



## Radio-Diagnosis

## COMPARATIVE EFFICACY OF CIRCULAR MUSCLE THICKNESS AND PYLORIC CANAL LENGTH IN THE DIAGNOSIS OF INFANTILE HYPERTROPHIC PYLORIC STENOSIS

**Dr Debasis Deoghuria**

(Professor, Dept of Radio-Diagnosis, Deben Mahato Govt Medical College, Purulia, West Bengal)

**Dr Anup Kumar Bairagi\***

(Specialist Medical Officer, Dept Of Radio-Diagnosis, Basirhat District Hospital, Basirhat, West Bengal)\*Corresponding Author

**Dr Bichitra Biswas**

(Specialist Medical Officer, Dept Of General Medicine, Basirhat District Hospital, Basirhat, West Bengal)

**ABSTRACT** **Background:** Infantile Hypertrophic pyloric stenosis (IHPS) is a fairly common surgical problem encountered in children presenting in their first two to three months of life with vomiting after feeds. Failure to thrive, dyselectrolytemia and metabolic alkalosis are its direct consequences. Ultrasonography (USG) aids in early diagnosis thereby enabling timely surgical intervention. In this article, we have endeavored to assess the comparative efficacy of pyloric canal length and circular muscle thickness to correctly diagnose the condition. **Aims:** To evaluate the comparative efficacy of pyloric canal length and circular muscle thickness as measured by USG to arrive at a definite diagnosis of IHPS. **Material and methods:** A total of 50 cases presenting with vomiting after feeds in the age range of three weeks to twelve weeks were selected for evaluation. Patients were examined with HD7 USG machine (Philips) using 7.5 to 12 MHz linear probe. Pyloric canal length and circular muscle thickness were measured in each case. Data were analysed by ANOVA method, sensitivity and specificity calculated and compared.

**KEYWORDS :** IHPS, USG, pyloric canal length, circular muscle thickness, dyselectrolytemia, alkalosis

**Introduction:** Infantile Hypertrophic Pyloric Stenosis (IHPS) is a common surgical problem among infants in the first few months of life [1]. First born male babies are generally affected. They usually present in about three to six weeks after birth with non-bilious projectile vomiting after feeds and with time they develop failure to thrive and electrolyte imbalances with metabolic alkalosis (hypokalemic hypochloremic type) [2]. Incidence is 3 per 100 livebirths per year, however there are wide variations in respect to geographic location and ethnic origin [3]. It results from thickening of circular muscle of pylorus with luminal obstruction. Early diagnosis and prompt treatment is mandatory for correction of dehydration, dyselectrolytemia and emaciation.

Ultrasonography (USG) is an effective means of early diagnosis of this potentially treatable condition enabling prompt a surgical intervention [4]. A high frequency 6-12 MHz linear probe will provide the depth required to visualize the pylorus effectively [5]. In this article we endeavored to compare the relative efficacy of two parameters-pyloric canal length and circular muscle thickness and to predict the current diagnosis based on single parameter.

**Materials and methods:** clinically suspected IHPS referred to the department of Radio-Diagnosis, Deben Mahato Govt. Medical College, Purulia, West Bengal from the Pediatric ward and OPD were subjected to ultrasonography with HD7 (Philips) USG machine using 7.5-12 MHz linear probe from June 2018 to May 2021. Both pyloric canal length and circular muscle thickness were measured in each case. Following criteria were selected for the diagnosis of IHPS on USG:

- I. Pyloric canal length 16mm or more and/or
- II. Circular muscle thickness 3mm or more

Those showing pyloric canal length of 16mm and/or circular muscle thickness >3mm were taken as sonographically positive for IHPS. Of the 50 cases 46 were male and 4 were female. Findings of USG were later compared with those of surgery, the efficacy of both parameters were calculated and compared.

#### Result:

Of the 50 cases, 46(92%) were male and 4(8%) were female, the youngest of them was 3 weeks of age and the eldest was of 12 weeks. All of them presented with history of repeated vomiting after feed and 12 with dyselectrolytemia. 47 cases were found to have IHPS at surgery. Based on Pyloric canal length 45 cases were reported to have ultrasonography positive IHPS of which 43 cases were surgically proven IHPS and 2 cases were found to be negative at surgery. Among the negative cases 4 cases were surgically positive and 1 case was also surgically negative. Sensitivity of pyloric canal length to diagnose

IHPS was 91.5% and Specificity, positive predictive value and negative predictive value were 33.3%, 95.5% and 25% respectively (Table 1)



Fig 1: 9weeks male presented with repeated vomiting and failure to thrive. On ultrasound circular muscle thickness was 3.5mm and pyloric canal length was 17.3mm. The pylorus was like cervix and there was also antral nipple sign(\*). On surgical exploration this patient was found to be positive for IHPS.

