office and ask to see images.
- “is it that important? Or did I simply what to proof I was correct ?”

These are 100% Mono/Di twins



Background

- Incidence of twin pregnancies is increasing: 3% of all deliveries
- 25% ↑ in twins over last 10 years
- ↑ in Perinatal Morbidity & Mortality
- RR of PTD < 35 wks is 7-10 fold higher vs Singletons
- ↑ in Maternal Morbidity

It is that important

- Followed twins closely
- Diagnosed stage 3 twin to twin transfusion at 22-24 wks
- Sent for laser and 2 healthy twins
- Would have never looked if not suspicious.
- IT IS THAT IMPORTANT

Background

- Spontaneous rate of twinning in the U.S. is 1/80
  - 1/100 Dizygotic, 1/330 Monozygotic
  - Approx 75% Dizygotic
  - Risk of Dizygotic is population dependent
- Rate of twinning increased by:
  - Infertility treatment (account for 50% of twins)
  - Maternal age
  - Maternal height/weight
  - Family history

Are they identical?

- Placentation ≠ Zygosity
  - Dichorionic diamniotic twins: (75% of twins)
    - Same sex : either mono or dizygotic (identical of not)
    - Different sex: dizygotic (not identical)
  - Monochorionic diamniotic twins: monozygotic
  - Monochorionic monoamniotic twins: monozygotic (1% of twins)
- Determination of zygosity is unimportant
- Determination of placentation is important!!

Determination of Placentation in Monozygotic Twins

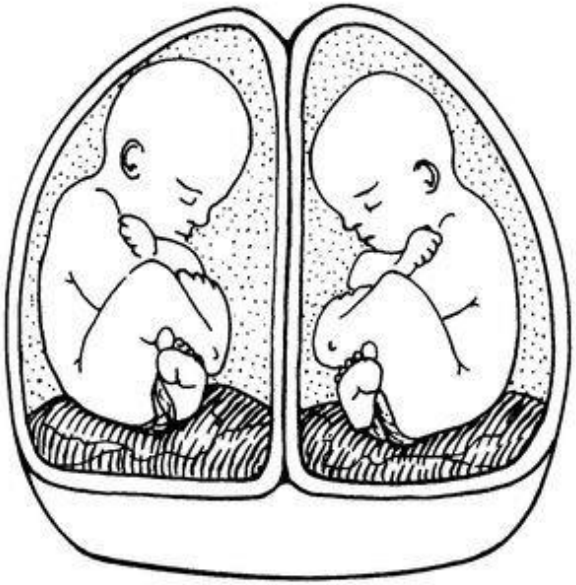
Type of monozygotic twin	Time of division into twins from fertilisation	Percentage of all twin pregnancies surviving to birth
Dichorionic diamniotic	0–3 days	25–30%
Monochorionic diamniotic	4–7 days	70–75%
Monochorionic monoamniotic	Up to 14 days	1–2%

Table 1: **Subtypes of monozygotic twins according to placentation**

After 14 days: Conjoined twins

Monochorionic/Monoamniotic

Monochorionic/Diamniotic



Dichorionic/Diamniotic
(Fused Placenta)

Dichorionic/Diamniotic
(Separate Placenta)

Determination of Placentation

- Important to determine – higher perinatal morbidity and mortality with MC twins
  - ↑ risk of Miscarriage/IUFD/IUGR
  - Specific syndromes unique to monochorionic
  - ↑ risk of malformations
  - ↑ risk of neonatal M & M
- Affects management decisions
- Best determination is made in 1st trimester (NOT BY MFM @ 18 WKS)
- Sono exam must include a effort to determine this

Determination of Placentation

- Fetal sex
- Twin peak sign / Lambda sign
- Number of placentas

BEST Method

- Presence and thickness of membrane
  - With increasing EGA membrane becomes thinner in DC twins
  - Measure thickness with membrane horizontal
  - Thin defined as < 2 mm
- Number of membrane layers seen: Worst Method

