Understanding ultrasound in the background of embryology

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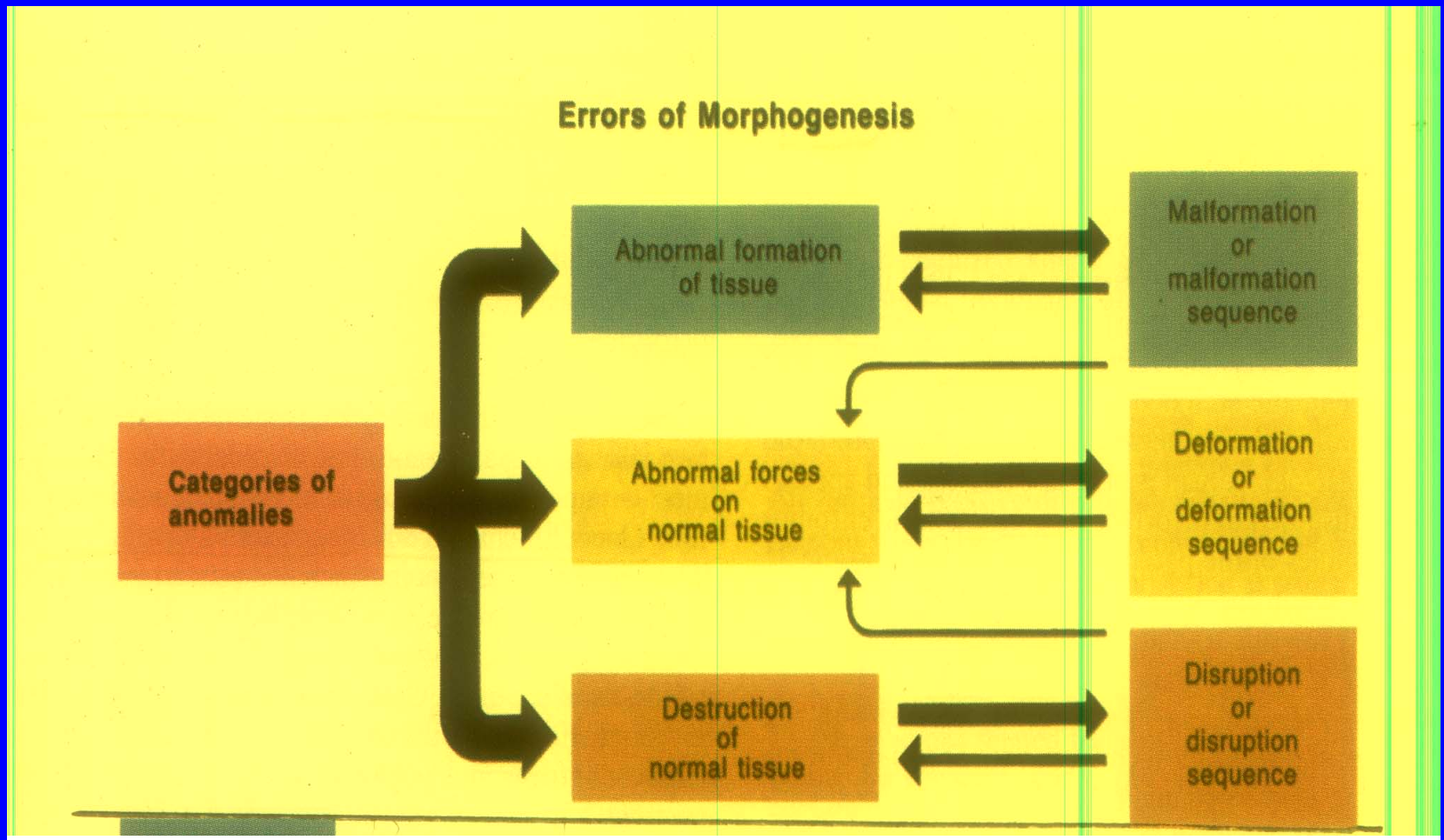
Sound knowledge of embryology

- Helps interpretation of gestational age
- Understanding of congenital anomalies
- Diagnosis of types of multiple pregnancy

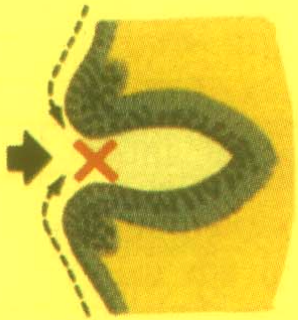

Errors of Morphogenesis
Categories of anomalies
Abnormal formation of tissue
Abnormal forces on normal tissue
Destruction of normal tissue
Malformation or malformation sequence
Deformation or deformation sequence
Disruption or disruption sequence

Malformation

Etiology

- Chromosomal
- Genetic
- Teratogenic
- Unknown

→ Morphogenic error → Developing structure → Primary structural defect



Failure of neural tube closure

Myelomeningocele (malformation)

Malformation. Primary structural defect resulting from error in tissue formation

Deformation

Etiology

Extrinsic (fetal constraint)

Intrinsic (fetal akinesia)

