Paediatric Surgery

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PAEDIATRIC SURGICAL CONSIDERATIONS

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Introduction

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Unique position of paediatric surgeons :

Three questions to be considered by the paediatric surgeons :

1. Whether the operation is mandatory or can it be avoided.
2. If the operation is inevitable, how urgent, can it be deferred for a while.
3. The minimum surgical intervention required to correct the anomaly.

Pediatric surgical speciality in India :

- Sushruta : Father of Indian surgery and plastic surgery.
- Only the union of medicine and surgery constitutes the complete doctor.
- The pediatric surgeon specialty in India, was first established in 1965, as a section of association of surgeons of India.
- Pediatric surgery is new and yet to be recognized for the role of specialty in providing quality care and reducing infant mortality rate.

WOFAPS KYOTO declaration 2002 :

- Children are not just small adults and have medical & surgical problems and needs that are often quiet different from those encountered by adult physicians.
- Infants and children deserve the very best medical care available.
- Every infant and child who suffers from an illness or disease has the right to be treated in an environment devoted to their care by a pediatric medical and surgical specialist.

The need for paediatric surgeons :

- Because of the unique training, they provide a wide range of treatment options and the highest quality care to children.
- To diagnose, treat, manage the surgical needs of the children.

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Features of paediatric cases :

- Different anatomic and physiological parameters.
- Smaller organs need intricate surgical skills.
- Difficult venous access, different dosage schedules.
- Different spectrum of anomalies.

Paediatric surgery needs specialiazed centres equipped with :

- Round the clock pediatricians.
- Pediatric intensivist.
- Pediatric radiologist.
- Pediatric anaesthetist.
- Pediatric pathologist.
- Pediatric orthopedician.
- Pediatric oncologist.

Objectives (Indian scenario) :

1. To provide specialized pediatric surgical services to over 400 million pediatric population at an affordable cost and safety, ethically and professionally.
2. To provide rigorous and uniform training including sub sections, at least in apex and centres of excellence.
3. To utilize the available limited financial resources to conduct only need based research to understand the common diseases in the region.

History :

Pediatric surgery in 19th century :

- Increasing interest in the surgery of children.
- Europe is considered to be the cradle of pediatric surgery.
- Many children's hospital came up all over Europe mostly during 1st half of 19th century.
- The Great Ormond street (World famous hospital for sick children) was established in 1852.
- The famous Boston children hospital was opened in 1882.
- Pediatric surgeons of 19th century were engaged in orthopedic surgery.

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modern pediatric surgery :

Three generations of surgeons :

1. William Ladd (Father of pediatric surgery) and Robert Gross.
2. Sir Denis Browne (London) : Founder and first president of the British association of pediatric surgeons.
3. Middle generation.

The Indian scenario :

- 40 years old.
- Paediatric surgery branch was started by :
    i. Prof. UC Chakraborty at Calcutta medical college.
    ii. Dr. Raman Nair at Trivendrum medical college.
    iii. Prof. O Anjaneyulu at Niloufer hospital college, Hyderabad.
    iv. Dr. Arthur & Desa at Bombay.
    v. Col RD Ayyar at Delhi.

History in India :

- Independent pediatric surgery section was established in 1964 (Dr R. K Gandhi).
- Postgraduate degree in pediatric surgery was started at university of Madras in 1966.
- First surgery on conjoint twins : Dr. Upadhyan (AIIMS Delhi).
- First successful tracheo-esophageal fistula repair : Prof. Subin Chatterjee from Kolkata.

Scope :

- Wide field and deals with most body parts and organs in newborns, infants and children.
- A general pediatric surgeon is allowed to operate on wide spectrum patients depending on the skill sets in view of lacking well developed exclusive pediatric surgical centers.
- In the interest of patient care, it is important to develop the sub-specialities as the distinct discipline.

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Scope of paediatric surgery :

