Pediatrics

Down Syndrome

- Also known as trisomy 21, is a genetic disorder caused by the presence of all or part of a third copy of chromosome 21
- Occurs in 1:800 of live births
- Risk correlate with mother's age
    - <25 years old - 1/1600
    - >40 years old - 1/80

Genetics

1. **Non-disjunction – 94%**
    a. 80% occurs during maternal meiosis phase 1
    b. Producing 3 copies of chromosome 21
    c. Karyotype
        i. **Male –** 47XY, +21
        ii. **Female –** 47XX, +21
2. **Robertsonian Translocation – 5%**
    a. Fusion of long arms (q) of 2 accrocentric chromosomes at centromere (chromosome 13, 14, 15, 21, 22)
    b. The short arms (p) were lost
    c. The most common translocation is between chromosomes 14 and 21
    d. Karyotypes
        i. **Male –** 46XY, t (14q21q)
        ii. **Female –** 46XX, t (14q21q)
3. **Mosaicism of Down Syndrome – 1%**
    a. The individual has 2 populations of cells
        i. One group of trisomy 21
        ii. One group with normal chromosomes
    b. Occurs due to
        i. Non-disjunction occurs after fertilization
        ii. Trisomic rescue
    c. Karyotypes
        i. **Male –** 47XY +21/46XY
        ii. **Female –** 47XX +21/46XX

Diagnosis/ Screening of Down Syndrome

Screening Method

1. **Ultrasound**
    a. Done between 18-24 weeks of gestation
    b. Findings that indicate high risk
        i. Increased nuchal translucency – 70-80% riskier
        ii. Absent/ small nasal bone
        iii. Large ventricles
        iv. Increased nuchal fold thickness
        v. Abnormal right clavian artery
2. **Blood Testing**
    a. A-fetoprotein
    b. Unconjugated estriol
    c. Total hCG
    d. Free βhCG

Diagnostic Methods

1. **Antenatal Diagnosis**
    a. Chorionic Villus Sampling/ Amniocentesis for Karyotyping Study
2. **Postnatal**
    a. Clinical examination and Karyotyping study

Clinical Signs of Down Syndrome

Head, Face and Neck

- **Head**
  - Brachycephaly
  - Flattened occiput
- **Face**
  - Hypoplastic midface
  - Flattened nasal bridge
  - Large protruding tongue
  - Small mouth
- **Eyes**
  - Upslanted palpebral fissures
  - Epicanthal folds
  - Brushfields spots on iris
  - Cataract
  - Myopia
  - Squints
- **Mouth**
  - Small mouth
  - Large protruding tongue
- **Ears**
  - Small ears
  - Low set ears
- **Neck**
  - Short neck

Upper Limbs

- Single, transverse palmar creases
- Hypotonia
- Joint laxity
- Clinodactyly (bent fifth finger tip)

Lower Limbs

- Shortened hands
- Wide gap between first and second toes
- Hypotonia
- Joint laxity

Cardiovascular Anomalies

- Atrioventricular Septal Defect – 80%
- Ventricular Septal Defect – 80%
- Mitral valve problem
- Tetralogy of Fallot
- Patent Ductus Arteriosus

Gastrointestinal Anomalies

- Duodenal atresia
- Annular pancreas
- Imperforate anus
- Hisrchprung disease

Other Associated Medical Problems in Down Syndrome

- Delayed motor milestones
- Moderate to severe learning difficulties
- Increase risk to infection
- 18 folds increased risk to get Leukemia
- Hearing impairment
- Atlanto-axial instability
  - Increased spinal cord injury
- Hypothyroidism
- Coeliac disease
- Epilepsy
- Alzheimer like features - >35 years old

Management of Down Syndrome

- Early intervention
- Good family environment
- Education and proper care
- Social support
- Work-related training
- Early medical intervention

Health Screening		Cognitive Development	Others

Echocardiogram	At birth	• Hearing aid is recommended for those who have hearing loss
		  ○ For language learning
		• Speech therapy
		  ○ Recommended to be started as early as 9 months old
		• Alternative/ Augmentative communication methods
		  ○ Sign language
		• Early education
			• Tympanostomy tube
			• Tonsillectomy
			  ○ Help with obstructive sleep apnea
			  ○ Prevent throat infection

Hearing test	6 months, 12 months. Then yearly		
T4 and TSH	6 months, then yearly		
Eyes	6 months, then yearly		
Teeth	2 years, then every 6 months		
Coeliac disease	Between 2 – 3years old		
Sleep study	Between 3-4 years old		
Neck X-ray	Between 3-5 years old		