Teratology : Study of congenital malformations; structural, behavioral, functional & metabolic disorders present at birth.

- 2-3% of live births

Another 2-3% manifest at later age

Total 4-6%; 21% of infant mortality

- genetic & environmental factors

-80% by combination of both

-10% each exclusively

Congenital anomalies can be of various types:

1.Structural: Where external form or structure is abnormal.

2.Functional: Where the function of the organ is affected. In functional anomaly the defect can be at cellular level, where a particular enzyme may not be formed normally, e.g. in hemophilia a particular factor essential for clotting is absent.

3.Metabolic: Where there can be defect in metabolism because of absence or defect in one or more enzymes.

VARIATIONS

1. Malformations > intrinsic abnormal developmental process i.e. in organogenesis. Most malformations have their origin during the **third to eighth weeks of gestation.**
2. Disruptions >morphological alterations of already formed structures and are due to destructive processes. E.g. Vascular accidents leading to bowel atresias.
3. Deformations > mechanical forces that mold a part of the fetus over a prolonged period. oligohydramnios producing club foot
4. Dysplasia > abnormal tissue formation e.g. congenital ectodermal dysplasia

Principles of teratology

- Susceptibility & degree of damage depends upon stage of embryonic development.
- Critical period for each organ is specific.
- Teratogens act by influencing metabolic process.
- Susceptibility depends on genotype of the conceptus.
- Manifestations depend on dose and duration of exposure.
- Manifestations of abnormal development are death, malformation, growth retardation and functional disorders.

Environmental Causes

1. Infections :– Viruses (Rubella, cytomegalovirus, Herpes simplex, HIV, Syphilis, Chicken pox, measles, toxoplasmosis)
2. Malnutrition:- Iodine deficiency
3. Antigenic reaction :– Rh-antigen, (Rh+ve & Rh-ve)

   haemolytic disease.
4. Drugs & Chemicals:- e.g. Thalidomide, lithium, tranquilizers, alcohol.
5. Hormones:- Synthetic Oestrogens (masculinization of female genitalia) Progestines, Maternal diabetes (Heart & neural tube defects)
6. Physical factors:- Radiations, smoking, alcohol
7. Abnormal Intrauterine environment:- site of implantation, presence of twins, hydramnios / oligamnios, insufficient Oxygen

Causes of congenital anomalies

Genetic factors

Chromosomal anomalies

1. Numerical: change in chromosomal number

I. Aneuploidy- e.g. trisomy, monosomy.

e.g. Turner syndrome (45,X) , trisomy 21 or Down sydrome

I. Polyploidy- e.g. triploidy, tetraploidy etc.

2. Structural:

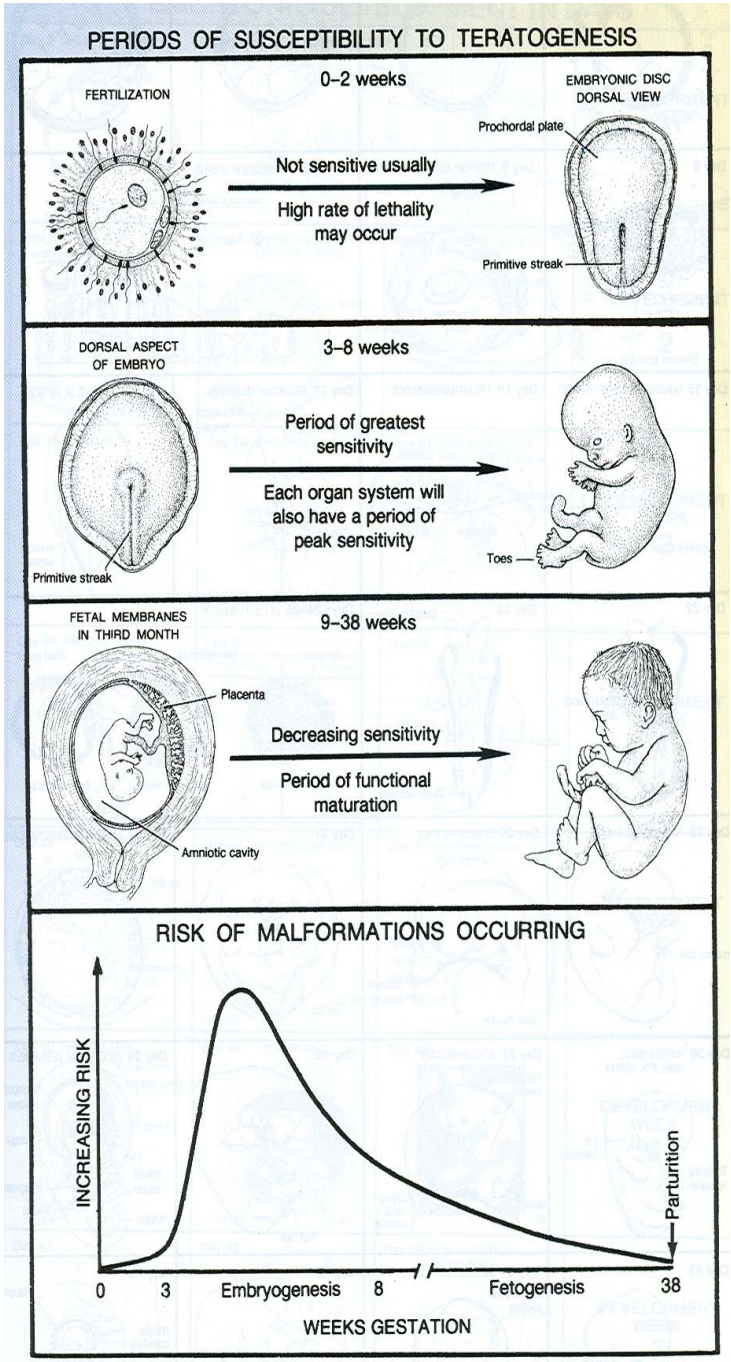
I. Translocation > between non-homologus chromosome.