Scope	
Pediatric gastrosurgery :	
• Anorectal malformation. • Malrotation. • Intestinal atresia. • Duodenal atresia. • Hirschsprungs disease. • Necrotising enterocolitis. • Septic ileus. • Meconium ileus. • Infantile hypertrophic pyloric stenosis. • Pyloric atresia.	• Achalasia cardia. • Biliary atresia. • Choledochal cyst. • Pseudopancreatic cyst. • Omentalcyst. • Mesenteric cyst. • Congenital duplication cyst. • Hernia. • Splenomegaly. • Abdominal trauma.
Pediatric urology :	
• Phimosis. • Labial synechia. • UTI. • Undescended testis. • Torsion testis. • Epididymo-orchitis. • Congenital hydrocele. • Pelviureteric junction obstruction.	• Posterior urethral valve. • Vesicoureteric reflux. • Antenatal hydronephrosis. • Hypospadias. • Exstrophy epispadias complex. • Non functioning kidney.
Pediatric thoracic surgery :	
• Esophageal atresia and tracheo-esophageal fistula. • Congenital diaphragmatic hernia. • Congenital cystic adenomatoid malformation. • Congenital lobar emphysema. • Diaphragmatic eventration.	• Diphragmatic trauma. • Lung cyst. • Empyema thoracis. • Esophageal replacement surgery.
Pediatric neurosurgery :	
• Spina bifida spectrum : meningocele. • Meningomyeocele. • Lipomeningomyelocele. • Diastometamyelia. • Tethered cord.	• Craniosynostosis. • Rachischisis. • Hydrocephalus : Congenital and acquired.
Pediatric oncosurgery :	
• Wilms tumor • Neuroblastoma • Sacrococcygeal teratoma • Soft tissue tumors	• Teratoma • Testicular tumors • Rhabdomyosarcoma
Pediatric minimal invasive surgery :	
• Laproscopy. • Cystoscopy. • Bronchoscopy : Rigid foreign body removal.	• Endoscopic guided procedures. • USG guided drainage procedures. • Recent advances : Robotics.

Age group for paediatric surgery : 12-18 years.

Ethical considerations

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Ethical consideration must be taken for many congenital conditions :

- Anorectal malformation.
- Neural tube defects.
- Disorders of sexual dysfunction.
- Hirschsprung disease.
- Exstrophy bladder.
- Urological anomalies.
- Vascular malformations.

Fetal surgery :

- Congenital malformations occur in 2–4% globally.
- Prevalence in India : 6–7%.
- Fetal malformations account for 30% perinatal deaths & considerable infant morbidity.
- Advances in imaging sciences, molecular genetics & in utero surgical techniques.

Screening for structural anomaly :

- Ultrasound screening : Recommended at 18–20 weeks of gestation.
- Shift in screening in aneuploidy in the 1st trimester.
- Conditions : Anencephaly, open spina bifida, cleft lip, diaphragmatic hernia, gastroschisis, exomphalos, serious cardiac defects, bilateral renal agenesis, lethal skeletal dysplasia, urinary tract anomalies.
- Informed choices are given accordingly.

Prenatal diagnosis and pediatric surgeons :

- Antenatal counselling.
- Significant impact on perinatal management of fetus.
- Modulating the delivery at appropriate centre, to ensure well being.

Common fetal structural anomalies :

1. Anterior abdominal wall defect.
2. CNS defects.
3. Congenital cardiac defects.
4. Congenital lung malformations.
5. Fetal genitourinary anomalies.
6. Fetal gastrointestinal anomalies.

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Surgery

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Fetal surgery :

- 1st attempted by Michael R Harrison, at university of California, San Francisco in 1980.
- Conducted first successful Vesicoamniotic shunting for a baby with posterior urethral valve (Open/fetoscopic).
- Techniques, risks (Prematurity, uterine rupture) and outcomes vary.

Anaesthesia :

- Indomethacin.
- Inhalational isoflurane, desflurane.

Types :

- Open.
- Fetoscopy.
- Minimal invasive techniques.

Indication :

- Lethal.
- Non-lethal.

Procedures :

1. Vesicoamniotic shunt placement.
2. Fetoscopic procedure (Laser ablation for twin twin transfusion, cervical mass).
3. Open fetal surgery (MMC, MOMS trial), CDH, sacrococcygeal teratoma.

Exit procedure :

Ex-utero intrapartum treatment.

Indication :

- Airway obstruction.
- Large cervical cystic hygroma.
- Tracheal atresia.
- Mediastinal mass.
- Cervical teratoma.

Tracheal occlusion : GoldBal2 balloon is used in CDH.

