Cystic Fibrosis (CF)

Learning objectives:

- Clinical presentation in pediatric age group
- Physical examination, investigation and management

Most common lethal inherited disease in Caucasian where the carrier rate 1 in 25 and much less in other ethnic group. It is autosomal recessive disorder and most carriers of the gene are asymptomatic. The defective gene is CFTR(cystic fibrosis trans-membrane regulators) is a cyclic AMP -dependent chloride channel found in the membrane of the cells with 900 different gene mutation.
Disease of exocrine gland function, involving multiple organ systems and chiefly resulting in chronic respiratory infections, pancreatic enzyme insufficiency, and associated complications in untreated patients.

Clinical features

Gastrointestinal tract manifestations (intestinal)

1) Neonates

- diagnosed through newborn screening (↑ immune reactive trypsinogen)
- meconium ileus (10-20%), volvulus, intestinal atresia, perforation, and meconium peritonitis. Less commonly, passage of meconium may be delayed (>24-48 h after birth)

2) infancy

- prolonged neonatal jaundice
- growth flattering
- recurrent chest infection
- malabsorption , steatorrha

3) older children and adolescent

- allergic bronchopulmonary aspergillosis
- diabetes mellitus
- cirrhosis and portal hypertnsion
- distal intestinal obstruction
- pnemothorax or recurrent hemoptysis
- sterility in males

Physical signs: Depend on the degree of involvement of various organs and the progression of disease.

- ☆ Nose ,Rhinitis, Nasal polyps
- ☆ Pulmonary system, tachypnea, respiratory distress with retractions wheeze or crackles, cough (dry or productive of mucoid or purulent sputum),
  Increased antero posterior diameter of chest , clubbing cyanosis , hyperresonant chest on percussion may be noted; crackles are heard acutely in associated pneumonitis or bronchitis and chronically with bronchiectasis.
- ☆ Gastrointestinal tract, Abdominal distention, Hepatosplenomegaly (fatty liver and portal hypertension), Rectal prolapse, Dry skin (vitamin A deficiency),Cheilosis (vitamin B complex deficiency)

Diagnosis : Typical pulmonary and/or gastrointestinal tract manifestations, a family history, and positive results on sweat test essential for the diagnosis of CF.

Sweat test: the quantitative pilocarpine iontophoresis test (QPIT) to collect sweat and perform a chemical analysis of its chloride content is currently considered to be the only adequately sensitive and specific type of sweat test .The sweat chloride reference value is 10- 40 mEq/L, and a value of 60 -125 mEq/L of chloride in the sweat is consistent with a diagnosis of CF , the sweat test must be performed at least twice in each patient,

Imaging Studies

Chest radiography: Initial changes are hyperinflation and peribronchial thickening. With advancing pulmonary disease pulmonary nodules resulting from abscesses, infiltrates with or without lobar atelectasis, marked hyperinflation with flattened domes of the diaphragm, thoracic kyphosis, and bowing of the sternum develop.

Sinus radiography: Pan-opacification of the sinuses is present in almost all patients with CF, and its presence is strongly suggestive of the diagnosis.

Genotyping

CFTR gene are amplified from genomic DNA by polymerase chain reaction (PCR)

Screening

Newborn screening tests for CF lead to better lung function in childhood, decrease malnutrition and improve neurodevelopment.

screening routinely done e.g in UK ,immunoreactive trypsin (IRT) is raised in CF patients (Guthrie test). Those patients with raised IRT then screened for common CF gene mutation ,infants with two gene mutation have sweat test to confirm the diagnosis

Medical Care: including counseling and instructions regarding airway clearance techniques and the use of equipment (e.g., nebulizer, spacer for metered-dose inhaler), is recommended.

Surgical Care:

- ☆ Respiratory complications such as pneumothorax, massive recurrent or persistent hemoptysis, nasal polyps, or persistent and chronic sinusitis.
- ☆ Gastrointestinal tract complications, such as meconium ileus, intussusception, gastrostomy tube placement for supplemental feeding, and rectal prolapse
- ☆ Lung transplant is indicated for the treatment of end-stage lung disease.

Diet:

- ☆ high caloric diet at 150% and unrestricted fat intake is recommended. A high-energy and high-fat diet, in addition to vitamin (especially fat soluble) and mineral supplementation,

Activity:

- ☆ Regular exercise increases physical fitness in patients with CF.

Treatment: The goals of treatment: include

- ☆ Maintaining lung function as near to normal as possible by controlling respiratory infection, clearing airways of mucous,
- ☆ Administering nutritional therapy (pancreatic enzyme supplements, multivitamin and mineral supplements)

Mild acute pulmonary exacerbations of CF can be treated successfully at home by increasing the frequency of airway clearance; inhaled bronchodilator treatment, chest physical therapy, postural drainage; and by use of oral antibiotics such as oral fluoroquinolones .

Prognosis: CF remains a life-limiting disease, and a cure for the disease remains elusive .

Median survival age is 36.8 years. The median survival age in males is slightly higher than that in females. Marked heterogeneity exists in disease severity and progression. Severity of pulmonary disease determines prognosis and ultimate outcome. With current treatment strategies, 80% of patients should reach adulthood.

Key message

CF should be considered in any child with recurrent infections ,loss stools or failure to thrive.

Reference : Nelson text book of pediatric -web sites
Illustrated text book of pediatrics