II. Deletion > e.g. chr. 5 – cri du chat syndrome

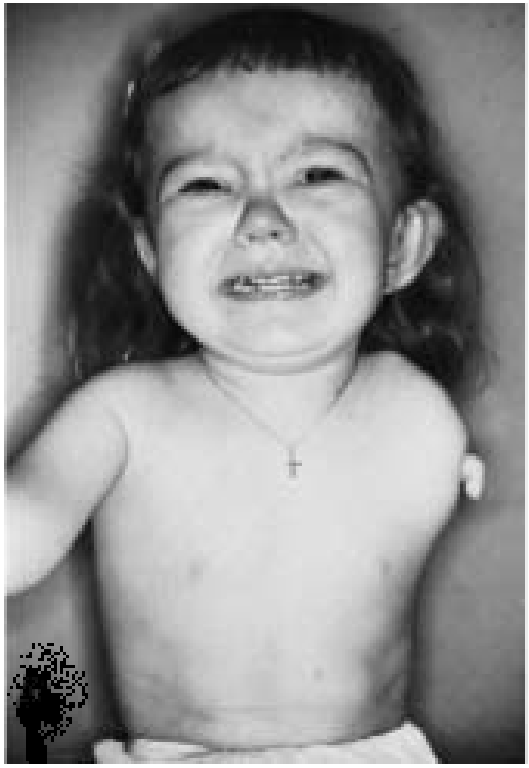
III. Duplication > within a chromosome

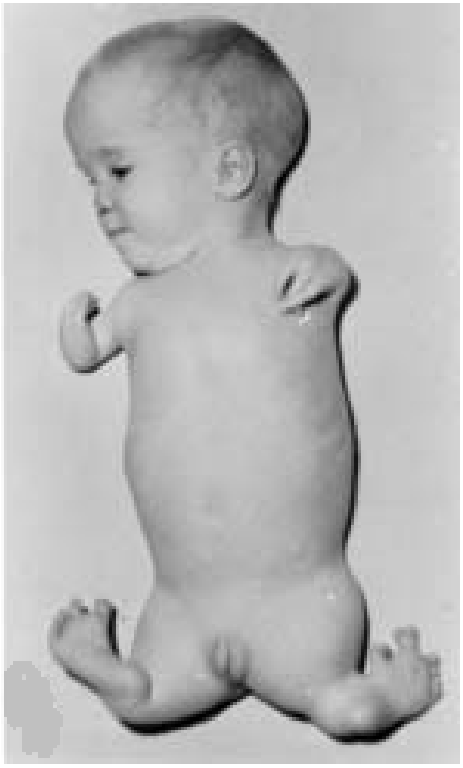
IV. Inversion > segment of chromosome is reversed

V. Isochromosomes > centromere divide transversely i.e. 1 arm missing & other duplicated


PERIODS OF SUSCEPTIBILITY TO TERATOGENESIS
FERTILIZATION
0–2 weeks
EMBRYONIC DISC
DORSAL VIEW
Prochordal plate
Not sensitive usually
High rate of lethality
may occur
Primitive streak
DORSAL ASPECT
OF EMBRYO
3–8 weeks
Period of greatest
sensitivity
Each organ system will
also have a period of
peak sensitivity
Primitive streak
Toes
FETAL MEMBRANES
IN THIRD MONTH
9–38 weeks
Placenta
Decreasing sensitivity
Period of functional
maturation
Amniotic cavity
RISK OF MALFORMATIONS OCCURRING
INCREASING RISK
Parturition
0
3
Embryogenesis
8
Fetogenesis
38
WEEKS GESTATION


119





PRENATAL DIAGNOSIS

Ultrasound can accurately determine fetal age and growth parameters and detect many malformations.
Maternal serum screening for alpha-fetoprotein can indicate the presence of a neural tube defect or other abnormalities.
Amniocentesis is a procedure in which a needle is placed into the amniotic cavity and a fluid sample is withdrawn. This fluid can be
analyzed biochemically and also provides cells for culture and genetic analysis.
Chorionic villus sampling (CVS) involves aspirating a tissue sample directly from the placenta to obtain cells for genetic analysis. Because many of these procedures involve a potential risk to the fetus and mother, they are generally only used for higher risk pregnancies (the exception is ultrasound).

Risk Factors

These risk factors include

- advanced maternal **age** (35 years and older)
- **history** of neural tube defects in the family
- **previous** gestation with a chromosome abnormality
- **chromosome** abnormalities in either parent and a mother who is a carrier for an **X-linked disorder**

Prevention

- **Fetal Therapy**

1. Fetal transfusion
2. Fetal surgery
3. Stem cell transplantation
4. Gene therapy