Diagnostic Value of Sonography and Upper G I Barium Series in Hypertrophic Pyloric Stenosis

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It is a prospective study carried out in fifty infants referred to the department of Paediatric Radiology children Hospital and Institute of Child Health Lahore with clinical suspicion of hypertrphic pyloric stenosis (HPS). In this study we have analysed the diagnostic value of ultrasound and upper GI series in a group of patients referred for suspected HPS. Abdominal ultrasound was performed as first step of imaging towards the diagnosis of pyloric stenosis and the upper GI series was carried out to compare the results with sonography. Abdominal sonography was performed with real time 5.0 MHz convex and 6.0 - 7.5 MHz transducer. Upper GI series was performed according to the standard technique. On sonography HPS was diagnosed in 54% (27) infants. In all these infants muscle thickness was found more than or equal to 4mm and length of pyloric canal was more than or equal to 16mm. While on barium examination of upper GI series only 50% (25) infants displayed radiological features of HPS. All the patients were already diagnosed on ultrasound for HPS. This study confirms usefulness and reliability of USG , as a tool in the diagnosis of HPS.

Key words: Hypertrophic pyloric stenosis, abdominal ultrasonography

It is the condition encountered in first week of life, in vast majority of infants symptoms develop between two to eight weeks of life after birth[1]. Although the precise aetiology is unknown, there seems to be a definite trend to explain infantile pyloric stenosis in terms of prolonged pyloric muscle spasm. This condition is now considered acquired rather than congenital in origin.

The diagnosis of hypertrophied pyloric stenosis is made primarily on clinical grounds. Typical findings include the presence of projectile vomiting, palpable mass or "olive" exaggerated gastric peristalsis visible through the abdominal wall. Indeed in one large series, 85% of patients were confidently diagnosed usually on history and physical examination[2]. In reality this figure is significantly lower and thus if there was any doubt as to the diagnosis, either because of history is atypical or the olive is not palpable, an upper GI series were performed and was examination of choice[3,4,5]. With upper GI series many cases were classic but a number were atypical[6]. Now with use of ultrasound, these problems can be circumvented. Unlike upper GI series ultrasound visualises pyloric muscle directly and not indirectly. In 1977, Teele and Smith[7] reported on the sonographic diagnosis of HPS, this technique gained popularity rapidly and now proposed as diagnostic procedure of choice[8-9].

Technical improvement of sonographic equipment and increasing experience with its use have made the method quite accurate. In this study we have analysed the diagnostic value of ultrasound and upper GI series in a group of patients referred for suspected HPS.

Materials and Methods

It is a prospective study carried out on fifty infants referred to the department of Paediatric Radiology children Hospital and Institute of Child Health Lahore with clinical suspicion of HPS. Among this group of infants 36 were male and 14 female. Age of the infants ranged from two to twelve weeks. All the infants had a physical examination before any imaging. Abdominal ultrasound was performed as first step of imaging towards the diagnosis of pyloric stenosis and the upper GI series were carried out to compare the results with sonography. Abdominal sonography was performed with real time 5.0 MHz convex and 6.0 - 7.5 MHz transducer. The baby was positioned supine on examination couch and placed on rolled towel under the left side of abdomen. This position encourages the distension of the antrum with fluid and allows easier localisation of the gastric out-let.

The sonographic examination was performed in several planes. sagittal views in reference to the abdomen were used to visualise the cross sectional appearance of pylorus. Transverse abdominal views were necessary to visualise the pylorus along its longitudinal axis. Measurements were made using electronic callipers. Two measurements were obtained in this study. Muscle thickness was determined from both cross sectional and longitudinal images. The length of pylorus was measured according to standard technique[9] on images depicting the long axis of pyloric muscle.

Upper GI series was performed according to the standard technique. Diagnostic performance of ultrasound

and upper GI series were compared in terms of diagnostic accuracy of both procedures in HPS. All the infants in which ultrasound, barium study of upper GI tract or both confirmed the diagnosis of hypertrophied pyloric stenosis were surgically operated.

Results

Fifty infants presented with clinical suspicion of HPS. Abdominal sonography and barium examination of upper GI tract were carried out on all these patients. On sonography HPS was diagnosed in 54% (27) infants. In all these infants muscle thickness was found more than or equal to 4mm and length of pyloric canal was more than or equal to 16mm.

While on barium examination of upper GI series only 50% (25) infants displayed radiological features of HPS. All the patients were already diagnosed on ultrasound for HPS. Infants in whom abdominal sonography revealed the hypertrophied pyloric stenosis, barium examination displayed atypical features and did not correlate with HPS. All the patients in which abdominal sonography diagnosed HPS, surgical exploration confirmed the diagnosis. In remaining 23 infants in which abdominal ultrasound was normal Barium examination of upper GI tract was normal in 18 infants. gastroesophageal reflux was demonstrated in 3 and hiatus hernia in 2.

