Case Scenarios in Pediatric and Adolescent Practice

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Innumerable Children and Adolescents
whose sufferings contributed
to learning new knowledge
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It gives me immense pleasure to write a foreword for Dr A Parthasarathy's yet another exemplary contribution to the academic field of pediatrics, *Case Scenarios in Pediatric and Adolescent Practice*. All those who believed that most of the medical conditions are taught in the undergraduate and postgraduate courses and are now in clinical practice will agree that the real learning begins with the patients, and every patient is a new source of knowledge. Hence, the essence of this book which has 28 sections covering various case scenarios and experiences encountered by leading experts in the specialties from neonate to adolescent. The reader is taken through the history and clinical findings with discussion and practice tips with the learning points mentioned under each case scenario. Such a format is not only educative but also equips the reader with confidence to manage patients with similar issues.

I congratulate Dr A Parthasarathy and his Associate Editors Dr Alok Gupta, Dr Anupama Borker, Dr Dhanya Dharmapalan, the section editors and contributors for this wonderful piece of work. My best wishes.

**Vijay Yewale**
President
Indian Academy of Pediatrics (IAP) 2014
It is a common belief that research in pediatrics can be carried out only in major hospitals and teaching institutions attached to medical colleges, but a lot more informative data is available in office practice too from patients treated by practicing pediatricians. Each child we treat offers a treasure of knowledge to us, more practical than the theoretical knowledge gained by us during our student days. Thus, each and every child and adolescent whom we treat is a learning experience for us.

The textbook description of clinical profile and management cannot be totally applicable for children and adolescents under our care since the presentation of symptoms are not uniform for the same illness that we treat. All cases of enteric fever, pneumonia, diarrhea, dengue, hemorrhagic shock syndrome, etc. are not the same in their presentation. So much so, we gain newer clinical experience from each case of similar disease entity which enriches our clinical acumen. Thus, we have wealth of information for research in office practice.

With this objective in mind, we approached more than 50 experts in various subspecialties in pediatrics from all over the country to share their experience and knowledge gained from their own patients by citing their own case scenarios, viz. common, uncommon but not rare and rare cases managed by them. The experience gained by them was unique and worthy of sharing with the upcountry practicing pediatricians and hence this new book in your hands.

We have attempted to cover a wide range of topics within the limited scope of the book inclusive of various systemic illnesses in pediatrics and its subspecialties from newborn care to adolescence and allied subspecialties with additional topics like investigations and procedures.

It is our fervent hope that this treatise will serve as “desktop” reference volume in day-to-day practice for practicing pediatricians, students as well as faculty members. We welcome your valuable suggestions to improve the quality of the book in its future editions. We wish you fruitful knowledge gaining experience by going through the contents of the 28 selected sections of the book and solicit your useful and valuable feedback.

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Dhanya Dharmapalan
Acknowledgments

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CASE 1: GROIN SWELLING

CLINICAL HISTORY

A child is born with a swelling in the groin. The swelling reduces in sleep but becomes prominent during crying and straining. There is no suggestion of pain, no excessive vomiting. The swelling can also be reduced clinically by digital pressure. The swelling does not seem to be disturbing the child’s routine.

WHAT ARE THE INVESTIGATIONS REQUIRED TO DIAGNOSE THE CONDITION?

Clinically, if the swelling is a reducible swelling in the groin with an impulse on crying, this swelling is due to an inguinal hernia. Routinely, no investigations are required to ascertain the diagnosis. In case, the parents are very keen to have an imaging done, the best option is a sonography. However, it is necessary to do the same when the child is crying (i.e. when the swelling is present because a hernia, which has reduced completely, may be missed even on sonography). The alternative imaging techniques like computed tomography (CT) scan and magnetic resonance imaging (MRI) of the groin are to be strictly reserved for only very special cases. This is because both of these procedures may miss a completely reduced hernia, they require either sedation or even a short general anesthesia (GA) and CT scan exposes the child to a radiation exposure also.