Abnormal force

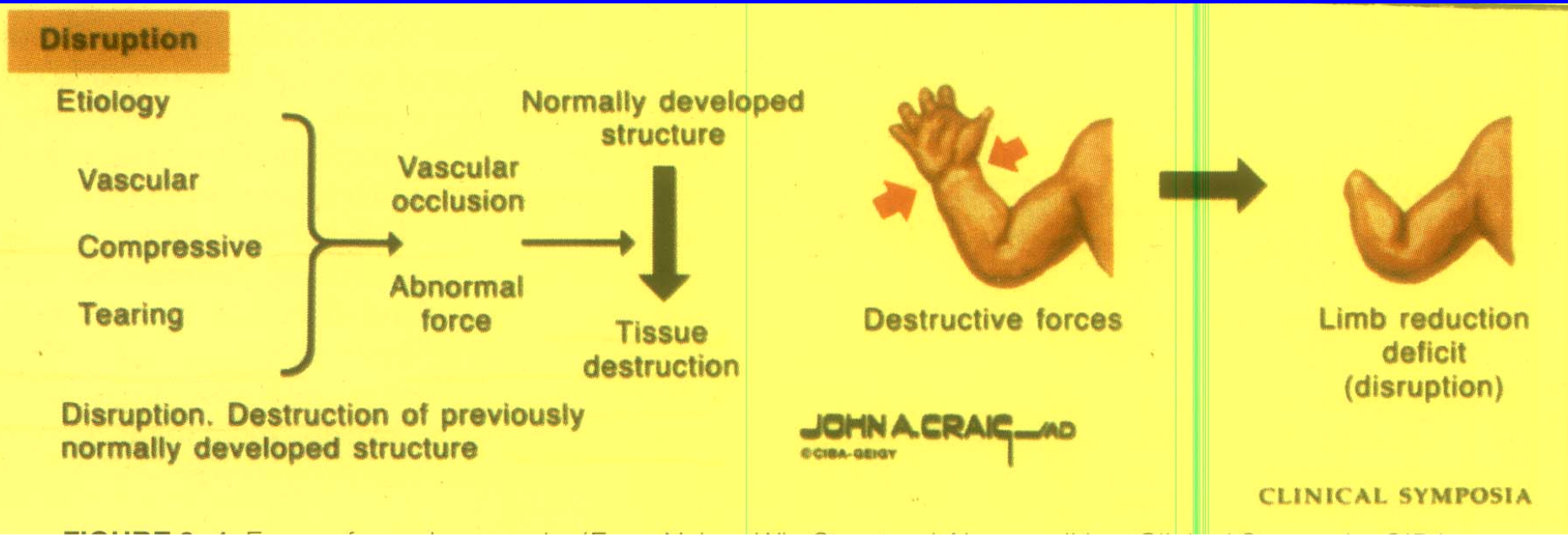
Normally developed structure

Altered structure or position

Deformation. Alteration in shape or position of normally developed structure

Intrauterine force

Clubfoot (deformation)


Disruption
Etiology
Vascular
Compressive
Tearing
Vascular occlusion
Abnormal force
Normally developed structure
Tissue destruction
Destructive forces
Limb reduction deficit (disruption)
Disruption. Destruction of previously normally developed structure
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CLINICAL SYMPOSIA

- On day 17 the notochordal process appears
- On day 19 the intra-embryonic mesoderm is formed
- The neural groove is seen on the 21 day
- On day 15 the primitive steak appears
- Closure of the neural tube is seen on the 23 day

An ectopic pregnancy can present before the missed period

Window period between +ve urine pregnancy test and appearance of Intrauterine gestational sac is 8 days

The characteristics of an intrauterine gestational sac helps distinguishing it from pseudosac

Identifying the gestational sac

Central fluid collection-chorionic cavity.

Surrounding echogenic rim

Chorionic villi & decidua

More echogenic than the myometrium

Intradecidual sign

Follow up the sac to see the yolk sac.

A gestational sac of 10 mm should show a yolk sac

A gestational sac of 15 mm should show an embryo with cardiac pulsations

In an embryo of 7-8 weeks rhombencephalon is cystic and should not be confused with the yolk sac when measuring CRL

At the time of the missed period the embryo will be in somite stage - teratogen exposure ,alcohol prophylactic folic acid

Embryology of twinning

2/3 Dizygotic

Each zygote develops embryologically similar to sigleton gestation

1/3 Monozygotic

Chorion differentiate at day 4

Amnion at day 8

25%- division prior to day 4 results in –dizygotic diamniotic

Division of inner cell mass- between day 4&8- monochorionic diamniotic- nearly 75%

Division after 8 days –monochorionic monoamniotic-1% of monozygotic twins

Division of the embryonic disc 13 days post fertilisation – conjoined twins.

Perinatal morbidity & mortality in monozygotic gestation

Structural defects 50% higher than dizygotic twins.

