CHAPTER 28

Intussusception

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INTRODUCTION

Intussusception means by definition that one portion of the gut is telescoping in another distal part with further motion of the intussusception into the intussuscipiens by ongoing peristalsis. The most common form is ileo-colic in 80–90% of cases, less often ileo-ileal occurs in up to 15% and rarely caeco-caceo-colic, jejuno-jejunal or even ileo-ileo-colic occur in a double or three-fold manner. Colo-colic is found more often in parasitic diseases.

As far as aetiology is concerned, a mobile ascending colon, malrotation or non-rotation facilitates intussusception. A leading point serves as head of intussusception, which is drawn into the distal gut by peristaltic activity, often in hyperperistalsis, as found concomitantly in episodes of gastro-enteritis or upper respiratory infections. The vast majority of cases are idiopathic (80–90%).

Swollen Payer's plaques in adenovirus or rotavirus infection protrude into the lumen of the bowel, initiating intussusception; so, lymphoid hypertrophy may be primary but is secondary as well, since swollen lymph nodes are found routinely. Mesentery is drawn into the intussuscipiens and is more and more compressed with lymphoid and vascular compromise, resulting in lymphatic and venous obstruction. Progressive oedema of the bowel wall finally leads to mucosal bleeding and possibly to arterial insufficiency and bowel necrosis.

Typical symptoms are explained by this pathological pattern. In an early state initial vomiting – found in 80% – and lethargy are caused by tearing of the mesentery; so far there is no obstruction, as well as no abdominal distension. Colicky, intermittent abdominal pain with pulling legs up to the abdomen begins acutely at the rate of regular peristaltic activities – initially around every 20 min – but with increasing frequency. Typically these attacks cease as promptly as they started and the child is quiet in between these regular recurrent attacks.

Examining the child, the right lower quadrant seems empty but a tender mass – mostly in the right upper quadrant – can be felt in about 85% of cases. In a later stage of intussusception, on rectal examination, mucous clots, currant jelly -like and occult, or even gross, blood may be seen. As soon as oedema and venous compression has developed, clinical obstruction of the bowel becomes obvious, leading to bilious vomiting, abdominal distension, dehydration, tachycardia, fever and shock.

Typical patients affected are usually 3–12 months old, well nourished and healthy infants. Incidence overall is 1–4%. Less than 1% of intussusceptions are found in neonates and up to 95% occur within the first 2 years (van der Laan et al. 2001). With increasing age a pathological lead point should be expected, especially when the child is outside the usual age range. In children older than 5 years a pathological lesion is found in 75–90%. Leading points often found are Meckel's diverticulum, polyps, appendix or lymph nodes; rarely found but well known are neoplastic lesions like carcinoid tumour or Hodgkin lymphoma, foreign bodies, ectopic tissue of pancreas or gastric mucosa, duplication cyst or, in newborns, atresia. Intramural haematoma may induce intussusception especially in Schönlein-Hennoch disease.

Figure 28.1

■ **Diagnostics.** Plain abdominal radiograph is only indicated in unclear diagnosis, showing only late specific signs of abdominal gas distribution or faecal contents and, finally, signs of bowel obstruction or perforation. In retrograde barium enema formerly used, the contrast medium is outlining the apex of the intussusceptum.

Figure 28.2

Ultrasonography as well as fluoroscopy with contrast enema is well established; ultrasonography is preferred mostly because there is no irradiation and diagnostic sensitivity of ultrasound (US) is 98.5% and the specificity is 100%. Typical patterns of US are target – or doughnut or pseudo-kidney sign. This means "ring in the ring" in the transverse section or a kidney-like formation in longitudinal section of the intussusceptum. Absence of colour flow in colour Doppler suggests compromise of the mesenteric vasculature, indicating a difficult reduction and a lower reduction rate.

Figure 28.3

■ **Non-surgical Treatment.** Before preparing for conservative treatment radiologists should inform the pediatric surgeon and the operating room. In recent literature there is no contraindication for a conservative trial of reduction in respect to hours of case history or position of the apex. But non-surgical treatment should not be undertaken in a patient with clinical signs of shock, peritonitis or heavy obstruction. Hydrostatic reduction was formerly done by a barium or soluble isotonic contrast enema. Nowadays, saline (Hartmann's solution) or air is preferred needing less fluoroscopy or even no irradiation at all, since hydrostatic reduction can be visualized and controlled easily by ultrasound. In comparison to barium enema, air reduction is reported to be quicker, less messy, decreases time of irradiation and shows a higher reduction rate (75 vs. 90%). In air reduction there is no risk of barium peritonitis. Hydrostatic reduction under ultrasound monitoring is, in the meantime at 89%, as effective as air reduction in experienced hands. Ultrasound during hydrostatic reduction reveals the head of the intussuceptum in transverse and longitudinal sections.