INCIDENCE OF INGUINAL HERNIA

An inguinal hernia (Figs 1 and 2) may present in either sex although it is about six to eight times more common in males. The incidence in males is approximately 3–4% of the children but a large majority of them are seen in later infancy. Femoral hernia in either sex is extremely rare in children. The incidence of irreducibility in an inguinal hernia is highest in infancy (in fact higher in prematures). Irreducibility and subsequent strangulation of an inguinal hernia may lead to:

Fig. 1 A left inguinal hernia in a male-infant
• Gangrene of the involved bowel with rapid deterioration of the general condition of the child (Fig. 3)
• Even before, bowel strangulation sets in; the ipsilateral testicular vessels may thrombose leading to testicular ischemia. In case of a female patient where, ovary is a common content of the hernia, ovarian gangrene may set in (Figs 4 and 5). Vascular inadequacies in a strangulated hernia may start as early as within 6–8 hours making an irreducible hernia an acute emergency. In case of a strangulated ovary, the systemic features are less pronounced but the local features are unfailing.

![Fig. 2 A right inguinal hernia in a-female-infant](image1)

![Fig. 3 A strangulated inguinal hernia with resultant bowel gangrene](image2)
In view of the high morbidity and even potential mortality of a strangulated hernia, early surgery is the universally accepted recommendation for an inguinal hernia. In case the hernia is detected at birth, the child should be operated before discharge from the hospital (approximately by 1 week of age).
RELATED DIFFERENTIAL SCENARIOS

- **An infant with a nonreducible groin swelling:** This could be either a hydrocele (Fig. 6) or an irreducible hernia. In case of an irreducible hernia, the infant is likely to be vomiting, crying excessively (due to pain) and may also be having systemic features of sepsis. Locally, the swelling is usually inguinoscrotal (ovoid rather than globular), red and tender. An ultrasound examination of the groin will help the diagnosis in these cases. Whereas the strangulated hernia requires emergency surgery, the hydrocele usually does not warrant surgery in infancy. Infantile hydroceles are known to settle spontaneously, and are thus treated expectantly once the presence of a hernia is eliminated.

- **A communicating hydrocele in an older child** is indicative of a persistent processus vaginalis and this too needs to be operated like a hernia. Most of these children have a fluid-filled cystic swelling of the groin which though not reducible digitally but has a distinct diurnal variation of size due to their communication with the peritoneal cavity.

- **A groin swelling with an empty ipsilateral scrotum:**
  - In case the swelling is not acute/tender, it could be a palpable inguinal testis
  - In case the swelling is tender, then it could either be torsion in an inguinal testis or it could be a strangulation of an associated inguinal hernia in a case of undescended testis. The points of differentiation can be the associated symptoms or an urgent sonographic evaluation.

- **Rarer groin swellings** include lymphangiomas, lymph node swellings, canalicular (inguinal) lipomas and testicular tumors. Almost all of these, except a lymph node swelling, will require a surgical exploration to remove the same. In case of clinical suspicion, a sonographic evaluation or other imaging techniques may be resorted to.

LEARNING POINTS

- A reducible groin swelling (inguinal hernia) needs early surgery in view of the potential complications
- A red groin swelling (strangulated hernia or a gonadal torsion) requires urgent surgery without wasting undue time for investigations.

![Fig. 6 Right side hydrocele in a male child; note that the swelling is purely scrotal](image)
CASE 2: UMBILICAL DISCHARGE

CLINICAL PRESENTATION

An 8-month-old child has intermittent discharge from the umbilicus since almost 1 month of age. The discharge is clear fluid but occasionally blood-stained. There have been two episodes when there has been redness of the umbilicus with swelling of the tissues which settled with a short course of antibiotics. On clinical examination, it is a deep umbilicus with a polypoid swelling in the center of the umbilicus.

EXAMINATION

Clinical examination of a deep umbilicus is often difficult and is greatly facilitated by examining with an otoscope (ear speculum). The nature of the polypoid mass and the presence of any sinus openings, if any, may be looked for. Attempts must be made to palpate for subumbilical or periumbilical masses (cysts) which may lead to collection of mucoid material with intermittent discharge through a sinus and repeated infections. In very rare cases, there may be a history of greenish/feculent discharge or air bubbles coming from the umbilicus and this is a clear indication of a persistent patent vitello-intestinal duct (VI duct) or umbilical fistula into the ileum.

