

DIAGNOSTIC ACCURACY OF GRAY SCALE AND COLOUR DOPPLER ULTRASOUND IN THE DIAGNOSIS OF INFANTILE HYPERTROPHIC PYLORIC STENOSIS

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Abstract

Objective: To determine the diagnostic accuracy of gray scale and color Doppler ultrasound in infantile hypertrophic pyloric stenosis.

Material and Method: 45 patients with clinical suspicion of infantile hypertrophic pyloric stenosis were evaluated with gray scale and color Doppler ultrasound. According to the measuring parameter using

gray scale and color Doppler the finding were categorized into positive and negative. Positive findings were confirmed in surgery which were present in 18 infants (40%). Negative finding were present in 27 infants (60%) which were confirmed by means of follow-up.

Result: The diagnostic accuracy, sensitivity, specificity of gray scale ultrasound in diagnosing infantile hypertrophic pyloric stenosis is 100%.

Conclusion: Ultrasound is the method of choice in the diagnosis of infantile hypertrophic pyloric stenosis. The use of the color Doppler aids in diagnosis of IHPS than using the gray scale alone.

Key words: Grayscale ultrasound, colour Doppler ultrasound, infantile hypertrophic pyloric stenosis, diagnostic accuracy.

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Introduction

Infantile hypertrophic pyloric stenosis (IHPS) is a pathologic condition characterized by obstruction to gastric emptying as a result of the abnormal thickening of the antropyloric portion of the stomach in early infancy.¹ There is a progressive hypertrophy of the pyloric muscle results in a (near-) complete obstruction of the pylorus. This changes occurs between the third and sixth week of intrauterine life.²

Neonate presented often to the emergency department with nonbilious projectile emesis and a hypochloremic, metabolic alkalosis. Rarely, a palpable "olive" like mass may be felt at epigastrium on phy-

sical examination.³

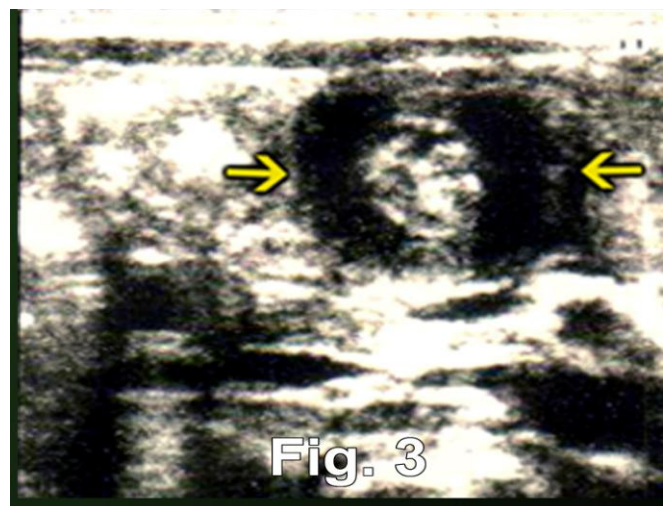
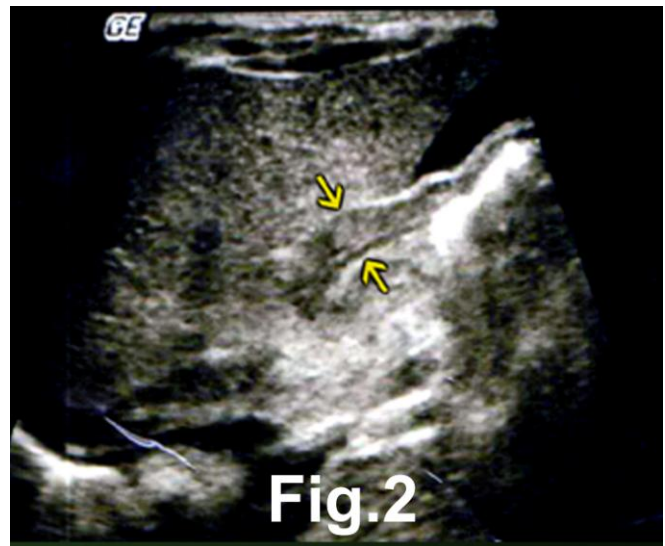
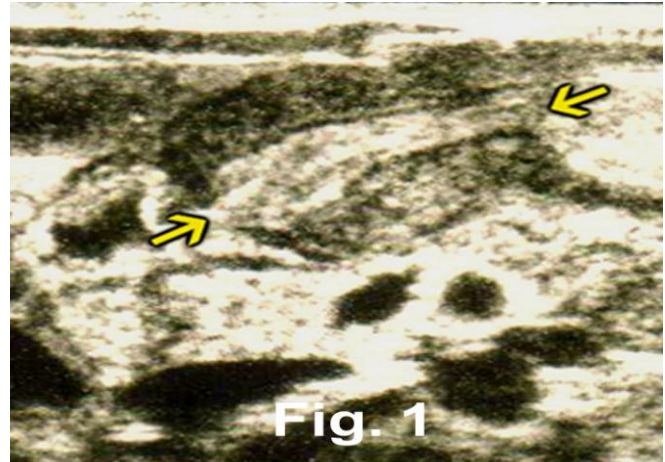
Ultrasonography is the first investigation of choice when infant having clinical feature rising the suspicion of HPS, as it is non radiated, non-invasive, which is an advantage in young age group.⁴ Another advantages of ultrasound is availability and relatively low cost, as well as allows ultrasound allows for dynamic study with direct visualization of the pyloric canal morphology.⁵ Most commonly used criteria for positive ultrasound study is pyloric muscle wall thickness 3 mm or more and pyloric canal length 12 mm or more.⁶ However these parameter depends on the infant age and weight. Therefore, the aim of this study is to diagnose the IHPS accurately using high resolution ultrasound.

