

CHAPTER 61

NEONATAL INTESTINAL OBSTRUCTION

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Introduction

Neonatal intestinal obstruction (NIO) is one of the most common emergency conditions a paediatric surgeon is called upon to assess during the neonatal period. Successful management of NIO depends on timely diagnosis and referral for therapy. The diagnosis is based on history (symptoms) and physical examination (signs) confirmed by some investigations such as radiographic and histopathological studies. Catastrophic events such as volvulus, ischaemic loop of bowel, pneumoperitoneum, and/or pneumonia from aspiration and malnutrition could be overcome through efficient and timely resuscitation and urgent transport to a specialised unit.

The desired goal of healthy survival of neonatal intestinal obstruction requires a coordinated interaction of medical, nursing, and rehabilitative specialties in an organised team. Early surgical intervention is paramount and may mean all the difference between intestinal salvage and crippling short gut syndrome. The typical case of neonatal bowel obstruction is generally straightforward, and the outcome is potentially excellent. Only very preterm babies and those of extremely low birth weight may succumb. However, in Africa, late presentations and poor resources lead to a mortality of up to 30%.¹ Few dedicated paediatric hospitals exist in developing countries.²

Intestinal obstruction can be complete (atresia, anorectal malformation (ARM)) or incomplete (stenosis, web). Obstruction may be intraluminal (meconium ileus or meconium plug syndrome) or functional (Hirschsprung's disease (HD)). Proximal obstruction presents with earlier vomiting and less abdominal distension, whereas distal bowel obstruction tends itself to late-onset and greater abdominal distension. This chapter provides an overview on neonatal bowel obstruction. Each specific condition is covered in chapters elsewhere in this book, specifically, Chapter 58 (inguinal and femoral hernias and hydrocoele), Chapter 62 (duodenal atresia and stenosis), Chapter 63 (intestinal atresia and stenosis), Chapter 65 (intestinal malrotation and midgut volvulus), Chapter 67 (meconium disease), Chapter 76 (Hirschsprung's disease), and Chapter 77 (anorectal anomalies).

Demographics

The incidence of NIO is approximately 1 in 5,000 live births. The true incidence in Africa is unknown, but a recent report from Tanzania has shown that it is still the most common neonatal surgical emergency.¹ Many cases still die undiagnosed and untreated.

Aetiology/Pathophysiology

Neonatal intestinal obstruction has varied aetiology, so the pathophysiology is diverse.

The gastrointestinal tract (GIT) arises from the yolk sac. At 3 to 4 weeks' gestation, it becomes a distinct entity. A connection, the vitelline (omphalomesenteric) duct, may persist as a Meckel's diverticulum. The alimentary tube is divided according to its blood supply into the foregut, midgut, and hindgut.

The foregut comprises the oesophagus, stomach, and duodenum. These are vascularised by multiple sources—the thyrocervical, intercostal, celiac axis, and superior mesenteric vessels.

The midgut comprises the jejunum and ileum as well as the ascending and proximal transverse colon. These are supplied by the superior mesenteric vessels.

The hindgut comprises the distal colon, which is supplied by the inferior mesenteric vessels, and the rectum, which is supplied by the internal iliac vessels.

Aberrations of foregut formation include duodenal stenosis, duodenal atresia, and annular pancreas. Maldevelopment of the midgut includes malrotation as well as jejunal and ileal atresia. Meconium ileus involves the distal ileum. Hirschsprung's disease (ganglionic megacolon), meconium plug syndrome, and imperforate anus involve the hindgut. Enteric duplications occur in all three locations.

Jejunoleileal atresia is a condition acquired during foetal development due to disruption of the mesenteric blood supply. In their classic work on foetal dogs in 1955, Lowy and Bernard from Cape Town, South Africa, clarified the pathophysiology of jejunoleileal atresia.³ Other abdominal conditions occurring in utero, such as gastroschisis, volvulus, or intussusception, may be associated with intestinal atresia due to kinking, stretching, or otherwise disrupting the blood flow to the foetal bowel. Chromosomal anomalies are rare (<1%) in babies with jejunoleileal atresia.

Meconium ileus is the earliest manifestation of cystic fibrosis (CF), an autosomal recessive condition characterised by abnormalities in cellular membrane physiology and chloride ion transport that contribute to progressive respiratory failure, derangements in cellular secretory patterns, and diminished mucosal motility. In developed countries, 10–20% of newborns with CF present with meconium ileus, an association first described by Landsteiner in 1903.⁴ A cystic fibrosis gene that is different from that in the Caucasian population has been identified in the Black African population,⁵ however, the incidence in Africa is much reduced, and in many sub-Saharan countries, the disease is not reported.⁶

Abnormalities in the cystic fibrosis transmembrane regulator (CFTR) disrupt transmembrane flux of the chloride ion, which subsequently affects sodium transport as well. The meconium of affected babies is thick and sticky; this, coupled with the poor motility of an immature intestine, leads to intraluminal obstruction of the terminal ileum. A contrast enema might reveal the characteristic finding of a microcolon. It is essential to push the contrast up to the level of obstruction, namely, the distal ileum to be therapeutic by flushing out the meconium plugs (Figures 61.1 to 61.4).

Meconium plug syndrome refers to inspissated meconium obstructing the colon; it may denote HD but not CF. Conditions that predispose to dysfunction of the neonatal bowel (e.g., maternal pre-eclampsia, diabetes mellitus, administration of magnesium sulfate, prematurity, sepsis, and hypothyroidism) may be responsible for the formation of the meconium plug. A water-soluble contrast enema can be both diagnostic and therapeutic for this condition.

Hirschsprung's disease is a disorder of the neuroenteric pathways in the distal colon that results in a bowel that is tonically contracted. Bowel peristalsis is controlled by neuroenteric ganglion cells, which

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