Ultrasonography (USG) of the abdominal wall may reveal a subumbilical cyst (remnant of the primitive vitellointestinal duct).

DIFFERENTIALS

- An umbilical granuloma (a hypergranulation tissue) after the umbilical cord shrivels off may respond to the application of locally acting sclerosants like copper sulfate or silver nitrate.
- An umbilical polyp (Fig. 7) represents a sequestrated remnant of the primitive vitellointestinal duct within the umbilical cicatrix. It invariably requires a surgical ablation. In most cases, a ligation of the polypoidal mass suffices and the polyp falls off. In some cases, there may be a little deeper connection and then a need to resort to a more formal surgical excision under GA.

Fig. 7 An umbilical polyp
• In case a sinus is visualized, this invariably will need a surgical excision. Attempts at identifying the depth of the sinus on routine radiology or contrast studies are usually unnecessary and unproductive. The sinus can usually be traced surgically under GA to its origin (Fig. 8).
• An umbilical fistula requires a formal laparotomy and excision.

LEARNING POINTS
• Persistent discharge from the umbilicus beyond first few months needs surgical evaluation
• Nature of the discharge is relevant to diagnose the source of the same.

CASE 3: BLEEDING PER RECTUM

CLINICAL PRESENTATION
A 7-year-old girl complains of bleeding per rectum (PR) since about 3–4 months. The bleeding is typically intermittent. There is intermittent constipation. Bleeding is fresh and in drops. Occasionally, a streak of blood lines the fecal mass.

It is necessary to know whether the act of defecation is painful. This would be indicative of a fissure–in-ano. Typically, a fissure is situated in the anal canal which has somatic nerve endings and thus is sensitive to pain. Unlike the anal canal, mucosal pathologies arising in the rectum (which has visceral nerve endings) are not painful. The most common of these is a rectal polyp. In case of a rectal polyp there may be a history of something coming out PR, especially if the polyp is low and pedunculated to prolapse out (Fig. 9).
On per rectal examination (PRE), a severe tenderness would suggest a fissure whereas in some other cases, a polyp may be palpable. It is necessary to ensure that the rectum is not loaded at the time of the PRE or else one may not be able to appreciate the polyp on the examining finger.

- In children the treatment of a fissure-in-ano is invariably conservative and surgery is indicated only in those where there is a failure of conservative treatment. Besides, stools softeners and local anesthetic gels, a short course of antibiotics may be indicated in case of acutely inflamed fissures. Some of these children may require a counseling on toilet training, especially in those with a recurrent fissure.

- In case a polyp is suspected but is not palpable even after evacuation of the rectum:
  - A contrast lower gastrointestinal (GI) study is an optional examination but this too may be misleading unless done with proper preparation of the colon.
  - A sigmoidoscopic or colonoscopic evaluation often requires sedation or short anesthesia in a child. In case there is a polyp, the examination is combined with polypectomy and its subsequent histopathological examination.

- Rarer diagnoses include, ulceration of the rectum (idiopathic/amoebic), mucosal telangiectasias, inflammatory disorders of the bowel. These will be evident either clinically (inflammatory bowel disorders) or on colonoscopy.

Different case scenarios:

- A 3-month-old top fed infant brought with a H/o intermittent bleeding PR, most likely to be a fissure-in-ano unless the bleeding is profuse or altered. There is a need to soften the stools in such a patient.

- Profuse dark/fresh blood in an infant: The blood is often passed in clots. There is a possibility of a bleeding Meckels’ diverticulum. This occurs due to the presence of heterotopic gastric mucosa in the diverticulum which produces acid. This acid ulcerates the adjoining normal ileal mucosa which can bleed profusely. Occasionally the degree of blood loss may necessitate a blood replacement. These patients need urgent surgery to stop the blood loss.
A neonate with volvulus neonatorum may present with bilious vomiting and bleeding PR but there will not be any significant abdominal distension unlike a neonate with necrotizing enterocolitis (NEC). These cases require urgent surgery to prevent complete ischemia of bowel.

- Bleeding with intermittent abdominal colics could be due to intussusception (see later)

**LEARNING POINTS**

- Bleeding accompanied with fecal matter may be due to infective or inflammatory pathologies of the GI tract
- Bleeding unaccompanied with fecal matter is more likely to be due to a surgical cause like an intussusception or a bleeding Meckel’s diverticulum.

