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DIAGNOSTIC VALUE OF ULTRASOUND IN INFANTILE HYPERTROPHIC PYLORIC STENOSIS

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Summary

Infantile hypertrophic pyloric stenosis was described for the first time at the end of the 19th century, yet, its etiology and pathogenesis are largely obscure to date. This study retrospectively investigates 35 children who presented to Baghdad Central Teaching Hospital for Children with upper gastrointestinal tract obstruction suggestive of the disease. The clinical features, investigation and outcome are discussed.

Introduction

Infantile hypertrophic pyloric stenosis (IHPS) is the most common intra-abdominal abnormality in neonates and one of the most common reasons for urgent surgical intervention.[1] Although satisfactory progress in the treatment of this disorder has been achieved, its etiology and pathogenesis remains obscure.

In 1646, Fabricius Hildanus was the first to describe this disorder.[2] It was not until 1888, that Harold Hirschsprung described the clinical presentation and pathology of the condition. At this stage, the preferred treatment was medical using a combination of gastric lavage, anti-spasmodic drugs, dietary manipulation, and an application of local heat. The surgical mortality rate during that period was almost 100%.[2]

The incidence of the disease varies from area to another. While it is most common in Caucasians, where it is reported to affect 4 out of 1000 live births in UK with the male/ female ratio being 4:1.[3] The lower incidence reported in some under developed countries is probably due to misdiagnosis.

Two sphincteric loops of circular muscle fiber encircle the pylorus and converge at the lesser curvature. The most proximal of these, or the left canals loopened (called Torgersen's muscle) blends with normal muscle on the antral side of the pylorus. In IHPS, the pylorus is increased in length and diameter to the average size of 3x 1.5 cm. This increase is due to both hypertrophy and hyperplasia of the circular muscle. These changes are the bases on which

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ultrasound diagnostic indices depend. There is no evidence of inflammation at first, but submucosal edema and round cell inflammation appear after prolonged vomiting.

The clinical picture is suggestive in 90% of the infants. Finding of a palpable, smooth but firm pyloric tumor is almost diagnostic. The diagnosis may be difficult to obtain in the absence of a palpable tumor after several test feeds, and either an ultrasound scan or barium meal should be organized.

Ultrasound was first used to diagnose IHPS more than a decade ago. Attempts to distinguish the hypertrophied from the normal pylorus have led to the development of relatively complex indices, most of which rely on measurements of pyloric diameter length or muscle thickness.[4] Ultrasonic diagnosis of IHPS is dependent on the following criteria: -

1. Thickening of the pyloric muscle on both longitudinal and cross-section >3mm.
2. Elongation of the pyloric canal >14mm.
3. Gastric outlet obstruction during real time examination.
4. An abrupt change in wall thickening and qexhogenicity of pyloric canal.

The present study is intended to investigate the value of ultrasound in diagnosis of IHPS in children

Patients and Methods

This is a retrospective study of 35 children, admitted to the Surgical Units at Saddam Central Teaching Hospital for children from 1994 to 1996. The clinical picture of all was suggestive of upper gastrointestinal tract obstruction and was investigated as such. Small olive mass was felt to be palpable in 27 patients only.

Results

There were 3o males and 5 females with a M/F ratio of 6:1. The mean age at onset of symptoms was 24 days (range 7 to 46 days). The mean age at presentation was 34.4 days (range 17 to 52 days). The pyloric olive mass was felt to be palpable in 27 infant only. All neonates were studied by barium contrast. The results were diagnostic of infantile hypertrophic pyloric stenosis in 23 patient only (65.7%). And was normal in the remaining 12 (34.3%) patients. All infants were also investigated by ultrasound to compare the results. It was diagnostic of IHPS in 32(91.43%) and showed a negative picture in the remaining 3(8.57%) infants. During surgery all the 32 patients diagnosed by US proved to have IHPS for which Ramestedt seromyotomy was done and all the infants run smooth postoperative course. The remaining 3 infants with negative US findings were treated conservatively. In 2, the clinical picture improved and the infants discharged in a good general condition. These 2 were also having negative picture of IHPS on barium study. The third infant with negative US and in which barium passed past the pylorus but was suggestive of small bowel obstruction, deteriorated on conservative treatment and was operated on. During operation malrotation of the gut was found. Although there was no false positive results in both barium and US study, but there were 9 out of 32 (28%) false negative results in barium study as compared with US.

Table 1. Sensitivity and specificity of ultrasound and barium methods for diagnosing IHPS in the 35 children

Result	U/S		Barium	
	No.	%	No.	%
True +ve	32	91.4%	23	65.7%
False +ve	-	-	-	-
True –ve	2	8.6%	4	11.4%
False –ve	-	-	8	22.9%
Sensitivity	100%		72.5%	
Specificity	100%		37%	

Discussion

Early detection of the IHPS is a very important point from the surgical aspect. It is well known that pyloric stenosis can be detected as early as two to three weeks of age. At that time, the infant is healthy with good weight and no electrolyte disturbance and needs only a few hours to be prepared for operation. The patient will run a smooth, post-operative period with the least complication.

Clinical presentation is usually straight forward, but the olive mass may not be detected clearly by clinical examination. This is especially in the first three weeks when infant is still healthy and fatty[3.] On the other hand, it is at this early three weeks where barium study is associated with high false negative results. Non-complete pyloric canal obstruction and free passage of barium to the duodenum explain this. Barium meal accuracy needs a good technique. This is important because the gastric antrum must be screened at an early stage before the pylorus is obscured. However, barium studies do not always provide an unequivocal result and false negative examinations were reported [6.]

It is after the golden first three weeks when no barium will show in the duodenum due to the more complete pyloric obstruction caused by the superceded edema of the gastric wall due to retention gastritis[1]. In addition to false negative results, barium meal when compared to US is an invasive procedure and has the hazards of radiation[7].

In our study, nine cases were presented with the typical clinical picture of IHPS and the olive mass could not be detected by clinical examination. Barium meal showed free passage of barium. Ultrasound on the other hand revealed a typical picture of pyloric sphincter hypertrophy, which was proved by explorative laparotomy. This makes a 28% (9 out 32) false negative results of barium study, which could be explained by early presentation of these 9 patients (their mean age was 16 days). On the other hand, in three cases the clinical presentation was suggestive of IHPS but US examination was negative. Two of these cases, with normal barium study also, were treated conservatively and surgery was avoided (true negative). In the third child, with barium passed the pylorus but was suggestive of small bowel obstruction, vomiting continued. Surgical exploration revealed mal–rotation of the gut. In all remaining cases (23 pt), both the U/S and barium results were positive which was confirmed at operation.

On the other hand, many of the patients presented late with severe dehydration and electrolyte disturbance. These patients may need few days to correct dehydration and electrolyte disturbance. During this period, edema of the mucosa will decrease and the pyloric canal may open and show free passage of barium, which may result in the diagnosis of pyloric stenosis being overlooked.

This occurred with one of our patients in which barium-meal showed free passage (false negative), but U/S showed a typical picture of pyloric stenosis, which was confirmed at operation.

In conclusion, ultrasound is simple, accurate, and associated with few incidences of false positive results.

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