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Ultrasound Value in the Early Diagnosis and Exclusion of Idiopathic Hypertrophic Pyloric Stenosis: 10 Years' Experience at Babylon Governorate

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Abstract

Background: Idiopathic Hypertrophic Pyloric Stenosis (IHPS) is one of the most common surgical conditions of early infancy, presenting in 1.5 to 4 per 1000 live births. Despite this high prevalence, the precise etiology remains poorly understood. The diagnosis is made primarily with history and physical examination. Projectile, non-bilious vomiting is the classic presentation of an infant with IHPS. The typical physical exam findings include visible peristaltic waves and palpation of the olive mass in the upper abdomen. In the absence of a palpable mass, an upper gastrointestinal (UGI) barium study or ultrasonographic evaluation will usually make the diagnosis. Ultrasound is the preferred modality to diagnose IHPS. Demonstration of pyloric muscle thickness of 3.5 mm to 4 mm or more and pyloric channel length of 16 mm or more increases the specificity of the ultrasound to 100%.

Objectives: This prospective study aims to evaluate the ultrasonographic accuracy in the diagnosis and exclusion of Idiopathic Hypertrophic Pyloric Stenosis in infants presenting with non-bilious vomiting and no palpable pyloric mass, suspected to have IHPS.

Patients and Methods: Prospective study carried out between June 2006 and June 2016 at Babylon Maternity and Pediatric Teaching Hospital. One hundred forty-six (146) infants suspected of having IHPS presenting with non-bilious vomiting and no palpable pyloric (olive) mass were enrolled in this study. All infants sent for abdominal ultrasound examination. The sonographic findings categorized as positive and negative IHPS. Surgery done for patients as indicated according to diagnostic positive criteria and the operative findings compared to ultrasound findings.

Results: Sixty-nine (69) infants with positive ultrasound criteria underwent surgery and the diagnosis was confirmed intra-operatively for (67) patients, while negative for (2) infants. In (77) infants with negative ultrasound criteria, the diagnosis of IHPS excluded for (75) patients, and all observed and treated conservatively as pylorospasm or chalasia (Gastro-esophageal reflux), only 2 patients then need pyloromyotomy. About 88% of patients with positive ultrasound criteria (69) diagnosed from third to sixth week of age and about 12% of patients in this study were diagnosed later. Sensitivity and the Specificity of ultrasound to confirm the diagnosis of (IHPS) in this study were 97.1% and 97.4% respectively.

Conclusion: Ultrasonography is the investigation of choice for early diagnosis of IHPS before significant fluid and electrolyte imbalance occur. It is cost effective, rapid, harmless, non-invasive procedure mostly available and easy to perform. It's the method of choice for both diagnosis and exclusion of pyloric stenosis. Indication for surgical interference could safely be based on positive ultrasound result.

Keywords: Idiopathic hypertrophic pyloric stenosis; Ultrasound; Infant; Sensitivity; Specificity

Introduction

Harold Hirschsprung in 1888 described initially Infantile Hypertrophic pyloric stenosis (IHPS) as a distinct clinical entity with the clinical presentation and the post-mortem findings and named it Angeborener Pylorsstenose (congenital pyloric stenosis) and he believed by congenital failure of the involution of the pylorus [1].

Infantile Hypertrophic pyloric stenosis (IHPS) is one of the most common surgical conditions of early infancy, presenting in 1.5 to 4 per 1000 live births in whites but is less in Africans and Asians [2]. The highest incidence is in the north Europe and the increasing with an increased number in the spring and autumn [3]. Its two to five more common in males and it's believed that first born males have a 30% risk for developing IHPS although this assertion is controversial [4]. Despite this high prevalence, the precise etiology remains poorly understood [5].

Intraoperatively, an abnormally enlarged pyloric muscle usually measures 2 cm to 2.5 cm in length and 1 cm to 1.5 cm in diameter. The hypertrophic changes result in partial or complete obstruction of the pyloric cannel. IHPS are the common leading etiology for the non-bilious emesis requiring a pediatric surgical intervention [6]. The peak

age of presentation in an infant is between 3 to 6 weeks of age [7]. Reports also have described early and late presentation of 2 to 8 weeks of age, respectively. Premature infant also have been described but typically present with projectile vomiting 2 weeks later than term infants [6].

