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Case Study

So You Think This Baby Has Appendicitis? The Subtle Clues and Deceptive Signs -

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SUMMARY

Diagnosing appendicitis in infants is challenging due to varied and heterogeneous presentations. Whilst the condition is uncommon, the consequences of missing this in a busy Emergency Department (ED) can be catastrophic.

We report an 8-month-old infant who presented to ED with a brief history of reduced feeding, lethargy and vomiting with normal observations. Excessive crying was noted when the child was supine, he was consolable when placed prone. Due to these paroxysms of crying which varied with position, investigations were commenced. He had a good clinical outcome.

A high degree of suspicion is needed in preverbal children. Clinical examination, observation of the behaviour of the child and parental concern remain key to diagnosis. Through this paper we aim to explore the clinical conundrum of making the diagnosis in this age group and the modalities which help in decision making.

BACKGROUND

Abdominal pain and vomiting, followed by fever are the most common presenting symptoms of appendicitis, with abdominal tenderness and temperature over 38°C being the most common signs. Whilst the diagnosis of appendicitis is more straightforward in older children, infants pose a particular challenge. Difficulty in examination and limitations in imaging also contribute to this challenge. Their clinical presentation may simulate other more frequent medical conditions like a urinary tract infection, gastroenteritis and constipation as well as other surgical conditions like intussusception and incarcerated hernia. Appendicitis should be considered as a possible diagnosis in a child presenting with vomiting, fever and abdominal tenderness. Nonspecific signs and symptoms account for overall misdiagnosis rate between 19 to 57% in preschool children [1]. Early diagnosis and treatment are integral to preventing complications such as perforation which is common in younger children [2].

CASE PRESENTATION

The index case presented to ED with a one-day history of lethargy, reduced feeding and one episode of vomiting. His vital signs were within normal limits for his age, sepsis screen was negative and the PEWS score was zero. He had a witnessed good volume feed during his stay in ED and a wet nappy. Senior review was sought prior to discharge due to his age. At the time of the second examination he was noticed to be crying excessively when laid supine, the crying would settle when he was placed prone on mother's chest. This unusual variation depending on position triggered further investigations.

Parents reported that his abdomen appeared distended however this was not clinically obvious. The abdominal examination was limited as he cried throughout, however the abdomen was soft on palpation and there were no palpable masses or organomegaly. The rest of the examination was normal.

Following maximal analgesia he improved rapidly and was alert and smiling. The episodes of excessive crying which was positional and thought to be splinting triggered further investigations. An ultrasound abdomen arranged out of hours showed no signs of intussusception. However it was noted, the patient cried briefly when the ultrasound probe was placed on the abdomen but subsequently settled. The ultrasound also revealed normal testicular appearance.

Baseline investigations were carried out; the clean catch urine dip was clear, blood gas unremarkable with a lactate of 1.4 mmol/l, laboratory blood tests showed a white blood cell count 14.4 10⁹/l with neutrophils of 8.1 10⁹/l and a markedly raised C-Reactive Protein (CRP) of 238. He was treated with intravenous Ceftriaxone.

He was discussed with tertiary centre surgeons for referral for a surgical abdomen. The surgical team thought that it was unlikely to be a surgical cause as the ultrasound was normal and the child had improved clinically. The advice was to manage locally and investigate for the focus of infection.

He was admitted to the ward, an LP was considered then deferred as he appeared clinically well. On the morning ward round, he was observed to be smiling and feeding with normal observations. He however showed discomfort when his abdomen was palpated. A repeat ultrasound was reported as colitis. Second surgical input was sought and the child was transferred out to a tertiary centre. A Computer Tomography (CT) scan done 36 hours after his initial presentation to PED showed a retrocaecal appendicular mass. He was treated conservatively with intravenous antibiotics for 14 days and had an interval laparoscopic appendicectomy several weeks later. He had a good clinical outcome.

The confounding factors in the index case were;

- the age
- the non-specific presenting symptoms
- good improvement with analgesia
- no anorexia and the lack of systemic symptoms

The retrocaecal position of the appendix and the formation of an appendicular mass also contributed to the delay in diagnosis.

Parental concerns regarding abdominal distension and the clues from observing the behaviour of the infant in ED helped to guide investigations. Children have the ability to compensate physiologically before deteriorating rapidly. This is a clinical conundrum, the clinical condition of a child should be interpreted taking into account parental concerns, observations, clinical examination and investigations.

Outcome and Follow-Up

The child made a full recovery, he was discharged from follow up.

DISCUSSION

Appendicitis in infancy is uncommon and these children are nearly 3 times as likely to have perforation at the time of diagnosis compared to adults [3]. Data gathered over a 13 year period on the demographics of children with appendicitis showed that only 2.9% of cases were ages 0-2 years, compared to 83.7% of cases who were in the age group of 6-15 years [1]. Amongst the cases aged 0-2 years the most common presenting complaints were fever closely followed by vomiting and then diarrhoea, whereas in the 6-15 year-old age group the presenting complaint was focal abdominal pain followed



by vomiting [1]. In the index case the two factors which indicated an abdominal surgical pathology were the positional “splinting” and the “probe tenderness” during abdominal ultrasound. These are subtle signs which are easily missed especially as the child went on to demonstrate wellness. This illustrates the comparative difficulty in diagnosing cases of appendicitis in infants compared to older children.