Structural defects in monozygotic twins

1. Lesions unique to monozygotic gestation-conjoined twins
   acardiac twins
   co-twin demise
   twin embolisation
2. Anomalies not unique to twinning but reported more often in twins
   -Neural tube defects,hydrocephalus congenital heart defects.
3. Congenital defects caused by constrictive and mechanical factors associated with twinning like congenital hip dislocation and clubfoot.

Concordance-when both twins have the same structural defects.
mono zygotic twins are concordant to fetal abnormalities in only about 15% of the cases.
concordance is even less common in dizygotic twins which have the same concordance in singleton siblings.

Ultra sound detection of chorionicity and amnionicity

- The perinatal mortality in monochorionic twins is high compared to dichorionic
- All twins should be carefully assessed with ultrasound to determine the chorionicity and amnionicity

1 trimester determination of chorionicity

Chorionicity most accurately determined in 1 trimester
Beyond 1 trimester accurate assessment of chorionicity and amnionicity may not be possible.

Chorionicity equals the number of gestational sacs.
Counting the number of gestational sacs –6 to 10 week-accurate methods of predicting chorionicity.sonography may undercount
The number of multi fetal gestations if scanned before 6 week in 15% of the cases.
Early sonography may undercount monochrionic twins also

Amnionicity

Dichorionicity implies Diamnionicity
Sonographically amnionicity can be assessed by 6 gestational week by counting the number of fetal cardiac pulsations in each gestational sac.

Identification of two gestational sacs with a single embryo in each sac confirms the gestation as dichorionic and diamniotic.

Identification of a single gestational sac containing two embryos can either be monochorionic diamniotic or monochorionic mono amniotic

Count the number of amnions

Amnions routinely becomes visible at 7 or 8 week gestation.

Visible only with TV probe.

When two separate amniotic cavities are identified in twin gestation –

Diamnionicity is confirmed.

What about the number of yolksacs?
The number of yolk sacs is a good proxy for the no: of amnions.
Sonography routinely identifies the yolk sac approximately 2 weeks earlier than the amnion.
Monochorionic with 2 yolksac –diamniotic.

Monochorionic diamniotic – 2 yolk sac.
Monochorionic monoamniotic – either a single or a divided yolksac

There is a theoretical situation of 2 yolk sacs in monoamniotic gestation but practically never seen.

Determination of chorionicity in II & III Trimester.

10 week the 2 amnions of the diamniotic twin gestation become opposed.

Composition of the membrane varies with chorionicity.

Two layers of amnion & chorion – D.D

Two layers of amnion & 1 chorion – M.D

Chorionicity no longer possible by counting the gestational sacs.

Determining chorionicity in II Trimester.

1. Fetal gender
2. No: of placenta.
3. Appearance of interfetal membrane.

No: of placenta

All dizygotic twins dichorionic

25% monozygotic will be dichorionic.

80% - All twins dichorionic.

Two separate placental masses – dichorionic.

When implantation is near each other – Single placenta.

So sonographic appearance of a single placenta does not differentiate between monochorionic & dizygotic gestation with 2 contigous placentas.

Interfetal dividing membrane in II & III Trimester.

Intertwin membrane not seen

1. Monoamniotic twin
2. Diamniotic with membrane difficult to visualize
3. Stuck twin.

Intertwin membrane thickness.

Subjective

No accepted definition of thickness(>2mm) or thinness(<1mm)

Not reliable after 26 weeks due to thinning of the membrane.

Twin Peak signs

Predicts dichorionicity.

Placenta will get fused in many dichorionic gestations.

The twin peak sign refers to the appearance of intertwin membrane at the junction with the placenta.

The twin peak is a triangular projection of trophoblastic tissue isoehoic with the placental surface into the intertwin membrane.

Single fetal demise

The death of one twin – increased morbidity and mortality in surviving twin.
Outcome worse for monochorionic than dichorionic
Major neurological and renal impairment

Possible explanations

When one twin dies – loss of circulatory equilibrium-
Acute twin twin transfusion from living to the deceased.
Anaemia ,hypotension undue perfusion of organs like brain and kidney.
Second mechanism production of thromboplastic elements in the deceased twin producing DIC which in monochorionic pregnancy will be transfused to the living twin through vascular anasthomoses.
In monochorionic or dichorionic maternal DIC can occur.

The Right Remedy for Iron Deficiency Anaemia

LINTONE SYRUP & CAPSULE

Micronutrients are essential for growing need

Dosage : BD or OD

- Iron
- Folic acid
- Vit. B.12
- Zinc
- Vitamin - E

Orange Flavour Taste

Iron-faster Increase in Heamoglobin Level

Dosage : Adults 10 ml - BD or OD
Children 5 ml BDor OD

Folic Acid - Coenzyme for normal metabolism

Vitamin B 12 - Necessary for normal cell division and protein Synthesis

Zinc - Metabolism of protein carbohydrates, Development of cells

Vitamin-E - for free Radical scavenger, hair loss, make dry, dull, lifeless skin come alive with health

Indications Enhances recovery from surgery & Trauma during convalescence from chronic ailments. Anaemic patients , cancer patients on treatment, and for growing children.

For a healthy tomorrow .....LINTONE SYRUP & CAPSULE

Thank you