Methods

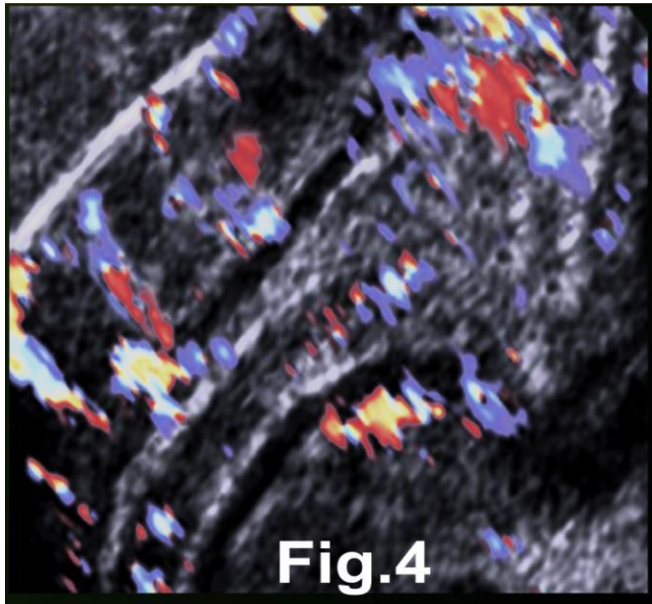
This study was conducted in Department of Paediatric Radiology Mayo Hospital from a period of 2012 to 2014. 45 patients fulfilling the inclusion criteria were concluded in this study. All the patients were examined with the TOSHIBA 7 MHz high frequency linear transducer. Pylorus was identified left of the gallbladder and anteromedial to the right kidney in transverse scan with the transducer in epigastric region. Right posterior oblique positioning and scanning from a posterior approach was followed if not visualized in the anterior approach. The pylorus muscle wall thickness, length of the pyloric canal was measured and the vascularity of the pyloric mucosa was assessed. Ultrasound finding was labelled positive when the pyloric canal length was more than 12 mm, pyloric muscle thickness was more than 3 mm, pyloric muscle diameter was more than 12mm and presence of vascularity in color Doppler. All data collected was collected and analyzed by SPSS 20.

