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Neonatal gastrointestinal imaging

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Abstract

Radiological imaging is an important part of the evaluation and management of neonates with suspected anomalies of the gastrointestinal tract. Clinical presentation is often non-specific, commonly with abdominal distension and vomiting for which the underlying cause may or may not be clinically apparent. In a proportion of patients, the clinical assessment alone may suffice in providing the diagnosis and no further imaging is necessary. The reader must have an understanding of the normal radiographic appearances of the gastrointestinal tract in neonates and appreciate normal variants and differences to adults. In certain cases, the abdominal radiograph alone is diagnostic. In others, sonography and contrast studies are useful adjunct investigations and the indications for CT and MRI are few, but specific. Appropriate radiological investigation will help to establish the diagnosis and guide surgical intervention whilst also avoiding unnecessary radiation.

Some of the conditions require transfer to specialist paediatric institutions for care. Thus, in some circumstances it is appropriate for imaging to be delayed and performed at the specialist centre with early referral often essential for the continued well being of the child.
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1. Introduction

Imaging plays an important role in the diagnosis and management of gastrointestinal (GI) disorders in both full term and preterm neonates. Imaging serves to help direct management, establish a diagnosis and look for associated anomalies. The type of imaging selected depends not only on the clinical scenario but also on a desire to minimise unnecessary radiation exposure in small babies.

Clinical presentation in neonates is often non-specific. Common presentations include abdominal distension and vomiting, which may, for example, be present in mechanical obstruction, sepsis or necrotising enterocolitis (NEC). Thus, two babies may present with the same symptoms and signs but have different underlying pathology. The initial radiological investigation is usually the plain abdominal radiograph (aXR), and in some conditions ultrasound (US). Knowledge of the general principles of aXR interpretation in the neonate is essential.

This article serves to highlight some common neonatal GI disorders that the radiologist may encounter and to help guide appropriate investigations to elucidate the cause. The rarer, more esoteric conditions are beyond the scope of this article.

2. Obstruction

In the normal term neonate air enters the stomach soon after the first breath and proceeds into the proximal small intestine within minutes. It is seen in the distal small bowel by 3 h, the caecum at 6 h and the rectum by 24 h. The bowel gas pattern in normal neonates differs from older children in that the differentiation into the typical appearances of small and large bowel has not yet occurred making it difficult to accurately determine the level of obstruction. Causes of neonatal obstruction can be broadly categorised into *high GI* and *low GI*. High GI includes obstruction to the level of, and including the proximal jejunum and the diagnosis can often be made by aXR alone. Presentation is usually with vomiting which is bilious if the obstruction is distal to the ampulla of Vater. Distal GI obstruction includes those from the mid–distal jejunum to the anus, produces less classical radiographic appearances, and usually requires further radiological investigations before a diagnosis can be made. These neonates may present also with abdominal distension and vomiting, but failure to pass meconium is the key to the diagnosis. Two conditions that mimic obstruction are *paralytic ileus* and

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infants post resuscitation. Paralytic ileus tends to present with uniform dilatation of the bowel loops to the level of the rectum. Post resuscitation, the bowel loops are distended with gas only and thus air fluid levels are absent. In mechanical obstruction, there is variation in the calibre of the bowel loops with dilatation of the bowel proximal to and collapsed bowel distal to the obstruction. Investigation of the neonate with suspected obstruction usually involves chest and aXR and contrast studies. US can be very useful such as to confirm hypertrophic pyloric stenosis and duplication, mesenteric, omental and choledochal cysts.

2.1. Oesophageal atresia and tracheooesophageal fistula

This is a common condition occurring in approximately 2.5 per 10,000 live births. The incidence in Caucasians is double that in the non-white population, and is increased in the offspring of a parent who had tracheo-oeophageal fistula (TOF) as well as in siblings, especially twins [1,2]. The classification of oesophageal atresia (OA) and TOF is based on their anatomic and radiographic appearance (Fig. 1). The fistula usually presents above the carina [3].