Projectile, non-bilious vomiting is the classic presentation of an infant with IHPS. Early in the course of the disease, vomiting is non-projectile and often is mistaken for pyloric spasm or GER (chalasia) both of which common other medical causes of non-bilious vomiting, and may be difficult to differentiate from IHPS without further evaluation [8,9]. Coffee ground emesis may occur secondary to gastritis or esophagitis [10]. Significant delay in diagnosis will lead to severe dehydration, pronounced malnutrition, and sever electrolyte imbalance [11].

Hyperbilubinemea is described in 2% to 5% of infants and is attributed to a glucuronyl transferase deficiency [4,12]. Indirect bilirubin levels can be as high as 15 mm/dl to 20 mm/dl, which usually resolves after pyloromyotomy [11,13].

Gastric peristaltic waves that progress successively from upper left to mid right abdomen may be observed with inspection. Palpation of the hypertrophic pyloric muscle, also known as the olive or tumor, can be difficult even for the most experienced clinician. Some surgeon may suggest surgery after confirming the presence of pyloric mass [11,14].

Electrolytes with a renal panel are essential. The longer duration prior to presentation to hospital and frequent vomiting can lead to classic and often late finding of IHPS which is hypokalemic, hypochloremic alkalosis [15].

Ultrasound is the preferred modality to diagnose IHPS. Demonstration of pyloric muscle thickness of 3.5 mm to 4 mm or more and pyloric channel length of 16 mm or more increases the specificity of the ultrasound to 100% [4,16]. Earlier, an upper barium gastrointestinal examination was recommended, which is replaced by ultrasound examination to confirm the diagnosis [11,17-19].

Patients and Methods

The total live birth over the specified period of the study (10 years) was 567965 live births according to Babylon Directorate of health records.

One hundred forty-six (146) patients who were presented with non-bilious vomiting and no palpable pyloric (olive) mass referred to the pediatric surgical unit at Babylon Maternity and children Teaching Hospital from June 2006 to June 2016 enrolled in this study. All infants with palpable olive mass were excluded from this study. The degree of clinical suspicion varied from case to case. The ages of these patients ranged from two to eleven weeks. Ultrasound examination was performed to all patients to confirm or exclude the diagnosis of Idiopathic hypertrophic pyloric stenosis depending on the following criteria [19]:

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

The sonographic findings categorized as positive and negative IHPS. Follow up ultrasound was performed for the doubtful cases after 24 hours. Surgery done for patients as indicated according to diagnostic positive criteria and the operative findings compared to ultrasound findings. Conservative managements and follow up continued for infants with negative criteria.

Results

All patients (146) sent for abdominal ultrasound and accordingly, 69 (47.25%) of them with positive criteria while the remaining 77 (52.73%) patients with negative criteria. Fifty-tow (35.61%) of the positive criteria cases were male, while the female 17 (11.64%) cases with male to female ratio (3:1) (Table 1).

U\S Criteria	Male		Female		Total	
	NO	%	NO	%	NO	%
Positive +ve	52	35.61	17	11.64	69	47.25
Negative -ve	53	36.30	24	16.43	77	52.73
Total	105	71.91	41	28.08	146	100

Table 1: No. of patients (146), Gender with U\S criteria.

The total live birth over the specified period of the study (10 years) was 567965 live births according to Babylon Directorate of health records.

Mean incidence rate of idiopathic hypertrophic pyloric stenosis and according to the surgical findings over ten years was 0.114/1000 live births with range 0.086-0.192.

About 88% of patients with positive ultrasound criteria (69) diagnosed from third to sixth week of age. Only about 12% of patients in this study were diagnosed later (Table 2).

All patients with positive ultrasound criteria (69) send for pyloromyotomy. According to the surgical finding, (67) patients proved to have (IHPS) while (2) patients were negative. Seventy-seven patients with negative criteria treated conservatively and just 2 patients need pyloromyotomy for IHPS.

False positive value and false negative values were 2.89% and 2.59% respectively. Positive predictive value was 97.1% and negative predictive value 97.4%.