Results

Out of 45 patients 35 were boys and 10 were girls. The age ranges from 2 to 8 weeks with mean age of 4.5 weeks. The sonographic criteria was positive in 18 cases (40%) which later were proved surgically. 27 cases (60%) were negative on ultrasound and were managed conservatively and were discharged after the symptoms subsides. The mean pyloric canal length is 11.9 mm with minimum length of 9 mm and maximum length of 16.2 mm. Similarly, the mean pyloric muscle thickness is 2.7 mm with minimal thickness of



1.8 mm and maximum thickness of 4 mm. The pyloric canal mean diameter is 11.7 mm with minimum diameter of 10 mm and maximum diameter of 14 mm. colour Doppler ultrasound of pyloric mucosa show increase blood flow of all patient having thickened pyloric muscles seen by gray scale ultrasound.



Discussion

The ultrasound finding positive for IHPS were pyloric canal length more than 12 mm (Fig. 1), pyloric muscle thickness more than 3 mm (Fig. 2), pyloric muscle diameter more than 12 mm (Fig. 3) and presence of vascularity in color Doppler (Fig. 4). The negative findings were pyloric canal length less than 12 mm, pyloric muscle thickness less than 3 mm, pyloric muscle diameter less than 12mm and absence of vascularity in color Doppler.

The cut off limit of pyloric canal length, pyloric muscle thickness and pyloric canal diameter are same as the previous studies. The cut off limit for the pyloric muscle length in this study is 12 mm which is same as the study conducted by Hernanz – Schlman.⁷ However, study conducted by CW Iqbal 2012 had taken the cut off limit of 15mm and have sensitivity and specificity of 100 % and 97% respectively.⁸ Another study conducted by Foster N et al had taken the cut off limit of 17 mm and have the sensitivity of 76% and 85% respectively.⁹ Similarly the cut off limit for pyloric muscle thickness taken in this study is 3 mm which is

same as taken in most of the previous studies as CW Iqbal, et al, WCL Yip, et al.^{8,10} The specificity and sensitivity in most of the studies in which the pyloric muscle thickness cut off limit of 3 mm is 100% as compared with the studies where the pyloric muscle thickness taken is greater than 3 mm shows slightly lower sensitivity and specificity.^{8,9} The pyloric canal diameter is another sonographic parameter assessed in this study. The cut off value taken in this study is 12 mm. A slightly higher value of 15 mm was taken by Strauss et al and a lower value of 10 mm was taken by J. Niedzielski, et al.^{11,12} The study conducted by Ashar Ahmad, et al, found that the pyloric canal diameter depends upon the duration of vomiting. Greater the duration of vomiting more is the positivity in ultrasound.¹³ These ultrasound parameter also depends in the infant weight and age. Slightly higher values are found in infants of older age and slightly with higher weight.^{9,14} Color Doppler assessment of the pyloric mucosa is another parameter assessed in this study which is also assessed by Mehboob Hussain.¹⁵ The normal pyloric mucosa shows minimal flow or absence of the flow but the pyloric mucosa in IHPS shows increased flow. This finding is found to be a significant factor in the diagnosis of IHPS. The only drawback in this study is that these measurements are operator dependent and some of the measurement also depend on the position of the infant. So, an un-experienced sonologist may produce a worse result.

Combination of finding of pylorus muscle wall thickness, length of the pyloric canal and the vascularity of the pyloric mucosa, this study achieved sensitivity of 100% and specificity of 100%

Conclusion

Sonography being non-ionizing is safe, fast and non-invasive method of investigation. It has high sensitivity and specificity in diagnosis of IHPS. The use of both gray scale as well as colour Doppler has good results than gray scale alone.

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