**CASE 4: SOMETHING COMING OUT PER RECTUM**

**CLINICAL PRESENTATION**

A 2-year-old child brought with something coming out PR.

**DIFFERENTIALS**

- *Rectal prolapse (Fig. 10)*: Common in this age, more common in relatively malnourished children with recurrent diarrheas but also associated with straining due to constipation. Usually there is no H/o any associated bleeding PR, although the prolapsing portion may cause some

![Fig. 10 Rectal prolapse: note the lumen in the center (arrow)](image)
spotting. Digital reposition usually reduces the prolapse. Occasionally if the prolapsing portion is very edematous, then manual reduction may be difficult in a crying or uncooperative child and there may be a need for sedation or short GA. Strapping the buttocks together for a few hours after the reduction helps to prevent immediate recurrence. Recurrent prolapse is best treated by submucosal injections of sclerosants.

- **Prolapsing rectal polyp**: Usually seen in children older than 4–5 years. H/o bleeding predominates the prolapse. The central luminal opening of a rectal prolapse differentiates it from the cherry-shaped prolapse of the rectal polyp.
- Prolapse of an intussusception is accompanied more with the general features of intussusception and a clinical dilemma is rare.
- Growths (benign or malignant) from the rectum—besides the above mentioned—are usually polypoidal in shape, are very rare and would be best diagnosed on a histopathological assessment.

**LEARNING POINTS**

- Recurrent rectal prolapse needs submucosal injections
- Bleeding with prolapse is suggestive of a rectal polyp.

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**CASE 5: VOMITING IN A NEWBORN**

**CLINICAL PRESENTATION**

A 1-day-old full-term newborn has vomiting after every feed.

**CLINICAL CASE SCENARIOS**

- The child drools out every feed, does not take adequate feeding and has frothing in between feeds. The abdomen is usually a little distended but occasionally will be scaphoid. Within a short interval, especially if the attempt to feeding is continued enthusiastically, the baby develops respiratory symptoms like tachypnea progressing to distress.
  - Frothing at the mouth should immediately give a strong suspicion of an esophageal atresia and feeds should be withheld till the time that the same is ruled out. There may be an antenatal H/o polyhydramnios with an absent gastric bubble on antenatal USG but this is a rare scenario.
  - A stiff rubber tube (number 8 red rubber catheter) or a number 12/14 FG Ryle’s tube is passed per orally into the esophagus. In case of an esophageal atresia, the tube arrests in the mid-thoracic region and does not go beyond. A thin infant feeding tube, if passed instead, has a tendency to coil in the dilated upper segment of the atretic esophagus and may give an erroneous impression of having gone into the stomach. Even air test (injecting 10 mL air into the feeding tube to confirm its presence in the stomach) may be fallaciously positive due to transmitted sounds. The arrest of the stiff catheter in the upper pouch is clinically a diagnostic test. The same maybe confirmed by a lateral chest X-ray with the tube in the upper pouch, which would clearly document the presence of the tube in the upper pouch. The need for injecting a radiopaque dye into the upper pouch is rarely recommended in view of the possible complications of the spillage of such a dye into the respiratory system. The
lateral chest X-ray additionally shows an air esophagogram of the lower esophageal pouch in the commonest variety of esophageal atresia (Fig. 11) (wherein the atretic lower pouch communicates with the bronchus or trachea) and thus gives a reasonable estimate of the gap between the two esophageal segments.

- The repair of an esophageal atresia with tracheoesophageal fistula is a high priority surgery rather than immediate surgery. The neonate should be stabilized as far as the respiratory condition is concerned before planning the thoracotomy. With advances in thoracoscopic techniques, an increasing number of pediatric surgical centers in the world are resorting to thoracoscopic repair of this condition to reduce and prevent the long-term morbidity of an open thoracotomy.