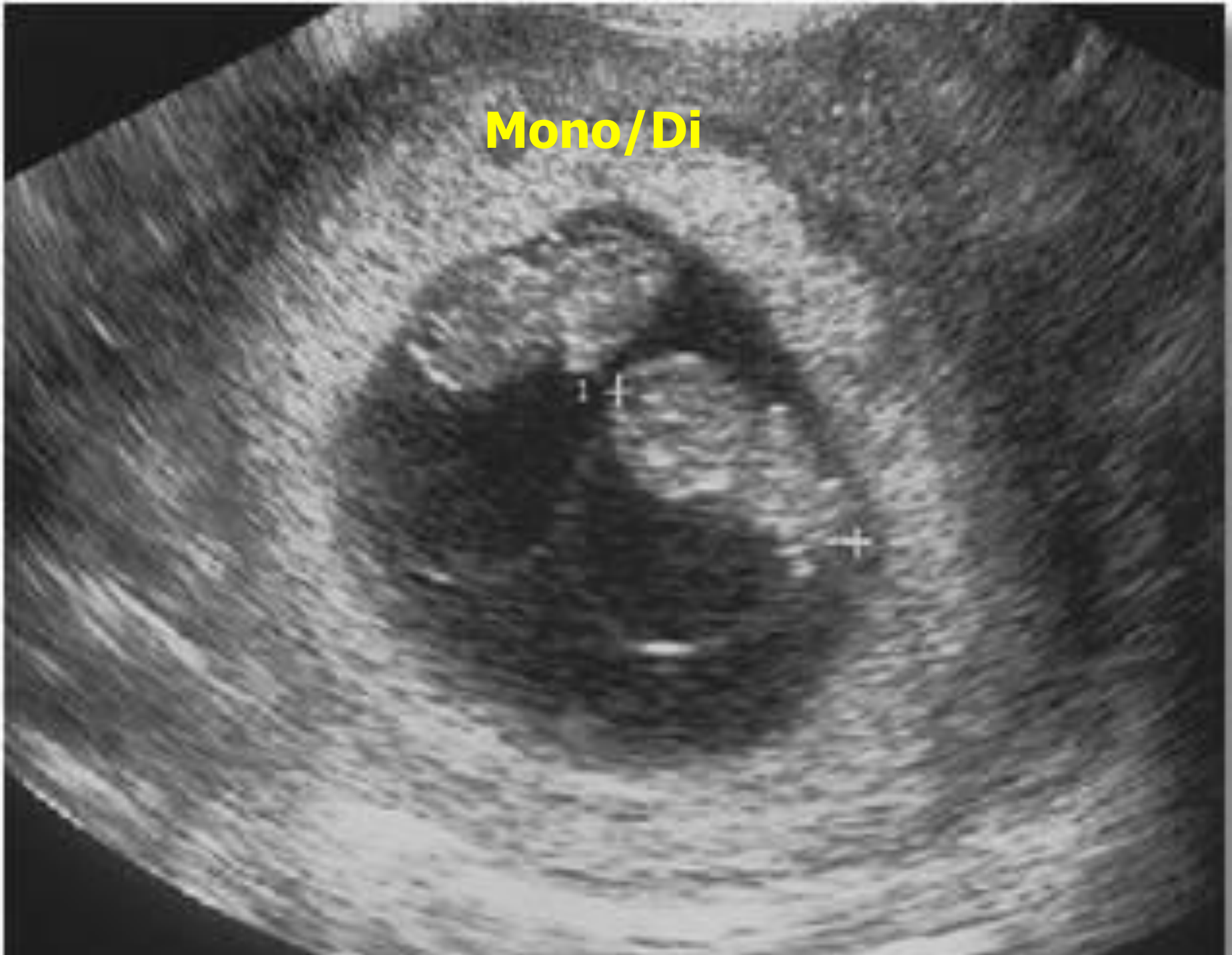
First trimester Dx of Placentation

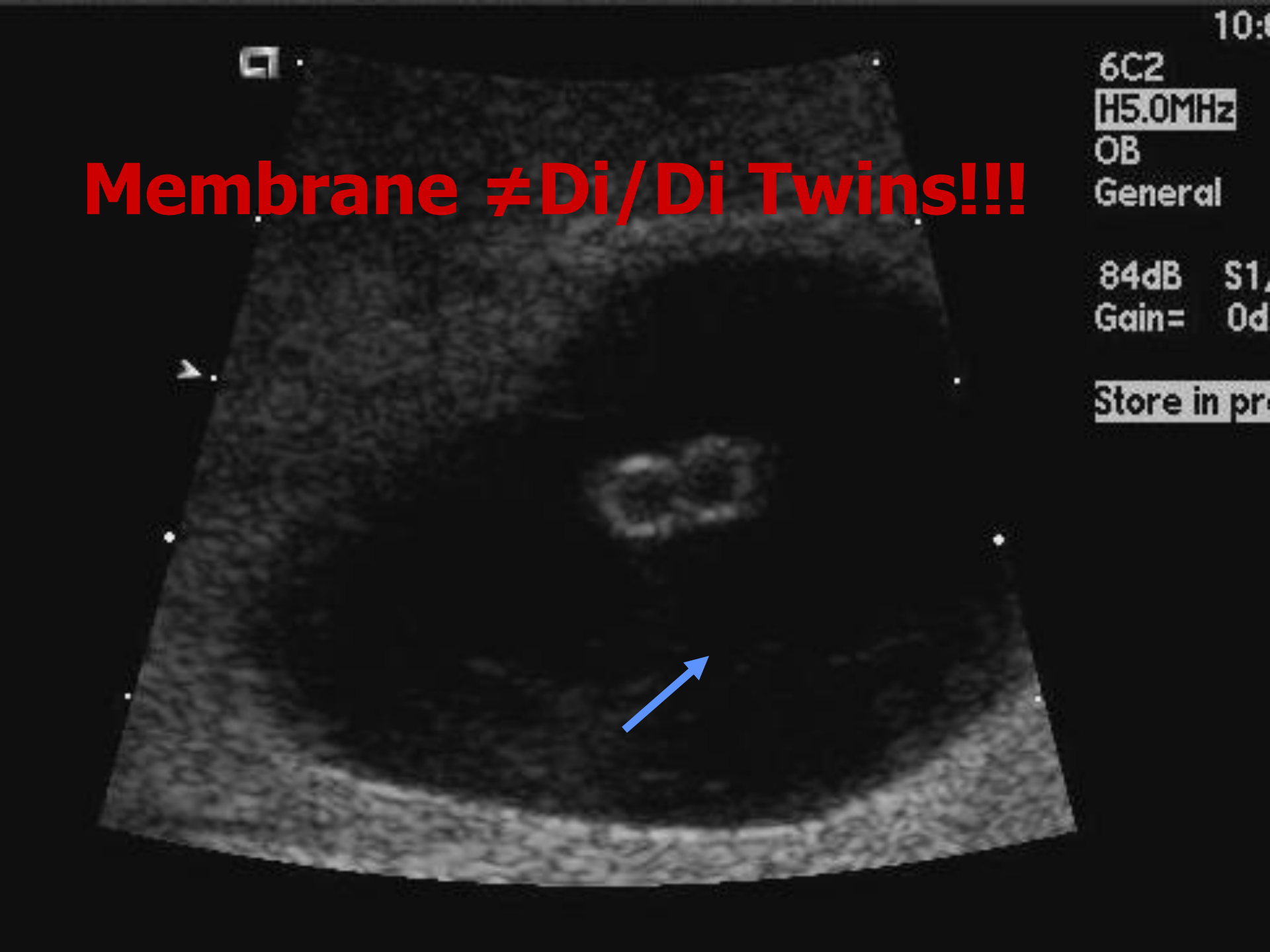
- Can make accurate diagnosis in 1st trimester after 7 weeks EGA
- 2 sacs = DC/DA
- 1 sac with membrane = MC/DA
- No membrane after 7 weeks EGA = MC/MA
- 2 yolk sacs = DA
- 100 % accuracy in 179 twin sets