Common paediatric surgical problems & treatment

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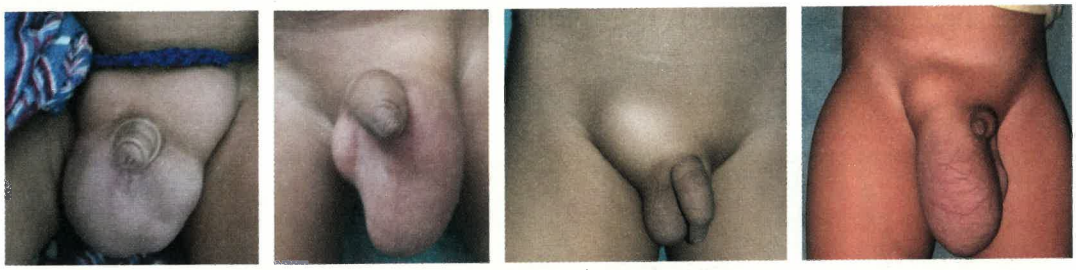
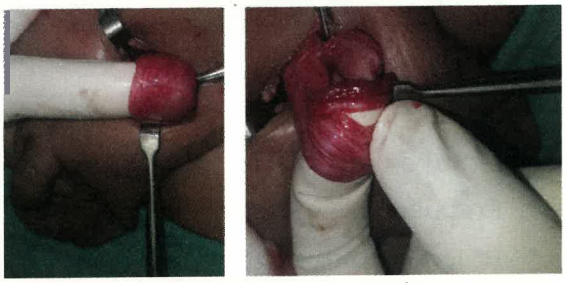
Hernia :

To be reparied as soon as it is diagnosed.

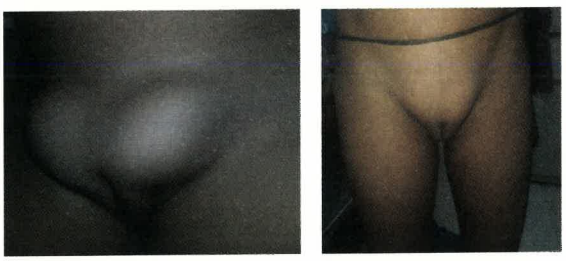


Inguino scrotal swelling

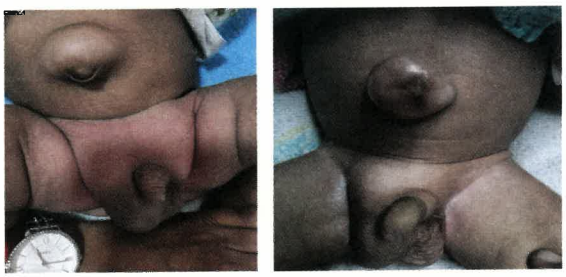
- Herniotomy should be done as soon as possible, as the newborns are at risk of incarceration & strangulation in the first 3 months of life.
- Requirements :
  - Minimum weight : 2 kg.
  - There should be no cardio pulmonary contraindication.
- In females :
  - M/c presentation is bilateral.
  - Sliding component is present (40%).
  - Treatment : Bevans repair.
- Umblical hernia can be waited as the umblical ring will close with time. Resolves by 2-3 yrs of age.
- Supra umblical hernia will require surgery as it doesn't heal.



Patent processus vaginalis



Inguinal swelling



Supra umblical hernia

Umblical hernia

Obstructed hernia

Incarcerated hernia

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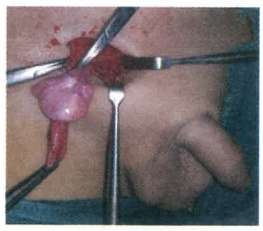
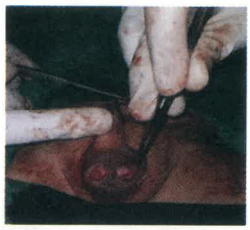
Undescended testes :

- Age of repair : 6-9 months.
- After 9 months, they undergo atrophy due to high temperature in the inguinal region.
- 80-90% of them are palpable.
- Complication : Torsion.



Right undescended testes



PMDS



Palpable testes

Phimosis :

Presentation :

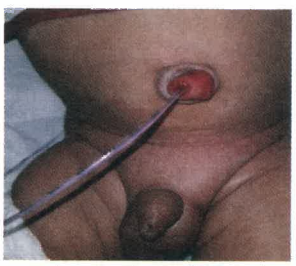
- Prepuce covering the meatus.
- UTI, difficulty in micturition.
- Ballooning of prepuceal skin.



Phimosis

Umblical granuloma & patent urachus :

- Umblical granuloma requires medical management.
- Patent urachus requires surgical correction.



Umblical granuloma and patent urachus

Umblical discharge :

Causes :

- Improper umblical hygiene.
- Surgical or infective.

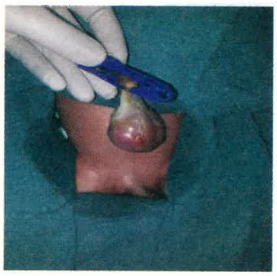


Umblical discharge

Omphalocele :

Do Karyotyping →

50% a/w chromosomal anomalies.



Hernia of umblical cord & omphalocele

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Gastroschisis :

Intestine to be covered to avoid risk of sepsis, ischemia of bowel (Dragging of mesentery).