- Nonbilious projectile vomiting in a neonate/infant may be indicative of a partial or a complete obstruction of the gastrointestinal tract (GIT) (pyloric/preampullary duodenal). Occasionally, severe gastroesophageal reflux (GER) too may present as a nonbilious projectile vomiting. A plain X-ray of the abdomen in a vertical position helps in most cases. In the former, the stomach shadow will be large with either paucity or absence of gas distally. A preampullary duodenal obstruction may give a double-bubble sign (Fig. 12). A USG of the abdomen will help to diagnose a hypertrophic pyloric stenosis whereas an upper GI contrast study will be required to diagnose the other conditions. The diagnosis of GER may require a contrast esophagography or a radioactive milk scan (Figs 13A and B). Either of the obstructive conditions (hypertrophic pyloric stenosis/prepyloric membrane/duodenal atresia) will necessitate a surgical exploration. It is, however, important to adequately resuscitate the child earlier in view of the loss of massive quantities of acidic fluid in the vomitus, which may cause significant dehydration and alkalosis.

- Biliary vomiting in a neonate invariably indicates an obstruction of the intestine. Very often
Table 1: Clinical differentiating features between primary dynamic obstruction and adynamic obstruction

<table>
<thead>
<tr>
<th>Primary dynamic obstruction</th>
<th>Adynamic obstruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Invariably evident since day 1</td>
<td>• Usually manifests later</td>
</tr>
<tr>
<td>• Usually failure to pass normal meconium or passed pale meconium</td>
<td>• Usually would have passed normal colored meconium.</td>
</tr>
<tr>
<td>• Abdominal distension usually limited to upper or up to mid-abdomen (rarely generalized)</td>
<td>• Abdominal distension invariably generalized.</td>
</tr>
<tr>
<td>• Chronologically, the systemic manifestations follow the features of obstruction</td>
<td>• Systemic manifestations precede the features of obstruction chronologically</td>
</tr>
<tr>
<td>• Abdomen is usually softer to touch</td>
<td>• Abdomen is usually more guarded</td>
</tr>
<tr>
<td>• Normal peristalsis usually audible (may be poor in duodenal obstruction)</td>
<td>• Peristalsis more tinkling in nature or absent</td>
</tr>
<tr>
<td>• Distinct fluid levels or double-bubble on vertical abdominal X-ray (Fig. 14)</td>
<td>• Ill-defined fluid levels and more of gaseous distension</td>
</tr>
</tbody>
</table>

this obstruction could be adynamic in nature wherein the most common causes are systemic like sepsis or electrolyte imbalances. The need to differentiate the same is important due to the totally different modes of treatment. Table 1 gives clinical differentiating features between the same.
The exception to these would be:

- A case of Hirschsprung’s disease (HD): A patient with an HD may pass some normal colored meconium and has a generalized distension which may manifest later than day 1 of life. The presence of distinctly visible or palpable transverse colon may help to suspect the same (Fig. 15). It may be proved radiologically on the demonstration of a typical cone on a distal cologram.

- A secondary dynamic obstruction after an adynamic obstruction, e.g. after an NEC perforation (Fig. 16). The features of NEC will precede the obstruction. Clinical or radiological signs of NEC like fixed bowel loop/pneumatocoeles/clumped bowel loops on USG, etc. may help to differentiate. Ground glass opacity in the abdomen on a plain X-ray would be indicative of peritonitis (Fig. 17).

- An infant with a malrotation of the gut too may pass normal meconium and may tolerate feeds for a few days before getting completely obstructed due to a volvulus neonatorum. The clinical and radiological features mimic a duodenal atresia but there may be some gas distally (Fig. 18). The fact that the obstruction has not started on day 1 should alert to the possibility of malrotation with volvulus neonatorum strongly. An abdominal ultrasound with Doppler/CT abdomen or a lower GI series will help to diagnose the same when in doubt. These children require urgent surgical intervention as the entire midgut may become gangrenous in case of a volvulus neonatorum.

