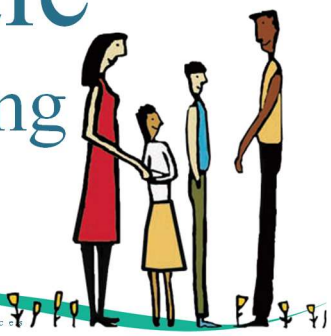
# Genetic Counseling



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## Introduction

- Any couple that has had a child with a serious abnormality
- Individuals with a family history of a serious disorder
- why this happened?
- Recurrent risk?
- The risk that their normal children might transmit the condition
- Great sensitivity is needed in communication

## Definition

The **consultant** is provided with information that enables him or her to understand:

- The medical diagnosis and its implications in terms of prognosis and possible treatment
- The mode of inheritance of the disorder and the risk of developing and/or transmitting it
- The choices or options available for dealing with the risks.

## Steps in Genetic Counseling

- **Diagnosis**-based on accurate family history, medical history, examination, and investigations
- Risk assessment
- Communication
- Discussion of options
- Long-term contact and support

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## Establishing the Diagnosis

- The most crucial step in any genetic consultation
- Three fundamental steps of any medical consultation:
  - Taking a history
  - Carrying out an examination
  - Undertaking appropriate investigations
    - Chromosome and molecular studies
    - Referral on to specialists in other fields

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## Establishing the Diagnosis

- Problem of etiological heterogeneous disorders
- Common examples include
  - Hearing loss
  - nonspecific mental retardation
- Counseling can be extremely difficult if the heterogeneity extends to different modes of inheritance

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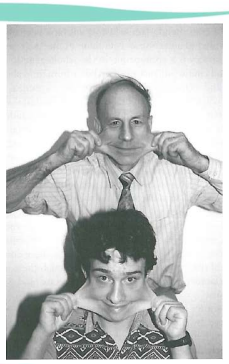
## Ehlers-Danlos syndrome

AD

AR

XLR



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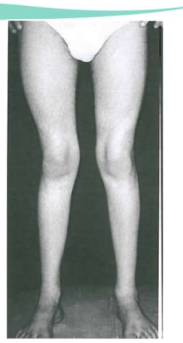
## Charcot-Marie-Tooth

AD

AR

XLR



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## Hereditary disorders show different types of inheritance

| Disorder | Inheritance |
|---|---|
| Congenital cataract | AD,AR,XR |
| Ichthyosis | AD,AR,XR |
| Microcephaly | AD,AR |
| Polycystic kidney disease | AD,AR |
| Retinitis pigmentosa | AD,AR,XR,M |
| Sensorineural hearing loss | AD,AR,XR,M |

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## Calculating and Presenting the Risk

- In some counseling situations, calculation of the recurrence risk is relatively straightforward
- Many factors, such as delayed age of onset, reduced penetrance
  - Quantification-The Numerical Value of a Risk
  - Qualification-The Nature of a Risk
  - Placing Risks in Context

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## Discussing the Options

- Details of all the choices open to them
  - The availability of PND with details of the techniques
  - Limitations and risks associated with the various methods
  - Other reproductive options

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# Communication & Support

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## Genetic Counseling-Directive or Non-Directive?

- Genetic counseling, a communication process that provides information
- The ultimate goal is to ensure that an individual or couple can reach their own decisions based on full information about risks and options
- Genetic counseling should be non-directive
- What you yourself would do if placed in my position?

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## Consanguinity

- One common ancestor no more remote than a great-great-grandparent.
- An increased incidence of both congenital malformations and other conditions that will present later
- For the offspring of first cousins, the incidence of congenital malformations is increased to approximately twice
- Is attributed to homozygosity for autosomal recessive disorders

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**Table 21.3** Genetic Relationship Between Relatives and Risk of Abnormality in Their Offspring

| Genetic Relationship | Proportion of Shared Genes | Risk of Abnormality in Offspring (%) |
|---|---|---|
| *First Degree* | 1/2 | 50 |
| Parent-child | | |
| Brother-sister | | |
| *Second Degree* | 1/4 | 5–10 |
| Uncle-niece | | |
| Aunt-nephew | | |
| Double first cousins | | |
| *Third Degree* | 1/8 | 3–5 |
| First cousins | | |

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# Teratogens

- An agent that can cause a birth defect by interfering with normal embryonic or fetal development
- Depend on the dosage and timing of administration during pregnancy
- **Drugs and Chemicals**
- **Maternal Infections**
- **Physical Agents**
- **Maternal Illness**

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**Table 16.6** Drugs With a Proven Teratogenic Effect in Humans

| Drug | Effects |
|---|---|
| ACE inhibitors | Renal dysplasia |
| Alcohol | Cardiac defects, microcephaly, characteristic facies |
| Chloroquine | Chorioretinitis, deafness |
| Diethylstilbestrol | Uterine malformations, vaginal adenocarcinoma |
| Lithium | Cardiac defects (Ebstein anomaly) |
| Phenytoin | Cardiac defects, cleft palate, digital hypoplasia |
| Retinoids | Ear and eye defects, hydrocephalus |
| Streptomycin | Deafness |
| Tetracycline | Dental enamel hypoplasia |
| Thalidomide | Phocomelia, cardiac and ear abnormalities |
| Valproic acid | Neural tube defects, clefting, limb defects, characteristic facies |
| Warfarin | Nasal hypoplasia, stippled epiphyses |

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**Table 16.7** Infectious Teratogenic Agents

| Infection | Effects |
|---|---|
| *Viral* | |
| Cytomegalovirus | Chorioretinitis, deafness, microcephaly |
| Herpes simplex | Microcephaly, microphthalmia |
| Rubella | Microcephaly, cataracts, retinitis, cardiac defects |
| Varicella zoster | Microcephaly, chorioretinitis, skin defects |
| *Bacterial* | |
| Syphilis | Hydrocephalus, osteitis, rhinitis |
| *Parasitic* | |
| Toxoplasmosis | Hydrocephalus, microcephaly, cataracts, chorioretinitis, deafness |

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## Physical Agents

- **Ionizing Radiation**
  - Microcephaly and ocular defects in the developing fetus
  - The most sensitive time is 2 to 5 weeks post conception
  - also have mutagenic and carcinogenic effects

- **Prolonged Hyperthermia**
  - can cause microcephaly and microphthalmia in early pregnancy

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## Maternal Illness

- **Diabetes Mellitus**
  - Two to threefold increase in the incidence of congenital abnormalities
  - Include congenital heart disease, neural tube defect
  - Control of the mother's blood glucose levels during early pregnancy

- **Phenylketonuria**

- **Maternal Epilepsy**

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