Figure 28.1

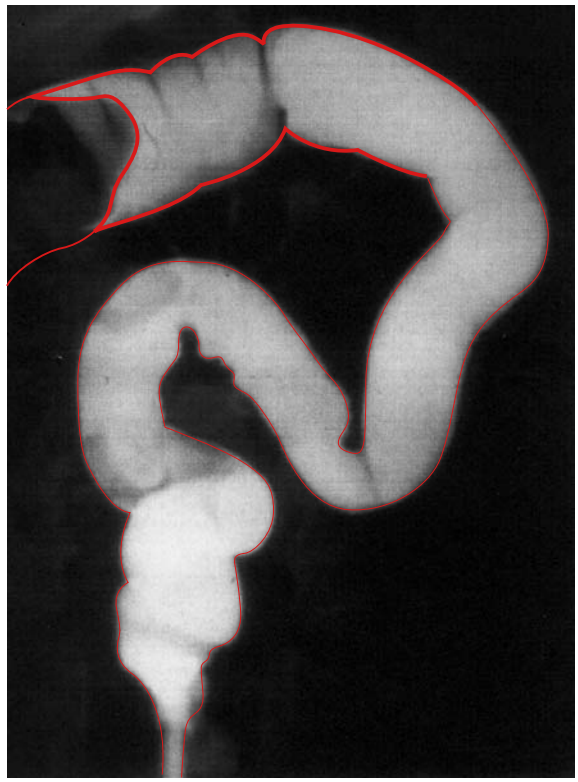


Figure 28.2

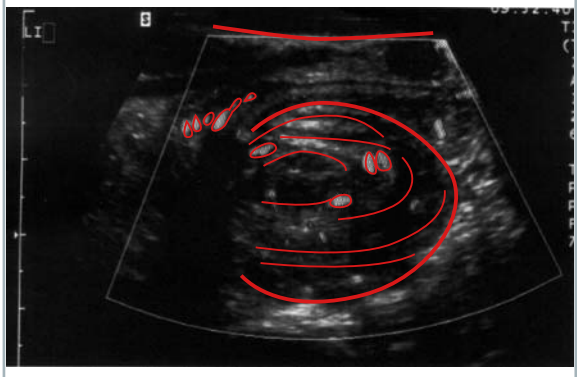


Figure 28.3

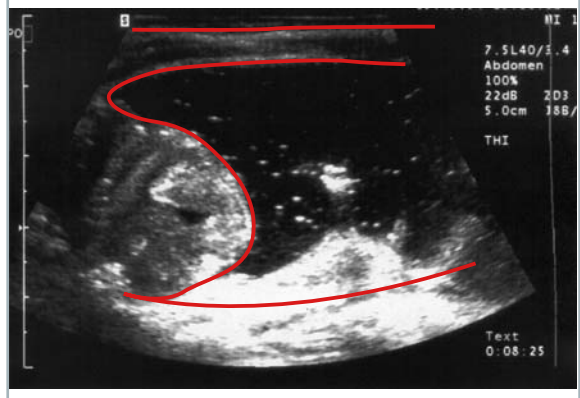


Figure 28.4

The technique of reduction is uniformly well accepted. The infant lies prone and should be on sedation and analgesics. A Foley catheter as big as possible is inserted into the ampulla of the rectum. The buttocks are squeezed together and taped to prevent leakage. Pressure used for reduction should not exceed 3 ft, i.e., 90–100 cmH_2O or 80–120 mmHg using air. Pressure can be maintained as long as reduction is occurring. In absence of progress for more than 3–4 min, hydrostatic pressure is reduced before reduction is started again for a second or a third time. Reduction may be continued for even 45–60 min as long as steady progress is being made. Often a delay in the caecum region is observed before free flow of air, saline or contrast medium into the distal small bowel is seen as well as the disappearance of the mass. Return of flatus or faeces indicates the complete reduction. Clinically the infant must show an overall complete improvement and lethargy should disappear in the following routine observation for 24–48 h. Prognosis of non-surgical reduction can be predicted according to sonographic pattern. If it is target-like, a reduction is to be expected in 100% of cases. In doughnut sign, patient's reduction rate is related to thickness, being 100% effective for a thickness less than 7.2 mm. Whenever it is more than 14 mm a resection is very likely required. Fluid within the head of intussusception means unsuccessful reduction is expected to be very likely. In unsuccessful or incomplete reduction the manoeuvre may be repeated after 2–3 h when the infant is still in good condition. The rate of recurrent intussusception after non-operative reduction is 13% in the typical age group. Complications of the reduction manoeuvre are perforation, marked by free air, and fluid or contrast medium intraperitoneally.