Age (weeks)	Male		Female	
	No	%	No	%
3rd	12	17.39	5	7.24
4th	19	27.53	6	8.69
5th	9	13.04	3	4.34
6th	5	7.24	2	2.89
7th	3	4.34	_	_
8th	2	2.89	_	_
9th	1	1.44	_	_
10th	1	1.44	_	_
11th	_	_	1	1.44

Table 2: Age and Sex distribution of the patients with positive criteria (no. 69).

Sensitivity and the Specificity of ultrasound to confirm the diagnosis of (IHPS) in this study were 97.1% and 97.4% respectively (Table 3).

U\S Criteria	No. of patient with no IHPS	No. of patient with IHPS	Total
Positive	2	67	69
Negative	75	2	77

Table 3: Statistical analysis of the Results.

Discussion

The total live birth over the specified period of the study (10 years) was 567965 live births according to Babylon Directorate of health records. This center was the only center dealing with suspected cases of idiopathic hypertrophic pyloric stenosis in the governorate, despite few cases could be referred away from the governorate. So the number of cases in this study is nearly representing the total actual number in the Babylon governorate.

In this study 52 (35.61%) of the positive criteria cases were male, while the female 17 (11.64%) cases with male to female ratio (3:1). Doyle D mentioned in his study male to female ratio of 4.06:1, while Jerzy Niedzielski, et al. mentioned ratio of 8.6:1 [20,21].

Barium upper gastrointestinal study could diagnose IHPS by demonstrating delayed gastric emptying, string sing or double track sign [22]. These findings not demonstrated early in the course of the hypertrophy and because these findings not the sequel of tumor itself which ordinarily causes the narrowing of the canal, but rather by added edema of the mucosa of the pyloric canal. So if the barium study is done before this stage will show free passage of barium to the small bowel [17].

Real time ultrasonography depends on the thickness and length of the pyloric canal, so the diagnosis can be done early in addition to other advantages namely; its non-invasive, harmless method in comparison to barium study which has more hazard of radiation and early detection of the problem is a very important point from the surgical aspect. It's well-known that pyloric stenosis can be detected as early as two to three weeks of age by ultrasound. The patient at that time will run a smooth post-operative period with the least complication and even need only a few hours to be prepared for surgery because the infant with nearly good health and no electrolyte disturbance[11,15,17]. In this study about 88% of cases were diagnosed early and around the sixth week of age because we start with ultrasound to confirm the diagnosis, while about 12% of the cases were delayed because the referral physician start with barium study which was negative because of free passage of the barium during the earlier weeks. In this study consideration had been put for the sample size and prevalence of the idiopathic hypertrophic pyloric stenosis in the governorate because it might influence the degree of precision in the estimate of sensitivity and specificity.

A consequence of using too few subjects is that the estimates of sensitivity and specificity may be imprecise, and therefore fail to provide clinically useful information. Furthermore, evaluating the diagnostic test with a sample of subjects whose prevalence of disease is different from that of the population for whom the test is developed may provide misleading information [23].

Ultrasonography is the most sensitive test to diagnose pyloric stenosis in the absence of a palpable olive mass [24]. Ultrasonographic imaging had a sensitivity of 98%, specificity of 100% with a positive predictive value of 100% and 90% respectively [21], which is approximately similar to present study results. The ultrasound, sensitivity and specificity were (97.1%) and (97.4%) respectively. The positive predictive value was 97.1% and negative predictive value 97.4%. Almost with no need for further confirmatory method.

Conclusion and Recommendation

Ultrasonography is the investigation of choice for early diagnosis of IHPS before significant fluid and electrolyte imbalance occur. It is cost effective, rapid, harmless, non-invasive procedure mostly available and easy to perform. It's the method of choice for both diagnosis and exclusion of pyloric stenosis. Indication for surgical interference could safely be based on positive ultrasound result.

Accurate sonographic diagnosis of IHPS requires the ability to work with infants in order to generate highly detailed images for the pylorus

and fitting the diagnostic criteria properly. We believe by this way reducing and avoiding the false positive diagnosis and false negative exclusion of the IHPS.