**LEARNING POINTS**

- Bilious vomiting at any age invariably needs a surgical evaluation
- Persistent non-bilious vomiting needs a pediatric surgical evaluation.
**Fig. 14** Fluid levels mainly restricted to the upper abdomen in a jejunal atresia

**Fig. 15** Visibly distended transverse colon in a child with Hirschsprung’s disease (DS)
Fig. 16  Generalized abdominal distension with periumbilical redness in meconium peritonitis

Fig. 17  Ground glass appearance in a case of peritonitis with secondary obstruction and fluid levels
CASE 6: ACUTE ABDOMINAL PAIN IN AN INFANT

CLINICAL PRESENTATION

A 1-year-old healthy child suddenly starts crying with bouts of acute abdominal pain. In between the bouts of pain, the child is apparently normal and playful. There may be a prior history of upper respiratory tract infection (URTI). The pain is accompanied with an occasional vomit; nonbilious. There is no significant abdominal distension. The child has passed normal stool once since the onset of the attacks of pain. On a general examination, there are no gross findings and there is no significant abdominal distension. The patient has been given an antispasmodic but the pain continues.

Most cases of acute abdomen in children do not give significant signs, especially in the early stages. Additionally, the signs are often difficult to elicit in view of the non-cooperation of the child. A history that a good dose of antispasmodics has not given enough relief becomes very relevant and should raise a red flag toward the possibility of ischemic pain. The location of the ischemic organ may be helped if the child is old enough to show the site of the pain. Ischemic pain occurring from any of the paired organs of the abdomen (e.g. ureter/gonads) is localized to the ipsilateral side of the abdomen whereas ischemic pain occurring from an unpaired organ, (e.g. from GIT) typically is felt in the midline. Pain in the epigastric region or retrosternal usually arises from the preduodenal portion of GIT including the pancreaticobiliary tree, a periumbilical pain could have its origin anywhere from the duodenum till the mid transverse colon including the appendix whereas a hypogastric colic is more suggestive of either distal colonic pathology or distal urinary pathology.

Fig. 18 Double-bubble with gas filled distal bowel loops
EXAMINATION

An ultrasound examination of the abdomen helps especially in identifying renal or gonadal pathologies but is less sensitive for most bowel or appendicular pathologies except for diagnosing intussusception.

DIFFERENTIALS

- Intussusception: High possibility in view of age and presenting features; diagnose on USG or occasionally a contrast enema. In early cases (< 24 hours history), an attempt for hydrostatic reduction either under ultrasound or fluoroscopic guidance is strongly recommended. In later cases, there needs to be a clinical assessment and in case a nonviable bowel is suspected or hydrostatic reduction fails then surgical exploration may be indicated.

- Gonadal pathology, especially torsion: In every case of abdominal pain, it is essential to examine the entire torso of the child. A testicular torsion may thus be identified in view of a tender scrotum or a tender mass in the inguinal region (in case of torsion in an inguinal testis). Torsion in an ovary or in an abdominal testis will typically present as an acute abdomen with a more lateralized pain and sonography is a reliable mode of diagnosis.

- An acute appendicitis can present at any age though, occurs usually after the age of 5 years. The clinical presentation in younger children is more acute with a higher possibility of complications. The classical triad of pain, vomiting and fever as described in adults is often not seen and children are also not able to accurately describe the shifting of the pain from the midline to the right iliac fossa. A high degree of suspicion is necessary for the clinician as well as the sonologist to diagnose the same early. The lack of adequate fat planes in younger children may render a CT scan less reliable as a means of diagnosis.

- Intraperitoneal bands or adhesions may lead to internal hernia or localized volvulus. The same may also result from mesenteric cysts (Fig. 19). These patients have unremitting abdominal colics. There is also a very high possibility of closed loop obstruction which may lead to severe distension of a portion of a bowel loop and a high possibility of early perforation. Typically, perforation gives a temporary relief to the severe abdominal colics and there is false sense of

![Fig. 19 Mesenteric cyst leading to volvulus and acute abdominal pain](image-url)
remission of symptoms only to be taken over by generalized peritonitis and rapid deterioration of the condition of the patient.

- Colics originating from the urinary system are usually secondary to pathologies which are diagnosable on a USG. Occasionally an early pyelonephritis may not be identified on USG but a urine analysis will give the diagnosis.
- Infective hepatitis may present as an acute abdominal pain and in clinically suspected cases, one may need to rule out the same by biochemical evaluation.

**LEARNING POINTS**

- Gastrointestinal pathologies causing acute abdominal pain are often not diagnosable on abdominal imaging
- Careful clinical examination of the abdomen is often a key to successful management.