Figure 28.5

■ **Indication for Surgery.** A residual intraluminal filling defect even with terminal reflux into the ileum has to be considered as incomplete reduction. Early or multiple recurrences mean a likely leading point exists. Whenever a pathological leading point is suggested a straight-forward surgery is recommended. With evidence of a seriously ill patient with peritonitis by bacterial translocation, by perforation or by necrosis, as well as in a septic status, the treatment of choice is primarily surgical. Whenever no intussusception in the colon is found in obvious bowel obstruction by ultrasound or enema fluoroscopy, the operation should be started at once because intussusception is likely to be located in the small gut. Preparation of the patient for surgery in cases of intussusception should include decompression of gastrointestinal tract by open nasogastric tube, and monitoring of body temperature and oxygen. Laboratory studies show dehydration, electrolyte deficiencies, base excess abnormalities and inflammatory parameters. Antibiotics may be started even pre-operatively when there are signs of peritonitis or sepsis.

On the operating table, the child lies on his or her back with a roll under his middle abdomen and is under general anaesthesia including full relaxation. Mostly, a right transverse incision supra-umbilical at the umbilicus or lower is recommended, adapted to the position of the apex of intussusception. A midline longitudinal incision is an easier and quicker approach and may be used as well. Pararectal incision has been abandoned. Extensions of the incisions mentioned are readily possible if required. In right transverse line the skin is cut. Fat, anterior rectus sheet, rectus muscle, posterior rectus sheet and lateral abdominal muscles, i.e., m. obliquus externus, internus and transversus, are incised, mostly using diathermy. As soon as abdominal cavity is entered, free peritoneal fluid is aspirated and a swab is taken. Cloudy or sanguineous fluid raises the suspicion that a perforation or necrosis is going to be found.

