

APPROACH TO CHILDREN WITH CONGENITAL ANOMALIES

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Objectives:

1. List 2 ways in which early identification of congenital anomalies and establishing an underlying diagnosis can be beneficial to patients and their families.
2. Identify historical and physical clues to the significance of congenital anomalies.
3. Obtain additional historical, physical, and laboratory data appropriate for the further evaluation of a patient with congenital anomalies.
4. Define and apply terms commonly used in the description of congenital anomalies.

Background:

Incidence: Major anomalies (those requiring surgery or ongoing medical care) affect 3-7% of all live born infants, depending on the age at detection:

Newborns	3%
1 year	5%
5 years	7%

Minor anomalies: 15% of newborns have 1; 1% have 3 or more; 90% of those with 3 or more have a major anomaly as well.

Impact: second only to complications of prematurity (and may soon exceed them) as the leading cause of death in the first month of life, and second only to accidents between 1 and 5 years. It is estimated that more than 15 million Americans are disabled as the result of congenital anomalies.

Etiologies:	Chromosome rearrangements	5-10%
	Single gene defects	10-15%
	Environmental (nongenetic) factors	10%
	Polygenic/multifactorial causes	35-40%
	Unknown	30%

I. *Why seek a diagnosis for suspected congenital anomalies?*

- A. Facilitates optimal medical and surgical care when the natural history of the disorder is well understood:

examples: Down syndrome
Turner syndrome
Beckwith-Wiedemann syndrome
Midline vs. Bilateral cleft lip and palate
Multiple congenital contractures

B. Counseling issues:

1. Acceptance of the child and any attendant disabilities.
2. "Why did this happen?" - an obstacle to coping
3. "Will it happen again?" - recurrence risk estimation

II. *When should I be suspicious that congenital anomalies might be significant?*

A. Prenatal history

1. abnormal fundal height progression
2. abnormal fetal movement: onset >20 weeks
character ("swimming")
diminished activity
position at birth
3. prenatal exposures: drugs
infections (TORCH)
maternal illness (diabetes, epilepsy)
4. abnormal prenatal screening tests:
alphafetoprotein (AFP)
"triple" screen
5. ultrasound: high or low amniotic fluid volume
visible anomalies
fetal growth abnormalities

B. Postnatal history

1. Asphyxia
2. Feeding problems
3. Neurological abnormalities (seizures, lethargy, hypotonia, hypertonia)
4. Biochemical abnormalities (hypoglycemia, hypocalcemia, acidosis)
5. Abnormal growth, especially proportionate (wt = length = OFC) growth failure, overgrowth, asymmetry, skeletal disproportion
6. Presence of other anomalies
7. Developmental delay/mental retardation

C. Family history

1. congenital anomalies
2. mental retardation
3. recurrent pregnancy losses
4. unexplained neonatal death(s)
5. parental ages
6. consanguinity

III. *How are morphological features analyzed and described?*

- A. Gestalt (“Walk in the room” impression)
- B. Detailed exam with measurements
- C. In addition to the above, interpreting significance of findings must take into account;
 - 1. what’s normal for the family
 - 2. embryologic and developmental processes
 - 3. changes in the phenotype over time
- D. Photographs
- E. Laboratory studies

1. Chromosome analysis

Indications: Major anomalies of 2 or more organ systems or 1 major anomaly and 2 minor anomalies, growth impairment or developmental delay/mental retardation

2. Biochemical testing:

Indications: Metabolic acidosis, lethargy, vomiting, seizures, jaundice, E.coli sepsis, abnormal odor, loss of developmental milestones

3. Radiographs

Indications: Positional abnormalities, torticollis, abnormal skull shape, disproportionate or asymmetric growth, limb deficiencies

4. DNA studies (limited)

IV. When is a Genetics evaluation indicated for infants with congenital anomalies?

- A. For diagnosis
 - 1. Any infant with more than one major anomaly, or one major and multiple minor anomalies.
 - 2. Any infant with one or more major anomaly and/or multiple minor anomalies, and a family history of congenital anomalies, recurrent pregnancy losses (>2), neonatal death, mental retardation, or parental consanguinity.
 - 3. Any infant with anomalies and a history of exposure to a potential teratogen during the pregnancy.

- B. For management of an established diagnosis
 1. Recommendations for expectant management of associated complications
 2. Coordination of tertiary care
 3. "Parallel" care (e.g., skeletal dysplasias)

- C. For counseling
 1. Grief
 2. Recurrence risks
 3. Identification of resources for additional support

V. *Terminology*

- A. For constellations of anomalies
 1. Syndrome: Pathologically related anomalies which occur together more often than expected by chance (e.g. Down syndrome).
 2. Sequence: a constellation of anomalies derived from one primary anomaly (e.g., Robin sequence).
 3. Developmental field defect: anomalies resulting from disturbed development of a related group of cells in the embryo (e.g., midline anomalies)
 4. Association: anomalies that occur together more often than expected by chance but whose pathogenetic relationship is unknown (e.g., VACTERL, CHARGE).

- B. For pathogenetic processes
 1. Malformation: Defect caused by intrinsically abnormal morphological development (e.g., neural tube defects, cleft lip & palate)
 2. Deformation: Defect of structure or position resulting from the action of abnormal extrinsic mechanical forces on intrinsically normal development (e.g., club foot from intrauterine compression).
 3. Disruption: Defect caused by extrinsic breakdown of or interference with originally normal development (e.g., amniotic bands).

4. Dysplasia: Abnormal organization of cells and tissues (e.g., skeletal, connective tissue dysplasias).

C. Other

1. Anomaly: any abnormal characteristic
2. Dysmorphic: abnormally formed
3. Congenital: present at birth (not necessarily genetic)
4. Genetic: caused by the action of one or more genes
5. Familial: occurrences within a family (not necessarily genetic)

VI. *Syndromes rarely identified in the newborn period:*

- A. Klinefelter (47,XXY)
- B. Many cases of Turner syndrome incidentally diagnosed
- C. Williams syndrome
- D. Most cases of Noonan syndrome
- E. Fragile X syndrome unless there is a positive family history
- F. Storage diseases

Counseling parents of children with congenital anomalies:

1. If anomalies are identified during the pregnancy, the information at hand is often insufficient or ambiguous. Parents must be helped through the processes of adjusting to the loss of the baby they thought they would have, and coming to terms with the prospect of having a child with birth defects. The physician's role is to make sure the parents understand what is and is not known about the identified anomalies, their prognostic implications, and options for further evaluation and management. This must be done in an open, supportive, and compassionate manner.
2. Anomalies identified at birth also require early (in the delivery room), open, and compassionate discussion with the family, and an urgent diagnostic evaluation.
3. Guilt, shock, anger, sadness, and helplessness are all normal and expected reactions to this news, though different individuals will experience them at different times. It is not appropriate to attempt to protect parents from these feelings except in extreme and extraordinary circumstances.