**CASE 7: CHRONIC ABDOMINAL PAIN IN A SCHOOL-GOING CHILD**

**CLINICAL PRESENTATION**

An 8-year-old girl c/o abdominal pain off and on since about 8 months. The pain is mainly umbilical in location. She gets the episodes of abdominal pain two to three times a day and they last for about 20–30 minutes. They would often subside on its own either after the passage of some flatus/stools or occasionally a vomit. On some days she may require an antispasmodic medicine. There has been some anorexia during this period but no significant weight loss. The patient has taken two courses of antihelminthics with antibiotics and anti-amoebic medications in the past 8 months. The course of medication is usually followed with a period of remission of pain for a few weeks and then once again the pain recurs.

**HISTORY AND CLINICAL EXAMINATION**

A patient of chronic abdominal pain requires a very thorough history and clinical examination since these may itself give a clue to the affected organ. The character of pain, the associated symptoms and a patient evaluation of the site of tenderness on the abdomen are important. Palpation of the abdomen requires the child to be sleeping comfortably and the flat of the palm and fingers should systematically palpate the abdomen. Poking the child’s abdomen with fingers should be avoided as it is likely to be eliciting an erroneous response.

**INVESTIGATIONS**

Routine investigations must include a hemogram, urine and stool analysis. Additional investigations may include an abdominal USG, an X-ray of the abdomen and contrast GI series in selected cases. The paucity of intra-abdominal fat planes in children and the need to sedate the pediatric patient limit the yield of CT scan and MRI as routine investigations. The detection of mesenteric adenitis on abdominal USG is more commonly indicative of a subacute or chronic infection of the GIT rather than abdominal tuberculosis unless there is evidence of caseation in the lymph nodes. Intercurrent subacute infections of the GIT may lead to mesenteric adenitis (akin to a cervical adenitis) and in most cases a repeat scan 6 weeks after a short course of antibiotics would show considerable regression in these lymph nodes. Persistence of symptoms and the sonographic findings may indicate persistent infections including a chronic infection of the appendix.
EXAMINATION

An endoscopic examination of the upper abdomen may be indicated in case the pain is distinctly epigastric or retrosternal and a colonoscopic examination may be indicated in those patients where there is an associated H/o of bleeding PR.

In all those cases, where the symptoms are significantly affecting the normal activities of the child or are creating an emotional deterrent to activities, one must consider more invasive investigations like a diagnostic laparoscopy before assigning a purely psychological etiology for the abdominal pain. Some of the pathologies which may not be identifiable by other investigations but detected on laparoscopy are congenital adhesions, pathological bands, a chronically inflamed appendix, a Meckels’ diverticulum (Figs 20 to 22) or some of the tubo-ovarian lesions.

**Fig. 20** Congenital Ladd’s bands leading to recurrent upper intestinal obstruction and abdominal pain

**Fig. 21** Terminal ileal adhesions leading to kinking of ileum and recurrent abdominal pain
LEARNING POINTS

- A detailed history is necessary to evaluate a pattern to the pain
- In the absence of a definite social pattern, like schooling etc., the pain is more likely to be pathological in nature
- Recurrent abdominal pain in children may lead to secondary functional complaints even into adulthood
- Diagnostic laparoscopy is very helpful in the refractory cases.

CASE 8: FOREIGN BODY INGESTION IN A CHILD

HISTORY AND CLINICAL PRESENTATION

Case 1

A 2-year-old child is brought with a H/o swallowing a safety pin about 30 minutes ago. There has been a single vomit but patient does not have any significant symptoms since then. On clinical examination, it is necessary to examine the pharynx for any local trauma and the neck for any obvious signs of tenderness/inflammation. The chest examination should be done for any localizing respiratory signs. In most cases there are no signs.

- In every case of foreign body (FB) ingestion, it is mandatory to take an X-ray to see the neck, chest and abdomen. This is essential even in a circular/inert FB like a coin (Fig. 23). In case the FB is lodged in the esophagus, these are best removed endoscopically since the possibility of complications due to persistent lodgment is high. Whereas flexible endoscopy offers a simpler methodology for extrication, the instrument channel in these instruments is often very small and it may not be proper for the removal of such FBs and in many such cases, the safer alternative may be a rigid endoscopic extrication under gastric analysis (GA).
The esophagus, and more particularly, the cricopharynx is the narrowest portion of the entire GIT. Therefore, in those FBs, which have reached the stomach, there can be an expectant line of management but this expectant line of management can be adopted only in those FBs which are not likely to cause a complication during their passage through the GIT. Open safety pins, sharp objects and battery cells are FBs which have a high potential for perforating or eroding the GIT during their passage and great caution needs to be exercised in these patients till the time that the FB is either removed or is passed out naturally.