Hill, J Clin U/S 1996;24:305

DA/DC twins at 6 wks

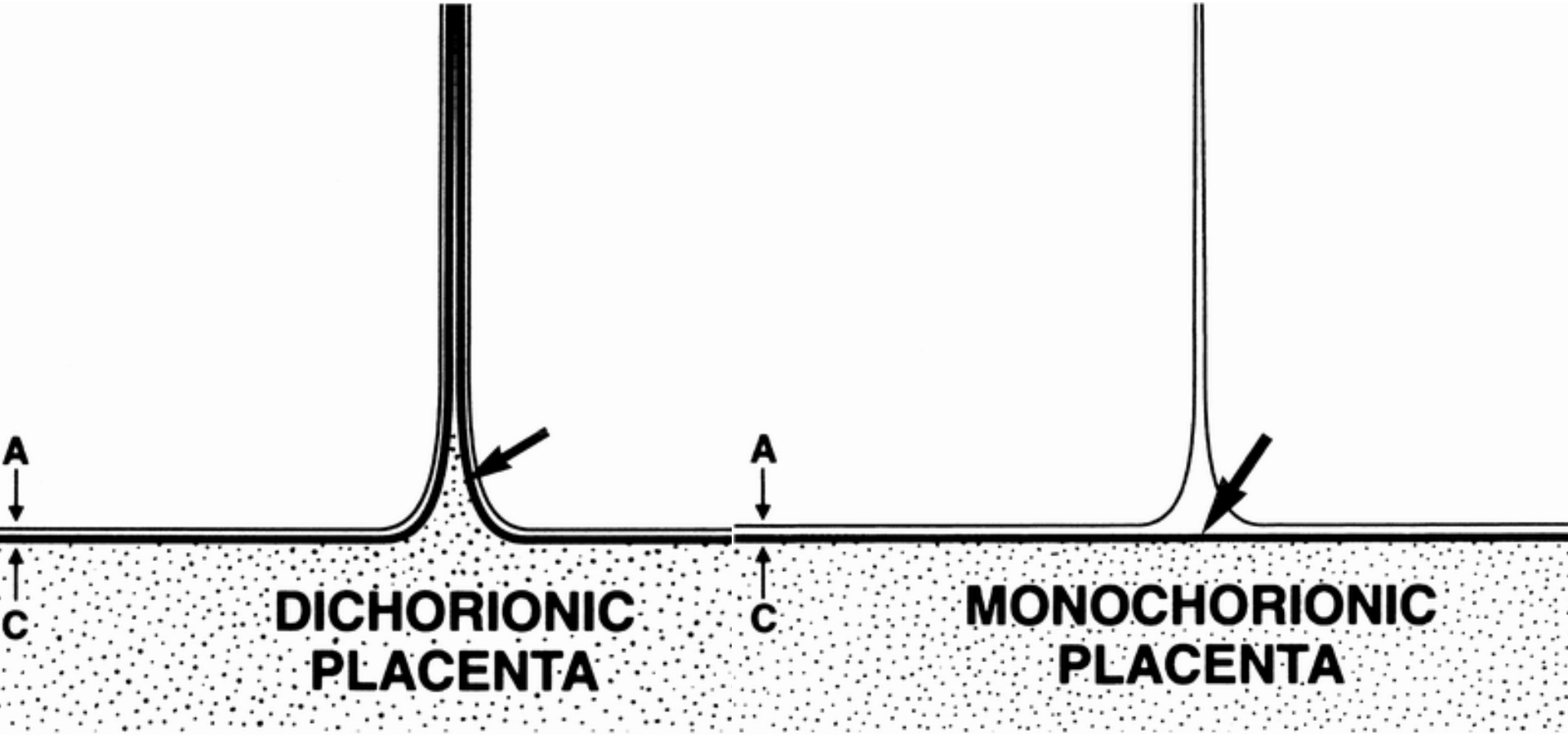
DA/DC twins at 10 wks


Mono/Di

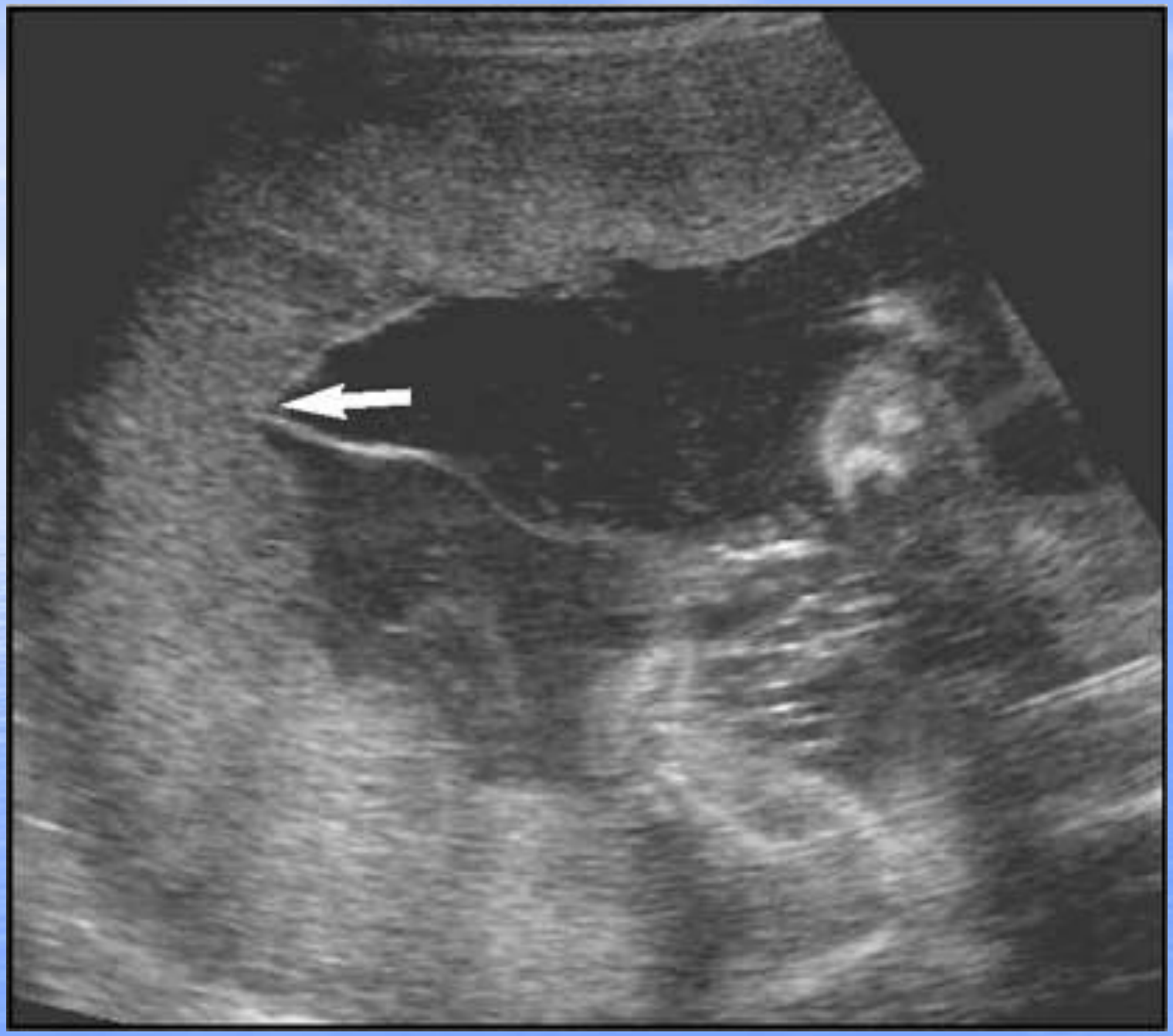

Membrane ≠Di/Di Twins!!!
6C2
H5.0MHz
OB
General
84dB
Gain=
Store in

Twin peak sign

- Refers to triangular projection of placental tissue between membranes
- Forms when 2 separate placentas grow together and appeared fused
- Used only when only 1 placenta seen
- Most accurate predictor of placentation in same sex twins
- Best < 14 weeks EGA