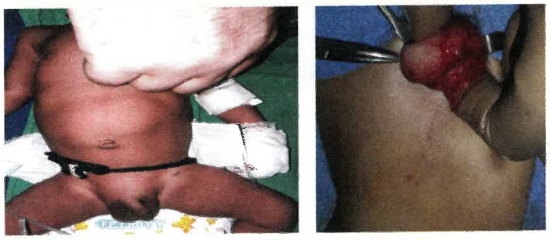
Gastroschisis

Idiopathic hypertrophic pyloric stenosis :

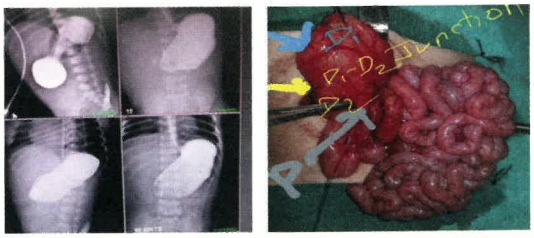
Treatment : Ramstedt pyloromyotomy.

Duodenal atresia :

Double bubble sign.



IHPS

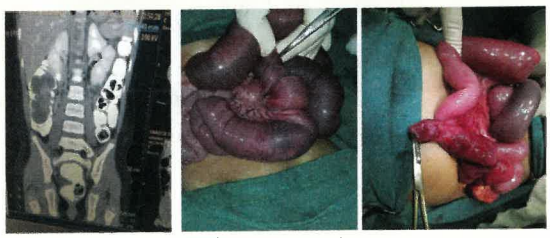


Double bubble sign

Intestinal atresia

Intussusception :

- Presentation : Shock, fever.
- Common lead point : Meckel's diverticulum.
- Treatment : Stoma, resection & anastomosis.



Intussusception

Infantile hemangioma :

- Based on site :
  - Facial : Mandates treatment
  - Trunk/forearm : Watchful waiting if stable & non-progressive.
- Treatment : Propranolol.

Infantile hemangioma

Neck swelling :

Neck abscess :

- Short duration of history.
- High grade fever, progressive swelling which is indurated, hard and tender.
- Pus on aspiration.
- Treatment : I & D.

Lymphatic malformation

Neck abscess

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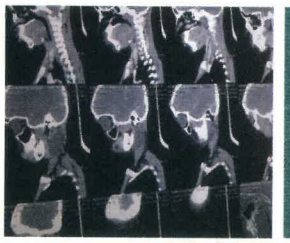
Cystic hygroma :

Treatment : Intralesional sclerotherapy using bleomycin.




Branchial cyst


TB lymph node

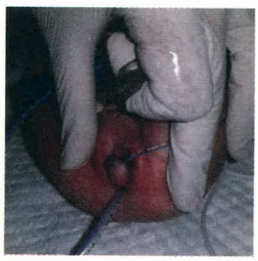
Anorectal malformation :

- High ARM : Colostomy + definitive pull through.
- Low ARM : One stage surgery.
- Meconium pearl : Associated with low ARM.
- Treatment : Anoplasty.
- Anterior ectopic anus is a variant of female ARM.


Anorectal malformation

meconium pearl

Pressure augmented colostogram



Recto-vesical fistula

Anterior ectopic anus

Hypospadias

Midline swelling : Spinal defect.

Important consideration :

- Size of the encephalocele.
- Amount of brain tissue.
- Associated hydrocephalus.
- Defect size.

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Midline defects

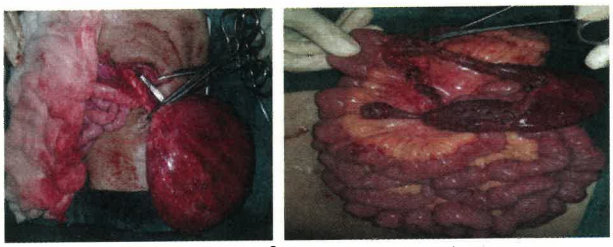
Omental cyst :

If omental cyst is attached to the tail of trachea, make sure there is no pancreatic injury to prevent pancreatic fistula while separating it.

Duplication of intestinal tract :

Contains ectopic gastric mucosa → Secretion of gastric juices → Gastritis → Perforation.

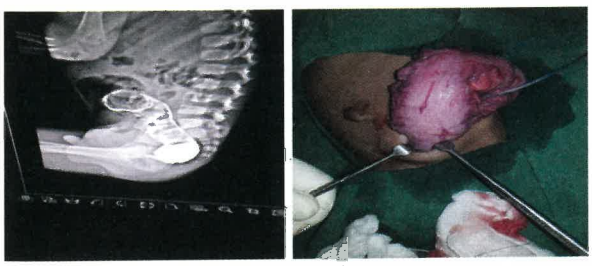
Omental cyst



Duplication of intestinal tract

Hirschsprung disease :

Treatment : Colostomy.