Case 2

A 15-month-old child is brought with a H/o sudden breathlessness while eating peanuts. The child had a severe bout of coughing while eating peanuts after which he had an attack of breathlessness for about 30 min and is a little better since past 2 hours. On clinical examination, there is mild tachypnea but no distress, oxygen (O₂) saturations are within normal limits and on auscultation there are harsh breath sounds bilaterally.

Any infant where there is a H/o aspiration of FB should be treated as having a FB in the respiratory tract unless proved otherwise. This is essential since the persistent lodgment of an FB can cause significant long-term morbidity in the child which can even be fatal in some cases.

INVESTIGATIONS

- In case a routine chest X-ray is normal, an X-ray in full inspiration and another in full expiration must be done (Figs 24A and B). This may show suggestion of emphysema on one side. The other possible findings on chest X-ray include collapse or consolidation on one side.
- In some patients, the chest X-ray may be completely normal but in case of a positive history, a CT chest with virtual bronchoscopy should be requested for.
- Even in those patients where virtual bronchoscopy is inconclusive, but symptomatically there is a very strong suspicion of an FB aspiration, a diagnostic bronchoscopy is justified in view of the long-term morbidity or the potential mortality of the persistent lodgment of a respiratory FB.
LEARNING POINTS

• Cricopharynx is the narrowest portion of the GI tract, thus any foreign body which crosses the same is likely to pass through the entire GI tract.
• Foreign bodies which could create complications either due to their shape or chemical content during their passage may need intervention.

CASE 9: ASPIRATION SYNDROME IN AN INFANT

HISTORY AND CLINICAL PRESENTATION

A 7-month-old child has been having recurrent lower respiratory tract infections. The child has a H/o vomiting after feeds and occasionally gets choked while feeding. The mother has been burping the child. Weight gain is poor. Clinically there are no positive signs when there is no respiratory infection.

The child seems to have a classical aspiration syndrome; the most common causes for the same are either a GER or an H-type tracheoesophageal fistula. In the absence of detailed investigations, the clinical differentiation can be done by keeping the child on tube feeds for a week. In case the episodes of choking reduce during this period then there is a very strong chance of this being an H-type fistula since the tube feeds bypass the fistula and thus reduce the incidence of aspiration. In contrast, tube feeds increase the chances of reflux in a case of GER.

INVESTIGATIONS

• Chest X-ray: While the classical posteroanterior (PA) view may show a patch of consolidation, a good lateral view of the child in the vertical position is likely to show a prominent air esophagogram in a case of H-type fistula (normally the esophagus being a collapsed structure, it is seen as an opaque structure but in case of an H-type fistula, since air passage through the distal esophagus is continuously present, a negative shadow is cast).
• A contrast esophagogram helps to document the reflux if any and grade the same (Fig. 13). It may also document an H-type fistula (Fig. 25) but this often requires keeping the baby in the prone position to document.
• An H-type fistula is best demonstrated by a bronchoscopy (Fig. 26). In case the fistula is narrow in diameter, it may be possible to also treat it endoscopically with fibrin glue.
• A patient with significant GER (causing aspiration syndrome) may require a surgical correction of the GER.
DIFFERENTIALS

- An achalasia cardia may be identified on a contrast esophagogram (Fig. 27) and then further confirmation may be done on esophagoscopy and esophageal manometry.
- A vascular ring may be suspected on a lateral film of contrast esophagogram. The same may be confirmed on a vascular chest CT with three-dimensional (3D) reconstruction.

LEARNING POINTS

- Aspiration syndromes can be potentially lethal either due to choking or due to the complications of lower respiratory infections.
- Advanced imaging techniques (including nuclear scanning) along with endoscopic procedures can help their diagnosis.