**Table 1: pyloric canal length vs surgically proven IHPS**

Pyloric Canal length	IHPS (surgically proven)	Not IHPS (surgically negative)
Positive for IHPS	43	2
Negative for IHPS	4	1
Total	47	3

Based on circular muscle thickness 46 were reported to be Ultrasonographically positive for IHPS of which 45 cases were surgically proven IHPS and 1 case was surgically negative. Among the negative cases based on circular muscle thickness 2 cases were surgically positive and 2 cases were also surgically negative. Calculated sensitivity, specificity, positive and negative predictive value of circular muscle thickness to diagnose IHPS were 95.7%, 66.7%, 97.8% and 50% respectively (Table 2).

**Table 2: circular muscle thickness vs surgically proven IHPS**

Circular muscle thickness	IHPS (surgically proven)	Not IHPS (surgically negative)
Positive for IHPS	45	1
Negative for IHPS	2	2
Total	47	3

Data were analysed using ANOVA method thereafter calculated sensitivity and specificity were compared for both the criteria.

#### Discussion:

A total of 50 patients were included in this study who were subjected to

ultrasonography. Out of 50,92% were male and 8% were female with a sex ratio of 11.5:1 whereas Doyel D et al mention male to female ratio of 4.06:1 in their study[6] , Assefa G mentioned male : female ratio is 12:1 in his study[7]. Ultrasonography is a reliable mode of investigation for diagnosis of this potentially treatable surgical condition. Two parameters were used: one was pyloric canal length and the other was circular muscle thickness. Abnormal elongation of canal is defined as greater than 12mm in length [8]. As this is more difficult to perform and therefore less reliable [9] we had taken the cut off value of 16mm. still we have found 4 patients with pyloric canal length 16-17mm to be negative for IHPS on surgical exploration. An abnormal cut off value for circular muscle thickness has been described in different literature as 3mm[8,9-12]. All cases with circular muscle thickness 3mm or more in our study were surgically proven IHPS. Those with circular muscle thickness below 3mm and pyloric canal length in between 16-17mm were found negative for IHPS on surgical exploration. We observed both the parameters were reliably sufficient as diagnostic criteria however circular muscle thickness does better as a single parameter.

#### CONCLUSION:

both pyloric canal length and circular muscle thickness are reliable indicators for the diagnosis of IHPS. However circular muscle thickness is a better predictor of diagnosis of IHPS when compared to pyloric canal length.

#### REFERENCES:

1. Ohshiro K, Puri P (1998) Pathogenesis of infantile hypertrophied pyloric stenosis: recent progress. *Pediatr Surg Int* 13:43-252
2. Chandran L, Chitkara N (2008) Vomiting in children: reassurance, red flag, or referral? *Pediatr Rev* 29:183-192
3. Panteli C (2009) New insights into the pathogenesis of infantile pyloric stenosis. *Pediatr Surg Int* 25:1043-1052
4. Hiorns MP (2011) Gastrointestinal tract imaging in children: current techniques. *Pediatr Radiol* 41:42-54
5. Hernanz-Schulman M (2003) Infantile Hypertrophic pyloric stenosis. *Radiology* 227:319-331
6. Doyle D, O'Neil M, Kelly D. changing trends in the management of infantile hypertrophied pyloric stenosis an audit over 11 years. *In J Med Sci* 2005;174:33-5.
7. Assefa G, Sonographic diagnosis of hypertrophic pyloric stenosis. Preliminary experience. *Ethiop Med J* 2002;40:149-54
8. Reed AA, Michael K (2010) Hypertrophic pyloric stenosis. *J Diag Med Sonography* 26:157-160
9. Blumhagen JD, Maclin L, Krauter D, Rosenbaum DM, Weinberger E (1998) Sonographic diagnosis of hypertrophic pyloric stenosis. *AJR Am J Roentgenol* 150:1367-1370
10. O'keeffe FN, Stansberry SD, Swischuk LE, Hayden CK (1991) Antropiloric muscle thickness at US in infants: what is normal. *Radiology* 178:827-830.
11. Hernanz-Schulman M, Sells LL, Ambrosino MM, Heller RM, Stein SM, Neblett WW (1994) Hypertrophic pyloric stenosis in the infant without a palpable olive: accuracy of sonographic diagnosis. *Radiology* 193:771-776
12. Rohrschneider WK, Mittnacht H, Darge K, troger J (1998) Pyloric muscle in asymptomatic infants: somographic evaluation and discrimination from idiopathic hypertrophic pyloric stenosis. *Pediatr Radiol* 28:429-434