Clinical presentation is early after birth with cyanosis, respiratory difficulty, excessive oral secretions and drooling. The diagnosis may be suspected on antenatal US in the presence of maternal polyhydramnios, absence of the stomach bubble and a distended fluid filled proximal oesophageal pouch. Postnatal chest radiograph may demonstrate the distended air filled oesophageal pouch and a nasogastric tube sited abnormally high. The aXR demonstrates a completely gasless abdomen in the absence of a distal fistula, but if a fistula is present varying amounts of abdominal gas may be present. It is important for the surgeon to know the position of the aortic arch. The site and number of fistulae present can be identified via fluoroscopic upper GI contrast study using non-ionic water soluble contrast. The H-type fistula usually runs an upwardly oblique course (Fig. 2) and is frequently only confirmed in the prone position. In the case of suspected OA alone without associated fistula, positive contrast is not recommended due to the high possibility of aspiration. Negative contrast using air alone is preferred. US has been utilised in the diagnosis and evaluation of OA and TOF [4]. The blind upper oesophageal pouch is well seen in OA. In OA with isolated TOF, detection of air bubbles in the soft tissues between the trachea and oesophagus or ascending in the oesophagus confirms the fistula.

Post-operative complications include anastamotic stricture, which is more common than anastamotic leak (15%) or recurrent fistula (3–14%). Other rarer complications include vocal cord dysfunction, gastro-oesophageal reflux and peptic oesophagitis, tracheomalacia, oesophageal dysmotility and failure to thrive. Approximately 50% of patients with OA and TOF have additional anomalies which account for the major cause of mortality and which require further more dedicated imaging [5];

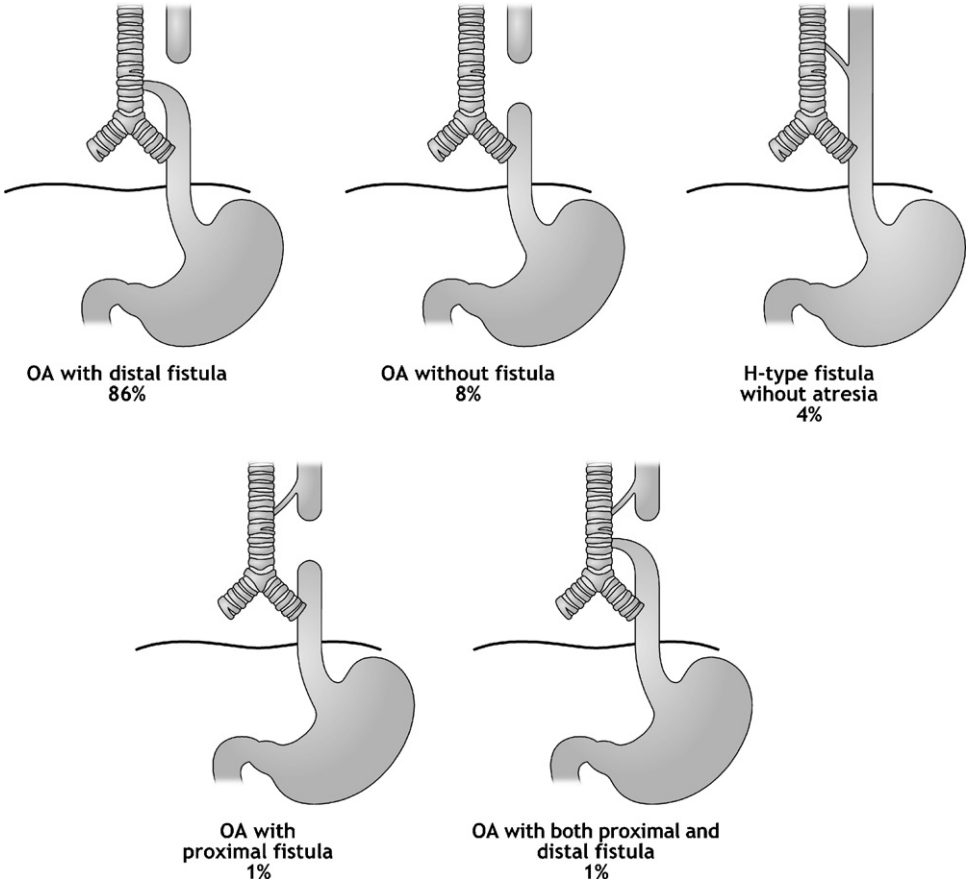

Fig. 1. Classification of oesophageal atresia and tracheooesophageal fistula.

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