Hirschsprung disease

Recent advances 01:00:55

Other treatments :

- Stem cell research.
- Minimal invasive surgery.
- Robotic surgery.
- Laser technology.
- Hormonic scalpel.
- Tissue engineering.

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- Fetal surgery.
- Pediatric tumors : Advancements with minimal risks.
- Brachytherapy.
- Telemedicine and teleconferencing.

Demand for paediatric surgeons :

- Changing social plethora.
- More antenatal and anomaly scans.
- More precious pregnancies.
- Long dates and flooded government institutions.
- Better understanding of evolution of more diseases.
- Better availability of team and equipments.
- More insurance coverage for surgeries.

Pediatric surgeon and the child :

- Late presentation and referral : Poor outcome and increased cost.
- Paucity of dedicated pediatric surgical centre & inadequate infrastructure.
- 50% districts in India don't have access to pediatric surgical facility.
- Medical facility is ramping up but pediatric surgical care is lagging.
- To ensure adequate care, 29th december has been marked as "Pediatric surgery day" : Childs right to quality surgical care.

CONGENITAL DIAPHRAGMATIC HERNIA

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Introduction

00:00:19

Overview :

Congenital diaphragmatic hernia (CDH) : Congenital malformation with a defect in the posterolateral diaphragm, the foramen of Bochdalek, through which abdominal viscera migrate into the chest during fetal life.

- Common malformation.
- Defect in posterolateral diaphragm.
- Bochdalek hernia.
- Incidence : 1 in 2600 to 3700.
- 80% left sided, 5% bilateral & 15% right sided.
- Hidden/antenatal mortality is high.

History :

- Mccawley : Earliest gross anatomy and pathophysiology in 1754.
- Bowditch : Bedside clinical diagnosis in 1847.
- Bochdalek : Hernia resulted from posterolateral rupture of membrane.
- Heidenhain : Reported first successful repair in 1905.
- Gross : Reported 100% survival (Immediate surgery) in 1946.
- Till 1980 : Standard care was immediate neonatal surgery postoperative → Resuscitative therapy.

Current trend :

- Survival : 55-70%.
- Mortality : Due to pulmonary hypoplasia & persistent pulmonary hypertension.

Epidemiology and genetics :

- Incidence : 1 in 2000 to 5000.
- 1/3rd infants are stillborn d/t pulmonary hypoplasia.
- Risk factors : Thin, underweight mothers, premature, macrosomic, male.
- Mostly sporadic.
- 10-15% CDH linked with abnormal Karyotype → Poor outcome.
- Cause unknown.

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- Exposure to pharmacological agents (Phenmetrazine, thalidomide, quinine, cadmium, lead, nitrofen a herbicide).
- Vitamin A deficiency : Retinoid regulated target genes may reverse pulmonary hypoplasia.

Associated malformations :

- Seen in 10-50% cases.
- Skeletal : Limb reduction and costovertebral defects.
- Cardiac : 33% of all malformations. (VSD, perimembranous type is m/c).
- Neural tube defect : m/c defect, meningoceles, anencephaly.
- Abdominal wall : Omphalocele, gastroschisis, pentalogy of Cantrell.
- Others : Urinary tract anomalies, malrotation trisomies (21, 18, 13).

Associated syndromes :

- Pallister-Killian.
- Fryns.
- Ghersoni-Baruch.
- WAGR (Wilms tumor, aniridia, genitourinary anomalies, mental retardation).
- Denys-Drash.
- Wolf-Hirschhorn.
- Beckwith-Wiedemann.
- Goldenhar.
- Coffin-Siris.

Embryogenesis

00:11:29

Sequence :

- Sporadic event.
- Occurs due to failure of fusion of pleuroperitoneal canal.
- Pulmonary hypoplasia : D/t mechanical compression, ipsilateral → Later B/L.

Diaphragmatic development :

- Starts at 4th week of gestation : Peritoneal fold from lateral mesenchyma and septum transversum.
- Anterior central tendon : Septum transversum.
- Dorsolateral : Pleuroperitoneal membranes.
- Dorsal crura : Esophageal mesentery.
- Muscular portion : Thoracic intercostal muscle groups.
- 8th week : Formation of pleuroperitoneal membrane, right side (80%) > left.
- Muscularization : Posthepatic mesenchymal plate.