Figure 28.4

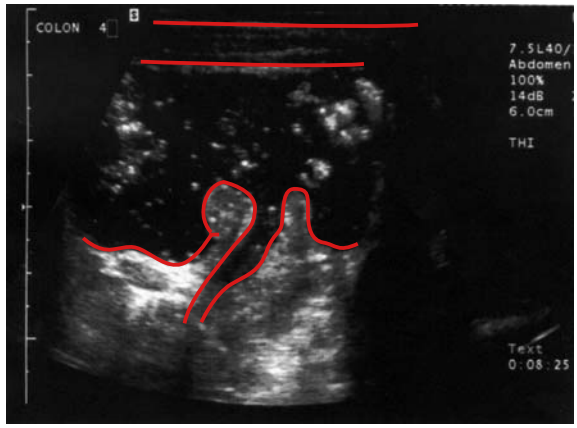


Figure 28.5

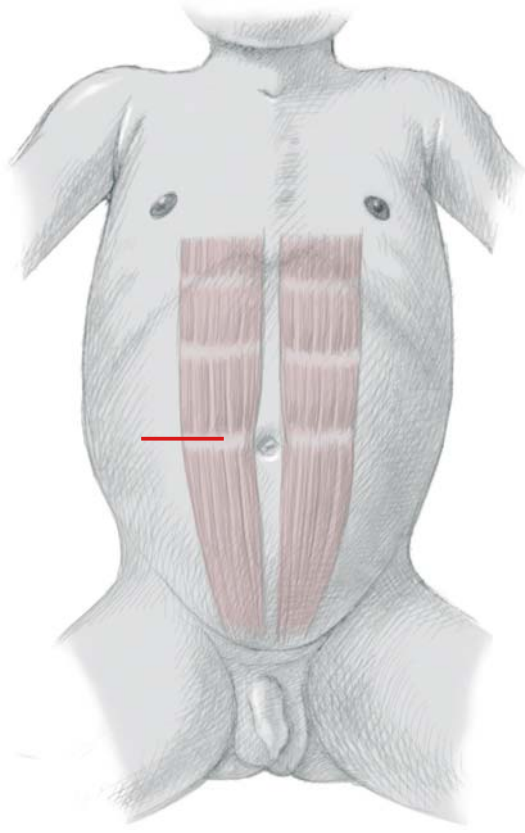


Figure 28.6

If the intussusception can be reduced easily and rapidly there is no need to deliver the intussusception. Thus, the incision may remain smaller, not bringing the whole intussusception outside the abdomen, as well as when a partial reduction could be managed intra-abdominally. But whenever the manoeuvre of reduction is difficult and an inspection of viability is necessary, it is easier to be done with the intussusception outside. In order to deliver the intussusception it may be wise to mobilize the bands of right ascending colon to lateral abdominal wall by division. Often this is not necessary because of a mobile caecum and ascending colon. Fluid contaminated by bacterial translocation may escape from the space between intussusception. Therefore, positioning of packs should avoid further contamination during reposition. Manual reduction has to be performed very carefully and slowly. Taking the apex of intussusception between fingers and cup of the surgeon's hand at the distal end, the intussusception is squeezed gently in a retrograde direction distally to proximally. A layer of gauze between bowel and fingers may facilitate this procedure. This gentle manipulation should be more pushing at the apex rather than pulling proximally at the intussusception. Time is an important factor since oedema must be allowed to dissipate in order to avoid serosal or even seromuscular tearing. Should this happen, serosal defects are left alone, seromuscular flaps are repositioned and fixed by 5/0 stitches. Attempts to perform reduction with instruments are followed by heavy laceration due to oedema and fragility. The reduced bowel wall is always oedematous with a non-shiny serosa, but may be discoloured or even blue or black. As a test of viability, administering moist and warm wraps may serve in order to check whether there is a regular colour coming back after some minutes of waiting.

Figure 28.7

A check for a leading point is very important. It is regularly found after a full reduction that the circumference of the bowel formerly intussuscepted is thickened and oedematous and a typical dimple is recognised at the site of the former leading point. This dimple, a Payer's patch or an oedematous ileocecal valve can mimic an intraluminal pathological mass as lead point, but careful palpation and the knowledge of this likely condition of dimple formation should prevent excising local tissue as a probe or even an unnecessary resection, particularly in the typical infant age group.

Appendectomy is usually perfomed. Additional fixation of terminal ileum is hardly mentioned in the literature. To preventing a second intussusception, it does make sense to fix that part where the disease is starting most often, i.e., the terminal ileum. Three sero-serosal stitches, 5/0 or 4/0, from terminal ileum to ascending colon are performed quickly and not interfering with mesenteric vessels. Since the rate of recurrence is not high, it remains a personal decision regarding whether to do a fixation at initial intussusception. In recurrent intussusception it is of definite benefit, since the ileocecal valve is widened.

For closure the abdominal cavity is irrigated with warm saline. No drainage is used. The peritoneum and posterior rectus sheet is closed at the same time by running 3/0 sutures. Continuous suturing is also sufficient for anterior rectus sheet. A subcuticular 4/0 running suture provides a good skin adaptation and a cosmetically good scar. Skin closure by intracuticular suture line, by fibrin sealant or metal clips is optional.

Indications for resection include irreducible intussusception, gangrenous bowel or perforation of the bowel. After resection of the bowel, end-to-end intestinal anastomosis is completed in a similar way as shown in Chap. 22.

Figure 28.6

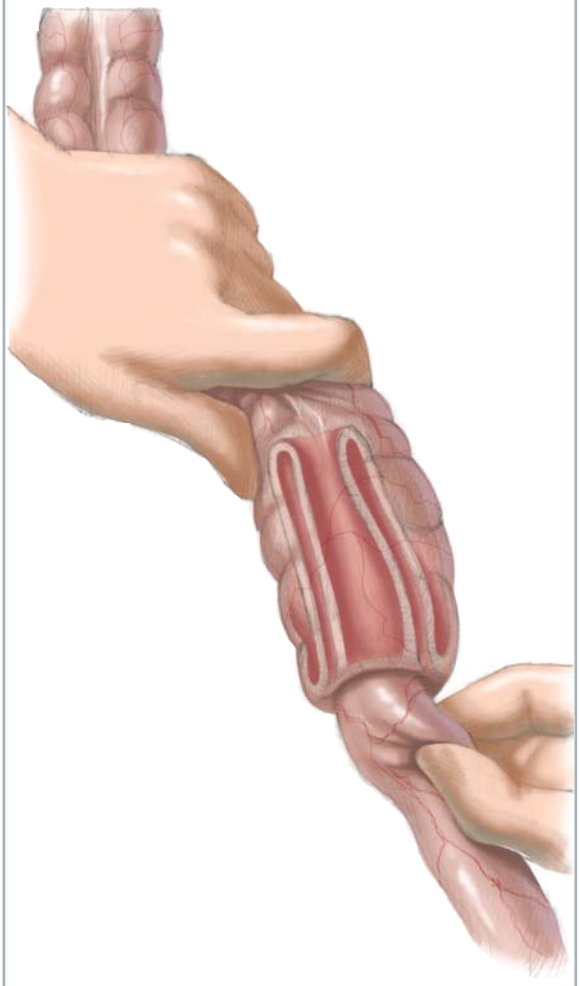
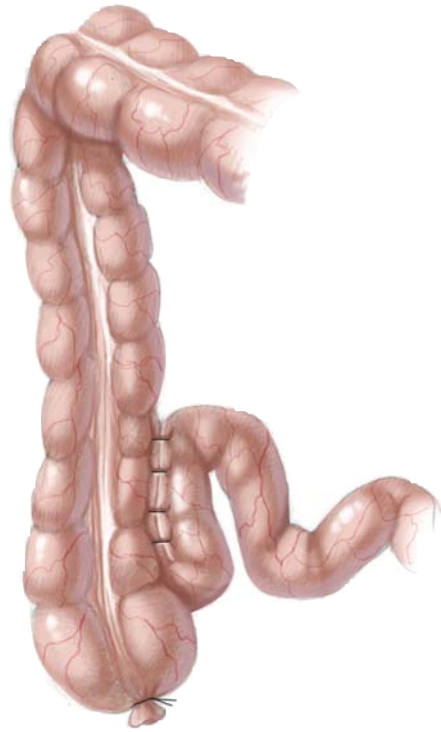