A
C
DICHORIONIC
PLACENTA
A
C
MONOCHORIONIC
PLACENTA

Twin Peak Sign



Antenatal prediction of placentation using twin peak sign and # of placentas

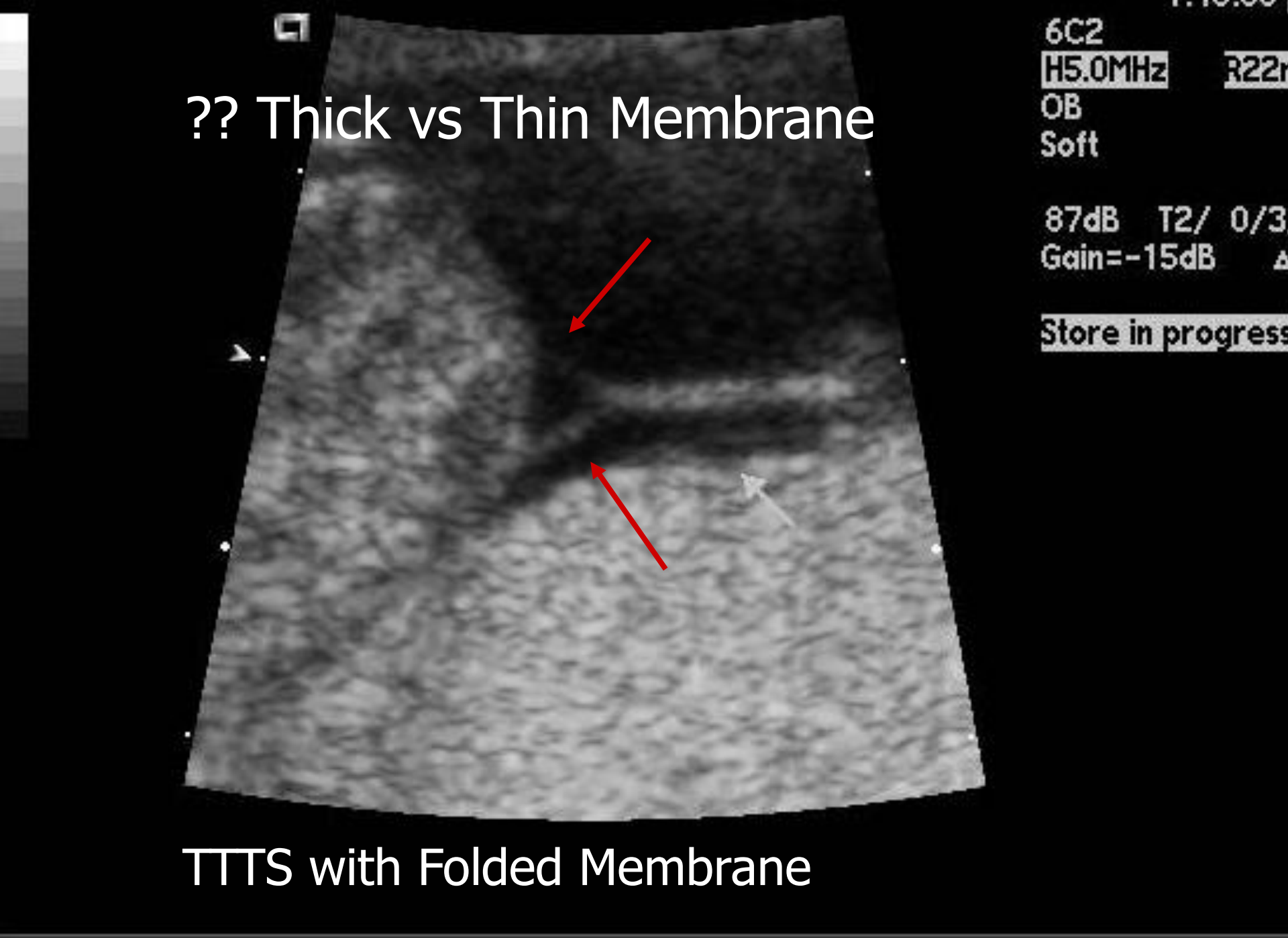
Antenatal prediction of monochorionicity

	Sensitivity	Specificity	PPV	NPV
Overall	91%	96%	89%	97%
<14 wks EGA	100%	99%	95%	100%

Stenhouse, Ultrasound Ob/Gyn 2002;19:350

Thin Membrane
6C2
H5.0MHz
140mm
OB
DR GORDON
80dB
S1/+1/3/4
Gain=
4dB
Δ=3
Store in progress

Thick Membrane



TTTS with Folded Membrane

Perinatal Complications

- Prematurity
- Fetal growth restriction
- Fetal losses (Sab's and IUFD)
- Maternal Complications
- Malformations
- Monochorionic complications

Outcomes of Twin Pregnancies @ 1 yr with delivery > 20 wks (n=150,000+)

- 2 surviving infants – 93.7%
- 1 surviving infant, 1 infant death – 2.3%
- 2 infant deaths – 1.5%
- 1 IUFD, 1 surviving infant – 1.1%
- 2 IUFD's – 1.1%
- 1 IUFD, 1 infant death – 0.4%