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References

1. Hirschsprung H (1888) Case of congenital pyloric stenosis. J children's healing 27: 61.
2. Dick AC, Ardill J, Potts SR, Dodge JA (2001) Gastrine, somatostatin, and infantile hypertrophic pyloric stenosis. Acta Pediatr 90: 879-882.
3. Spicer RD (1982) Infantile hypertrophic pyloric stenosis: A review. Br J Surg 69: 128-153.
4. Keller H, Waldmann D, Griener P (1987) Comparison of preoperative sonography with intraoperative findings in congenital hypertrophic stenosis. J Pediatr Surge 22: 950-952.
5. Honein MA, Paulozzi LJ, Himelrght IM, Lee B, Cragan JD, et al. (1999) Infantile hypertrophic pyloric stenosis prophylaxis with erythromycin: Case review and cohort study. Lancet 35: 2101-2105.
6. Schwartz M (2006) Hyperpyloric stenosis. In: Grosfeld JL, O'Neill JA, Coran AG (eds.) Pediatric surgery. 6th edn. St.Louis (MO): Mosby.
7. Rogers IM (2006) The true cause of pyloric stenosisis hyperacidity. Acta Pediatr 95: 1321-1326.
8. Schechter R, Torfs CP, Bateson TF (1997) The epidemiology of infantile hypertrophic pyloric stenosis. Pediatr Perinat Epidemiol 11: 407-411.
9. Mitchell LE, Risch N (1993) The genetics of infantile hypertrophic pyloric stenosis. Am J Dis Child 147: 1203-1211.
10. Carter CO, Evans KA (1969) Inheritance of congenital pyloric stenosis. J Med Genet 6: 233-254.
11. Manohran S, Mathur AB (2009) Infantile hypertrophic pyloric stenosis. In: Gapta DK (ed) Pediatric surgery diagnosis and management. Jaypee.
12. Naik-Mathuria B, Olutoye OO (2006) Foregut abnormalities. Surge Clin North Am 86: 261-284.
13. Spitz L, Mcleod E (2003) Gastroesophageal reflux. Semin Pediatr Surg 12: 237-240.
14. Benson CD, Lioyd JR (1964) Infantile pyloric stenosis. Am J Surg 107: 429-433.
15. Lippert MM (1990) Jaundice with hypertrophic pyloric stenosis. J Pediatr 117: 168-169.
16. Aktug T, Akgur FM, Olguner M (1999) Analyzing the diagnostic efficiency of olive palpation for hypertrophic pyloric stenosis. J Pediatr Surg 34:1585-1586.
17. Bell MJ, Ternberg JL, McAlister W, Tedesco FJ (1977) Antral diaphragm: A case of gastric outlet obstruction in infant & children. J Pediatr 90: 196-200.
18. Murray KF, Christie DL (1998) Vomiting. Pediatric Rev 19: 337-341.
19. Lamaki N, Athey PA, Round ME, Watson AB Jr, Pfleger MJ (1993) Hypertrophic pyloric stenosis in the neonate, diagnostic criteria revisited. Can Assoc Radiol J 44: 21-24.
20. Doyle D, O'Neil (2005) Changing trends in the management of infantile hypertrophic pyloric stenosis: An audit over 11 years. Ir J Med Sci 174: 33-35.
21. Niedzielski J, Kobielski A, Sokal J, Krakos M (2011) Accuracy of sonographic criteria in the decision for surgical treatment in infantile hypertrophic pyloric stenosis. Arch Med Sci 7: 508-511.
22. Roldan-Valades E, Solorzano-Morales S, Osorio-Peralta S (2007) Imaging diagnosis of infantile hypertrophic pyloric stenosis: Report of a case and review of the literature. Rev Gastroenteral Mex 72: 126-32.
23. Buderer NM (1996) Statistical methodology: I. Incorporating the prevalence of disease into the sample size calculation for sensitivity and specificity. Acad Emerg Med 3: 895-900.
24. Hernaz-Schulman M, Sells LL, Ambrosino MM, Heller RM, Stein SM, et al. (1994) Hypertrophic pyloric stenosis in the infants without a palpable olive: Accuracy of sonographic diagnosis. Radiology 193: 771-776.