Figure 28.7



CONCLUSION

■ **Postoperative Care.** In a regular case without resection nasogastric tube delivers decompression of the upper gastrointestinal tract for 1 or 2 days and patients are kept on intravenous lines for substitution of fluid and glucose. As soon as oedema of the bowel wall is dissipated, the passage and peristalsis recovers early. Satisfactory bowel function is indicated by an absence of spontaneous bile-stained flow out of nasogastric tube. The abdomen is soft early on, is not distended and during gentle palpation it does not hurt. Post-operatively there might be a short period of elevated body temperature but patients should clinically recover rapidly. Antibiotics are administered according to the intra-operative situs. Single shot is sufficient in most cases with normal reduction manoeuvres. In cases of resection and opening the gut, the post-operative course is prolonged. Patients may be discharged as soon as taking sufficient fluid and having bowel motion. Parents should be informed whether an appendectomy has been performed or not.

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■ **The Role of Laparoscopy.** In a suspected jejunal or ileal intussusception or in the case of post-operative or chronic intussusception, laparoscopy might be a diagnostic tool or the treatment might even be laparoscopically. A routine diagnosis of a primary intussusception by laparoscopy should be exceptional since ultrasound is perfect. A primary attempt to reduce an ileo-colic intussusception by laparoscopic instruments does not correspond to the treatment of gentle squeezing the apex instead of pulling. In the literature a warning is given because laparoscopical instruments may easily damage the vulnerable bowel.

■ **Recurrence of Intussusception.** Recurrent intussusception is seen after hydrostatic or air reduction over all in around 13% of cases. Recurrence is less likely after surgical reduction, especially when a fixation of terminal ileum was performed. A secondary intussusception may be reducible at the same rate as in the initial episode. It may be expected in around 30% of cases within the first post-operative day. Clinically irritability and discomfort are the first signs of an early recurrence. Therefore, it makes sense that these patients, even with a definite non-surgical reduction approach, are observed for this period of 24–48 h in the hospital. Indication for surgery in recurrences is given in patients with more than one episode of recurrence, because success rate diminishes with multiple recurrences. Here, additional suspicion of an anatomical leading point arises, especially when children are older than 2 years of age.

Post-operative intussusception after abdominal and thoracic procedures do not occur often but are well known in the literature. Especially prone to this condition are those procedures due to gastro-oesophageal reflux, Hirschsprung's disease and neuroblastoma. Intussusception is found in up to 10% of all post-operative intestinal obstructions. These are mostly ileo-ileal. Prolonged bilious nasogastric reflux, bile-stained vomiting, diffuse pain and abdominal distension are the clinical signs but are hardly to be distinguished from other usual post-operative problems like adhesions, the beginning of anastomotic leakage or abscess formation.

Chronic intussuception is a rare condition. This means a non-strangulating, long-lasting intussusception of a minimum of 14 days, mostly due to anatomical leading points. The clinical picture is dominated by chronic diarrhoea, which is resistant to any therapy. Patients are evacuating bloody or mucous stools and suffer from colicky pain including episodes of vomiting all the time, leading finally to weight loss. Diagnosis can be achieved by ultrasound, contrast studies or even by laparoscopy.

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