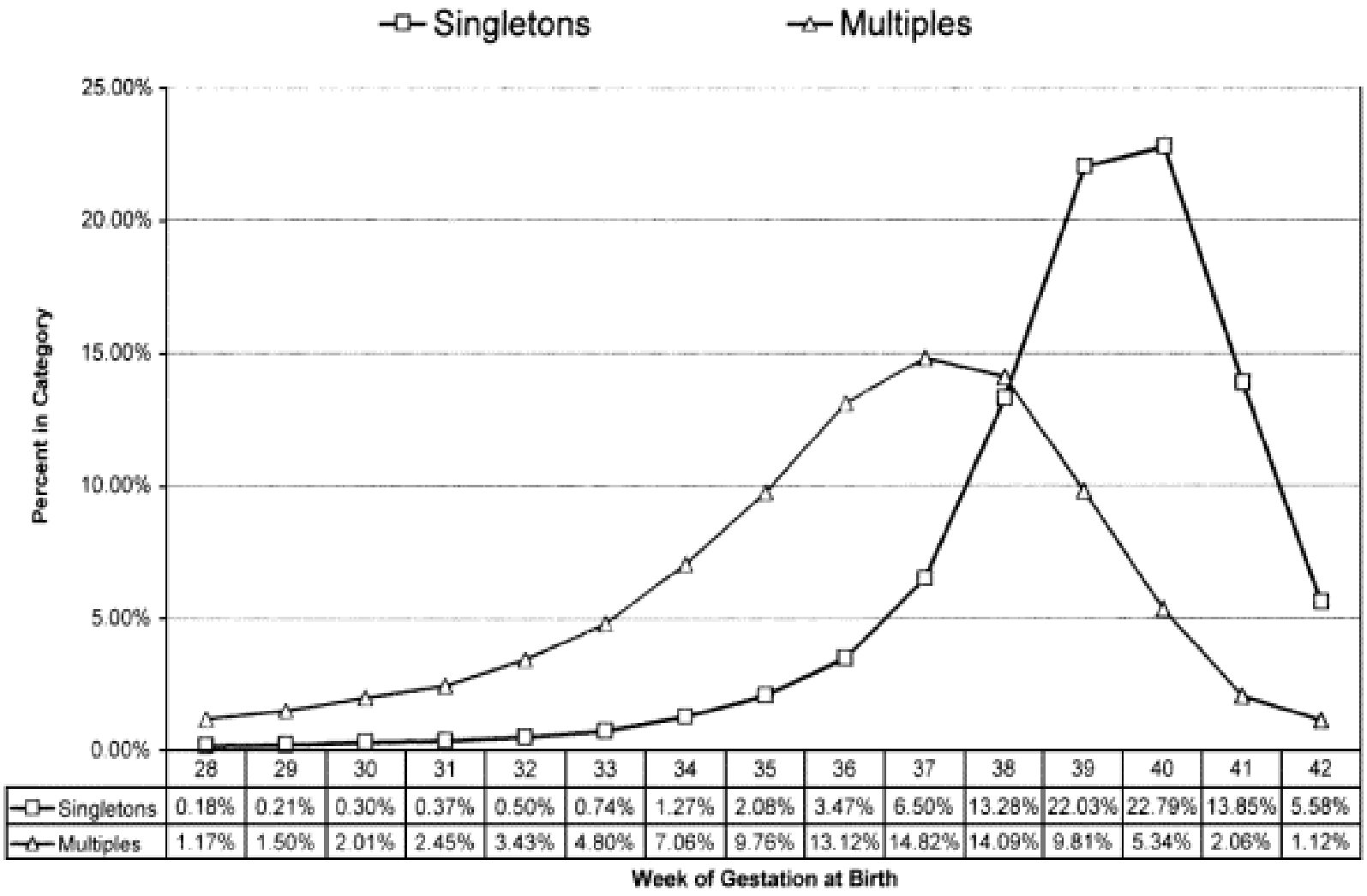
Data obtained from US registry 1995-97

Johnson; Ob & Gyn 2002;99:698

Background

- Mean EGA at delivery
  - Singletons: 280 days (40 weeks)
  - Twins: 250 days (35.7 weeks)
- Incidence of PTD before 34 weeks: 15-20%
- Causes preterm deliveries in twins
  - 50% PTL
  - 21% PPROM
  - 25% Indicated (Pre E, IUGR, etc)

(N=12,324,525 Live Births)



	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Singletons	0.18%	0.21%	0.30%	0.37%	0.50%	0.74%	1.27%	2.08%	3.47%	6.50%	13.28%	22.03%	22.79%	13.85%	5.58%
Multiples	1.17%	1.50%	2.01%	2.45%	3.43%	4.80%	7.06%	9.76%	13.12%	14.82%	14.09%	9.81%	5.34%	2.06%	1.12%

Week of Gestation at Birth

NOTE: Row totals do not add to 100% because births under 28 weeks and over 42 weeks of gestation have been excluded.

Perinatal Loss

- Twins have higher risk of Sab's and IUFD
- 5-10% loss of entire pregnancy if Dx in 1st trimester
- MC twins have highest risk of Sab's & IUFD
  - TTTS
  - MC/MA (PNM of 30-70%)
- If IUFD occurs then MC twins have increased risk of PNM &M
  - Minimal risk to DC twins

Hall; Lancet 2003;363:735

Early fetal losses

- "Vanishing twin" rate in IVF twins from 1st trimester until 20 wks (n=151)
  - 20% spontaneous reduction to singleton
  - 4.6% loss of entire pregnancy
- Risk of loss between 10-24 weeks
  - MC: 12% (r/o TRAP)
  - DC: 2%
- Increased risk of Sab to "survivor"
- No risk of Neonatal injury if <18 wks

Seoud; Fert Steril 1992;57:825

Sebire; Br J Ob/Gyn 1997;104:1203

Mortality of MC twins
(scanned at 10-14 weeks)

	DC	MC
n	354	102
≥ 1 loss (SAB,IUFD or NND)	5.4%	17.6%*
Loss < 24 wks	1.8%	12.2%*
PNM ≥ 24 weeks	1.6%	2.8%
BW < 5% (both)	1.7%	7.5%*
Discordance > 25%	12.1%	11.3%