Discussion

The role of ultrasound in the evaluation of a child with vomiting has been described many times with different protocols. At our institution there appears to be growing reliance on confirmatory diagnostic procedures. There is increasing proportion of infants under-going sonographic imaging of pylorus with increasing popularity of ultrasound as diagnostic tool. Many clinicians feel uncomfortable to confirm or exclude the diagnosis of HPS by history and physical examination alone. In this study ultrasound was diagnostic for HPS in 54% (27) infants, on sonography pylorus appeared as doughnut with the echolucent hypertrophied muscles surrounding the echogenic gastric mucosa as shown in fig. 1(A).

Fig. (1) Hypertrophic Pyloric Stenosis : (A)Transverse scan (B) Longitudinal scan shows the characteristic sonolucent ring of hypertrophied muscle surrounding the echogenic mucosa.

The sonolucent hypertrophied muscle sometimes appeared as non uniform on transverse scan. However it is important that muscle thickness should be measured in both longitudinal and transverse scan and they should be in close agreement. The length of pyloric canal was also measured in longitudinal section and demonstrated by echogenic gastric mucosa as shown in fig. 1(B). Cohen et al, have demonstrated an ultrasound double tract sign which they believe as reliable[10].

Barium examination of upper GI tract was diagnostic for HPS in only 50% (25) infants, all of these infants had already demonstrated HPS on sonography. In order to obtain technically satisfactory radiograph, the nasogastric tube was passed to empty the stomach. Most of infants with or without HPS show some degree of spasm. Therefore spasm is not a definitive sign of HPS. The radiographic signs of HPS are due to narrow pyloric channel (string sign) as illustrated in fig.2 and are remarkably constant from one patient to an other. Barium may be caught between the folds overlying the hypertrophied muscle and parallel lines (the double string sign) as shown in fig. 3 may be seen. The 'beak sign' is noted as barium column enters the pyloric canal of thick muscle. In two infants none of the above sign was demonstrated on barium examination but on ultrasound muscle thickness was found to be more than 4mm and length of pyloric canal was more than 16mm with clinical features of non-bilious, projectile vomiting.

In all these patients in which US was diagnostic for HPS, were surgically proved and pyloromyotomy was performed. In 46% (23) infants in which abdominal ultrasound was normal for HPS, on barium examination of

upper GI tract 3 infants displayed gastroesophygeal reflux, 2 hiatus hernia while 18 were found normal.

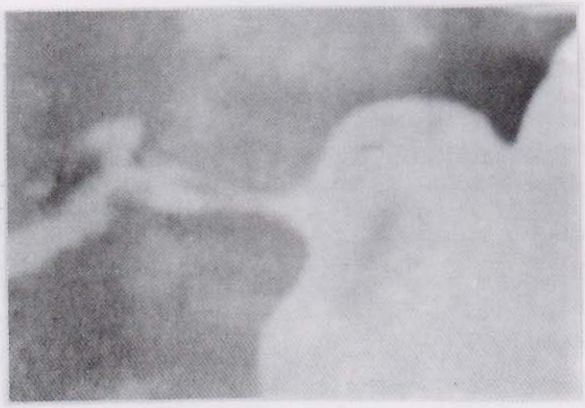

Fig. (2) Hypertrophic Pyloric Stenosis : An upper GI series demonstrate narrowing and elongation of antropyloric channel produce the string sign.

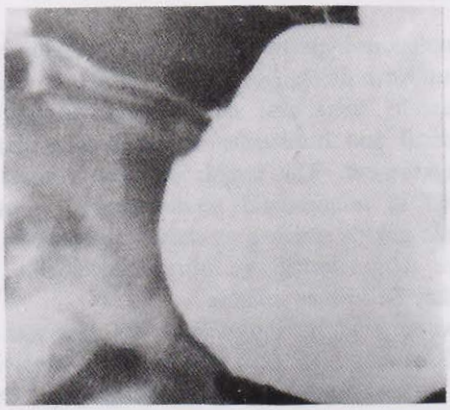

Fig. (3) Hypertrophic Pyloric Stenosis : An upper GI series show the characteristic antral double track sign.

This study proves that the imaging study of choice for the diagnosis of HPS is abdominal ultrasound because there is no exposure to radiation and barium investigation which adds volume to already obstructed stomach and increasing the possibility of aspiration and vomiting. The major argument against US as the primary imaging modality for pyloric stenosis is that US may be quite accurate in the diagnosis of HPS but will not be diagnostic in infants with vomiting from other causes. Barium examination is more reliable but we believe that if sonography confirm the diagnosis of HPS, there is no need of upper GI series. If clinical symptoms persists and sonogram does not confirm the diagnosis of HPS, then barium examination should be performed.

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