Case reports of young children with appendicitis show a similar characteristics with vague abdominal complaints. A case report of an 8-month-old girl presenting with vomiting, dehydration and fever, who initially passed an oral fluid challenge and was thought to have gastroenteritis, later deteriorated and was found to have a necrotic perforated appendix [4].

A correlation has been demonstrated between younger age groups and perforation rate although it is not proven that this is a direct result of delay in presentation or diagnosis. A study found that while the perforation rate is higher the younger the age (86% in age <1 year), it was not associated with higher post-operative abscesses [2].

WBC and CRP are commonly used biomarkers if appendicitis is suspected. However, WBC has low sensitivity and specificity with CRP being more specific and more sensitive in detecting perforation or abscess formation [5]. A study of 100 children with appendicitis found that 7 of them had a normal WBC and CRP [6]. In contrast, a study of 98 adults with appendicitis, none were found to have both normal WBC and CRP [7]. In children appendicitis remains a clinical diagnosis.

Ultrasonography is the most frequently used imaging modality; however it has limitations of being highly user dependant with a wide range in sensitivity for the diagnosis of appendicitis. A study found that ultrasonography had a sensitivity of 44% and specificity at 93% [8]. In the index case the first ultrasound was reported normal, the second ultrasound which was done by a paediatric radiology consultant reported colitis.

CT scan is known for its sensitivity and specificity in diagnosing appendicitis, however it is used with caution in paediatric patients because of the radiation exposure and its use must be justified with a favourable risk to benefit ratio. Studies have reported sensitivity of CT scan in the diagnosis of appendicitis between 87% and 100%, and a specificity of 83% to 100% [9,10]. CT is preferred for its ability to visualise a retrocaecal appendix.

In the index case, the CT scan reported an appendiceal phlegmon in the right iliac fossa. The infant benefited from the diagnosis and based on this a conservative approach was preferred. An appendicular mass is found on presentation in 30-50% of paediatric appendicitis cases under the age of three [11,12]. This mass can consist of a phlegmon, an inflammatory tumour consisting of the inflamed appendix, adjacent viscera and omentum which can form a circumscribed abscess. There is discussion as to the most appropriate management of appendiceal masses, immediate appendectomy is technically challenging due to the distorted anatomy as a result of the mass and it is associated with higher rates of morbidity compared with non-surgical management [13,14]. Traditionally the child would be managed conservatively with antibiotics and some weeks later once the inflammation had resolved a laparoscopic appendectomy would take place to prevent recurrence.

In the index case the initial management was conservative with

antibiotics and watchful waiting, an interval appendectomy was then performed.

Learning Points/Take Home Messages

- Infants with appendicitis have a non-specific presentation. Clinical examination, observing subtle clinical signs and having a high index of suspicion is important in making the diagnosis. The clinical presentation mimics other medical conditions which can lead to a missed diagnosis.
- Perforation is common in infants and younger children; hence swift action is essential. The presence of a senior decision maker is vital to guide management. The decision to observe, investigate and treat is based on experience.
- Combining investigative tools (bloods and imaging) gives a better chance of diagnosing appendicitis.
- Admission and observation is recommended when the evidence is not clear.
- The management of complicated appendicitis is still under discussion (conservative versus operative management).
- Clinical acumen is key, if it doesn't feel right it usually isn't.

No Competing Interests Declared

CP conceived the original idea, YR wrote the draft, all authors contributed and agreed on the final draft. Consent obtained from parent. Parent perspective added.

Parent Perspective

The following is an e-mail written by the mum of the 8-month-old boy, giving her point of view on the experience.

When patient was born he spent his first 20 days in NICU...the result if which is I've been left with like PTS/anxiety...Which was made worse from patient's time spent in hospital with appendicitis.

I've still not managed to read the report fully but my husband assures me that it is accurate and well written and I thank you for that.

After spending a night sat upright in an armchair with patient on my shoulder (like a winding position) I knew something wasn't right. He simply wouldn't be put down...and even when I tried to recline the chair. He cried as soon as he wasn't in upright position.

After taking him to hospital. It was clear. Initially the doctors didn't think much of it...he had no temperature, no sickness, was still drinking a bottle- be it awkwardly.

It was only when a doctor passed us while I was laying him down and heard his cry that she decided to do blood test...and you know the rest.

It was a very anxious time waiting for a diagnosis...made more difficult as patient didn't show the usual symptoms so was a very confusing time as parents we were both grateful patient was receiving treatment, and worried as no one seemed sure.

I think this study will be a big help in getting an earlier diagnosis and giving parents more reassurance.

Thank you for choosing patient as a case study.

(I've attached photos....I know they won't be used in study. but it's just to show you how confusing it was to have a child who looked



fine...no temp/sickness...and told his infection was really high and to be prepared for him to be taken into surgery taken at various stages of his 2 week stay in the hospital)

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