Sebire; Br J Ob/Gyn 1997;104:1203

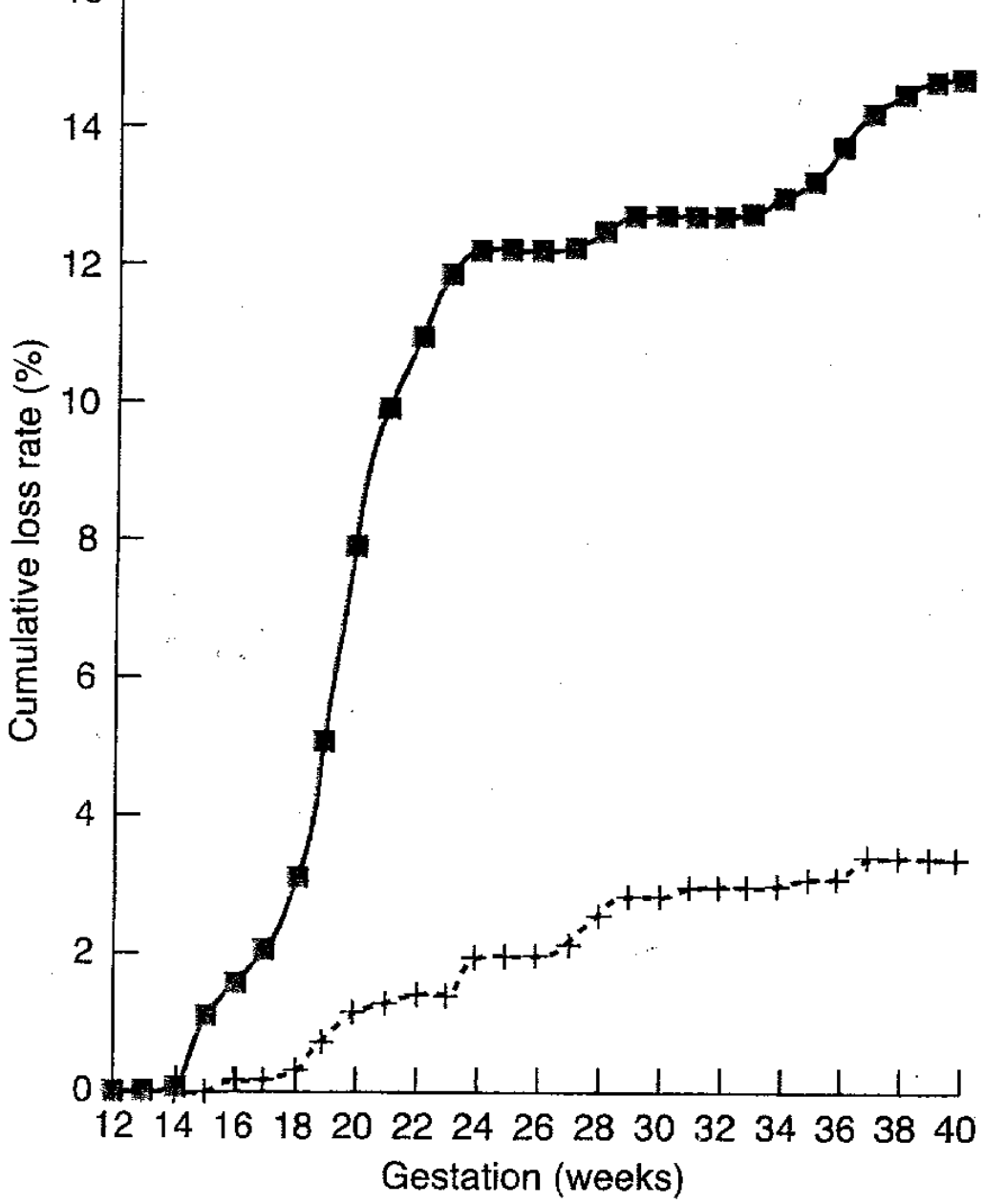


Fig. 1. Cumulative fetal loss rates in monochorionic (■), and dichorionic (+) twin pregnancies from 12 weeks of gestation.

IUFD risk in twins

- Risk for IUFD after 24 weeks
  - Singleton: 2.8/1000 vs
  - Twins: 9.2/1000*
- Risk of IUFD in MC/DA ≈ DC/DA after 24 wks if no IUGR/TTTS
- Risk of IUFD of twins @ 36-37 wks EGA ≈ risk of singleton @ 41 wks
- Risk of IUFD of twin = NND risk @ 39 wks
- ? Risk in MC/MA after 32 wks

Kahn; Ob & Gyn 2003;102:685

Complications of IUFD to survivor

- Complicates 2-6% of twin pregnancies
- Minimal risk in DC pregnancies (prematurity)
- Minimal risk of maternal DiC
- In MC pregnancies $\Rightarrow$ high risk
  - 119 pregnancies, 1985-95
  - 68 healthy survivors (57%)
  - 11 IUFD's (9%)
  - 12 NND (10%)
  - 28 severe sequelae (24%)
- Damage to co-twin @ time of demise

Complications of IUFD to survivor

- Damage due to vascular anastomosis found in 85-100% of MC
  - Earliest report of injury @ 18 wks
  - Damage to CNS, kidneys, GI tract, limbs,adrenals, liver/lung
  - Causes high risk of CP
- Risk of survival better with later IUFD
- Immediate delivery after IUFD when premature not indicated

Fetal Malformations

- "Monozygotic twinning seems to represent an anomaly itself"
- See 2-3 fold ⇑ in malformations in monozygotic twins (≈ 10%)
  - CHD, NTD's, disruptions (limbs, face)
  - Usually discordant for lethal anomalies
- Can see deformations (clubbing) due to crowding
- ?? ⇑ in malformations in IVF
- ≈ double the risk of aneuploidy (AMA = 33)
- This is the only time that Zygosity counts

Determination of chorionicity affects many decisions

- Management of
  - Anomalies
  - Aneuploidy
  - IUGR / discordance
  - Abnormal AFV
- Diagnosis and Rx of TTTS
- Management of MC/MA twin
- Management of pregnancy after IUFD
- Frequency of sono/appointments

Ascites of twin A

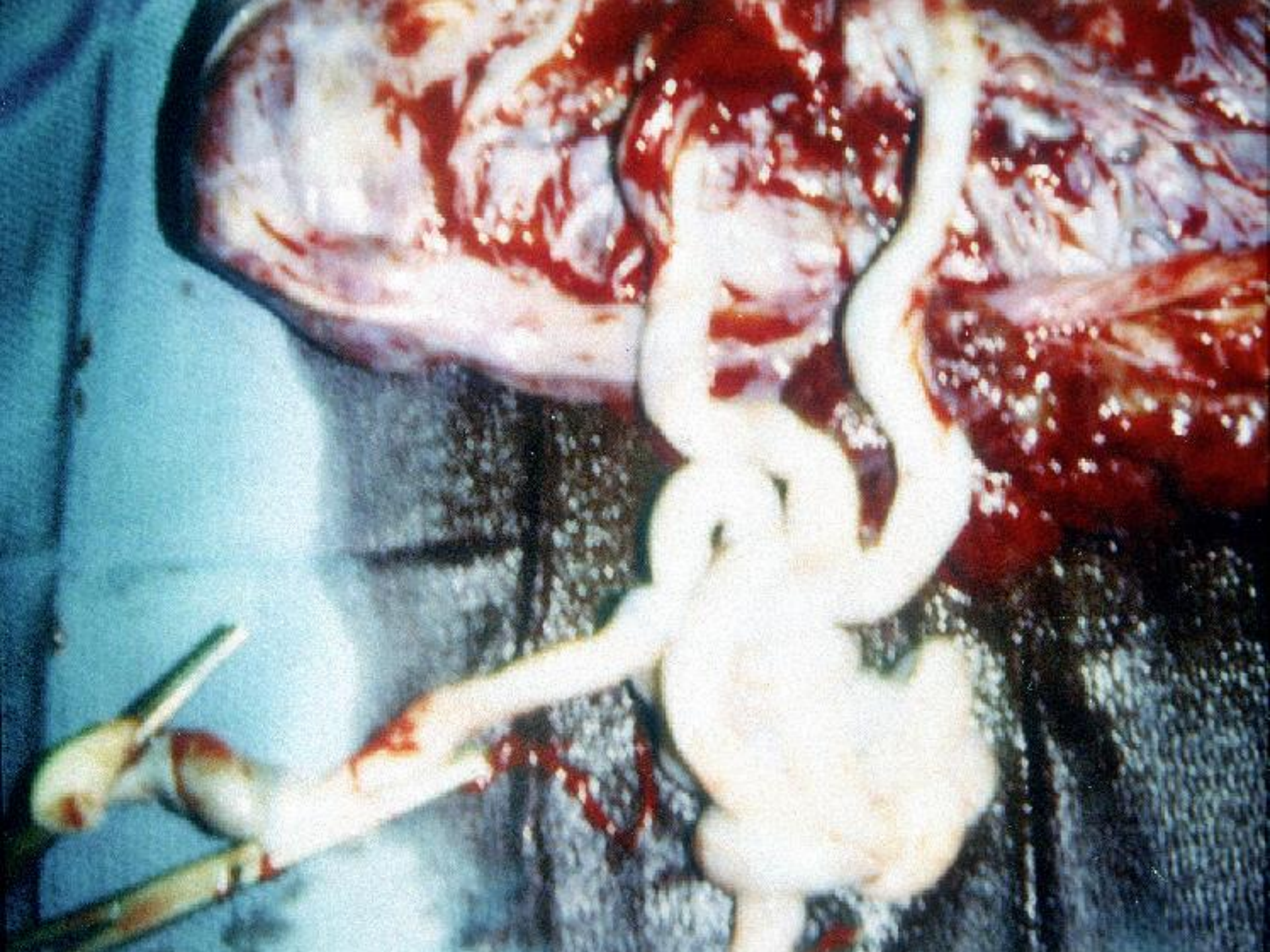
Trisomy 21

Abnormalities unique to MC twins

- Mono Mono twins: 70% with cord entanglement
- Twin-to-twin transfusion syndrome
  - 10-20% of MC twins
- TRAP sequence (Acardiac parabiotic twin)
  - 1/50,000 pregnancies
- TAPS seq: Twins Anemia Polycythemia Seq
- Conjoined Twins
  - 1/100,000 pregnancies

Monochorionic monoamniotic twins

- PNM of 30-70%
- Diagnosis
  - No membrane, tangled cords
  - 1st trimester: 1 yolk sac
  - CT amniography with injection of contrast
- Risks
  - PTD, TTTS, Cord accidents, anomalies



TRAP Sequence

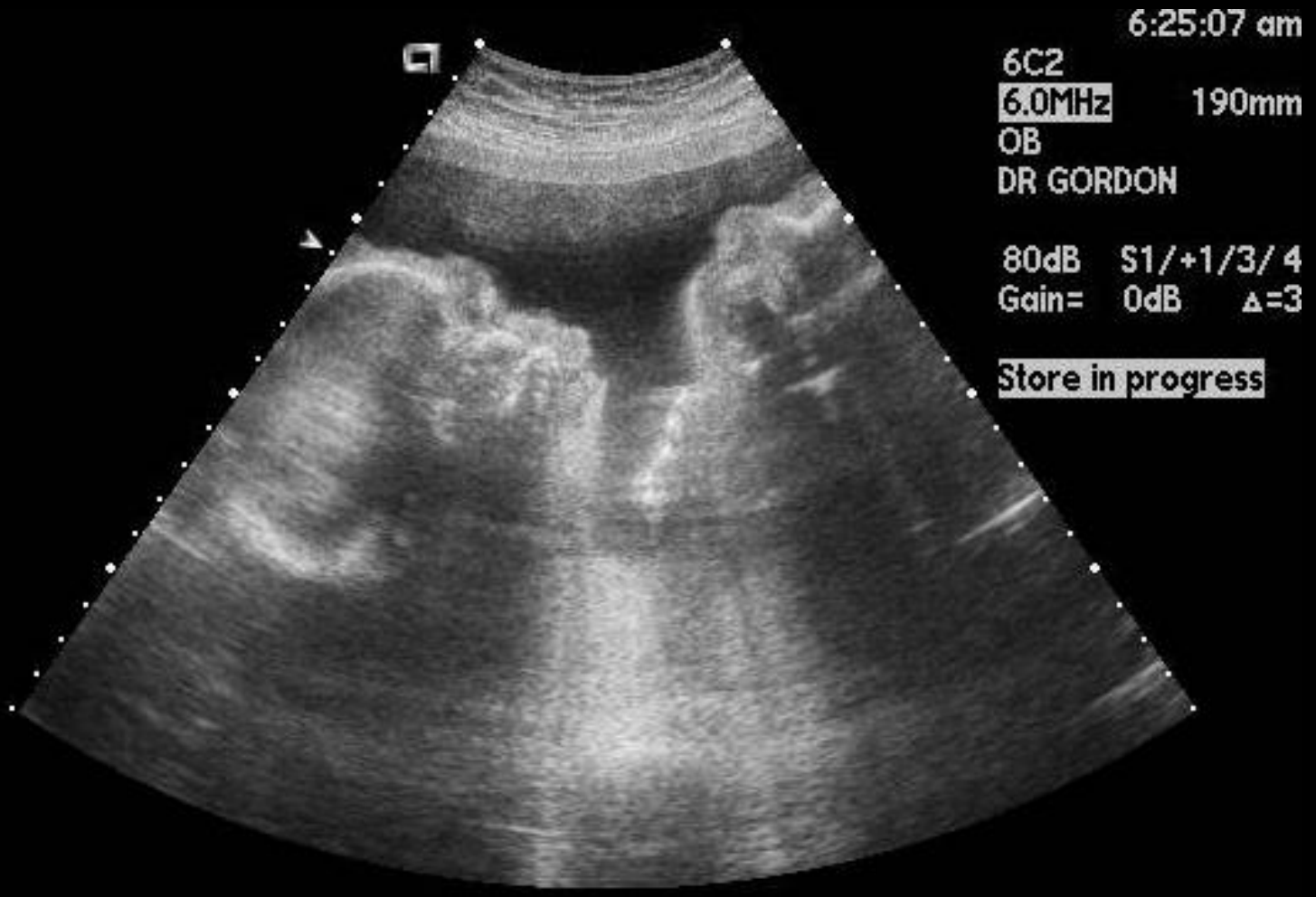
- Twin-reversed-arterial-perfusion sequence
- Usually MCDA, can be MCMA
- Need A-A and V-V anastomosis
- Can have anomalous hearts and severe microcephaly
- Dx: requires reversed arterial flow in direction of acardiac twin
  - Need to follow all early Sab's if MC

Figure 3: **Acardiac monster with normal monozygotic twin**

Conjoined Twins

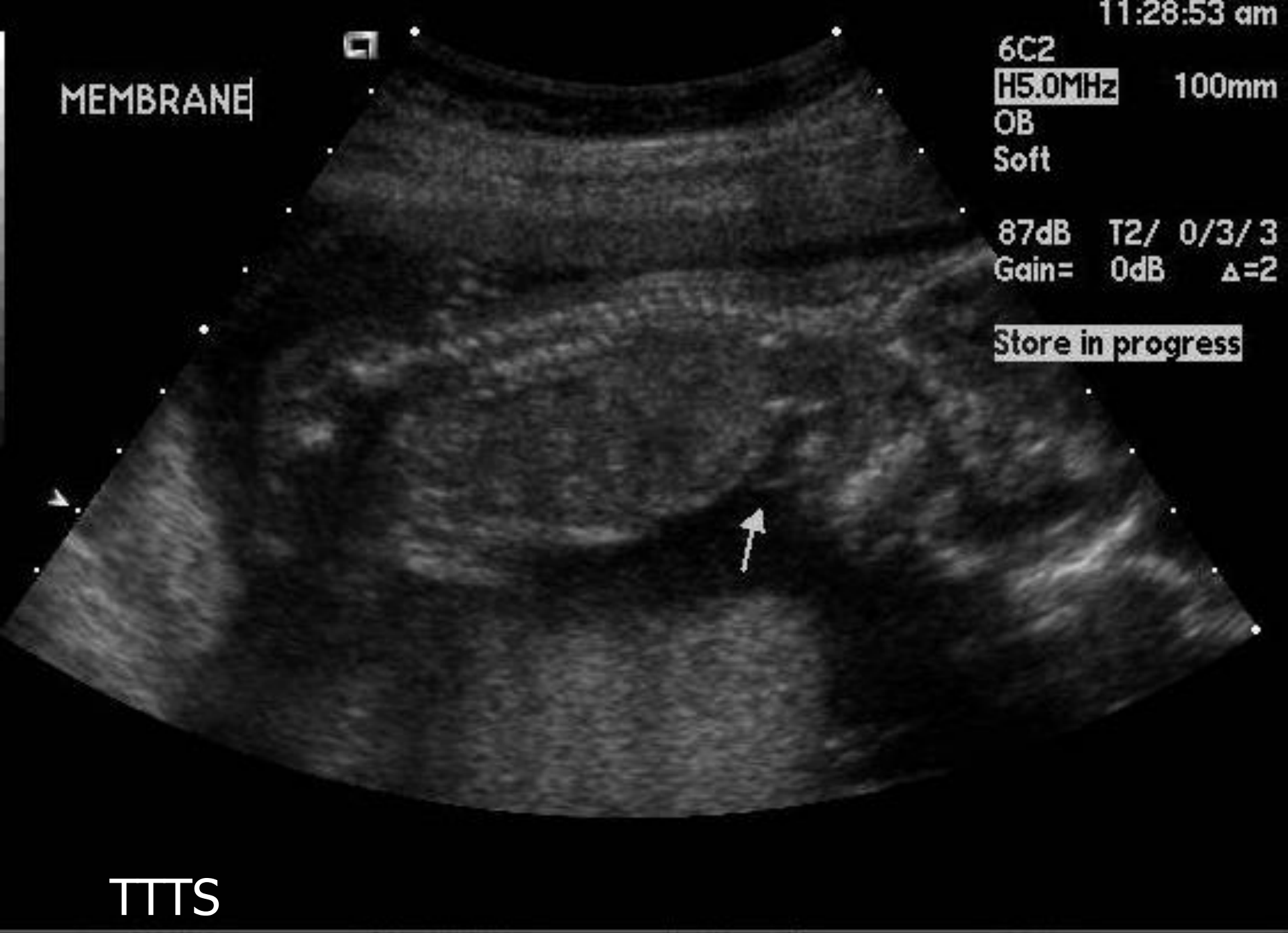
- Can offer early termination if early diagnosis
  - No membrane
  - Inability to Detect separate skin contour
  - Appearance of both heads persisting @ same level
  - No change in relative positions
  - Shared organs, Single UC > 3 vessels
- Shared heart = very poor prognosis

Conjoined twins: Thoracopagus



Twin-to-twin transfusion syndrome

- Placental anastomosis present in 85-100%
- Deep A-V connections are the problem
- Need to consider other etiologies
  - Velamentous cord insertion
- 90% mortality if untreated
- 65-85%% survival if treated
  - Amniocentesis
  - Laser coagulation
  - Septostomy
  - Ongoing trials



TTTS

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Predictors of TTTS

- MC twin: recommend Q 2 wk scans
- ⇑ nuchal translucency in 1st trimester sono
- Membrane folding at 15-17 wks EGA
  - 91% sensitivity, 43% PPV
- Velamentous cord insertion
  - 60% PPV of TTTS

Long-term outcomes in MC twins

- ⇑ poor outcome @ 1 year of life
  - MC: 9/88 (10%) Mainly due to TTTS
  - DC: 12/328 (3.7%)
- ⇑ risk of CP
  - 7-12/1000 twins vs 1-2/1000 singleton
- ⇑ abnormal newborn head sono's in preterm MC vs DC twins (23% vs 3%)

Management of twins : prenatal DX

- Determine chorionicity
- Use 1st nuchal translucency or genetic sono for aneuploidy screen
- Detailed anatomic survey (echo if monochorionic) By MFM
- Sono's Q 4 wks if DC, Q 2 if MC, weekly for concerns of TTTS
- Antepartum testing @ 32 wks
- Delivery at 38 weeks (36 for Mono/Di)

Summary of Care for Twin Pregnancy

- Educate your patient and your staff about risks
- Establish zygosity & chorionicity ASAP
- Monochorionic / Diamnionic
  - **↑ IUGR, Stillbirth, placental abnormalities, & TTTS**
- **Every Time you see a twin**
  - **WHAT IS THE CHORIONICITY"**

“Twins have intrigued civilizations across the centuries”

Questions?

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