

Assessment of diagnostic value of transperineal ultrasonography in determining type of imperforate anusMasoud Nemati¹, Reza Ataei Oskouei¹, Saied Aslanabadi²¹. Department of Radiology, Tabriz university of medical sciences, Tabriz, Iran². Department of Pediatric Surgery, Tabriz university of medical sciences, Tabriz, IranNematomasoufi@yahoo.com

Abstract: Neonates with an imperforate anus pose a challenge to those responsible for diagnosing and treating the congenital abnormality. The main purpose of this study was to assess the usefulness of transperineal sonography as a safe and available method in discrimination between low and high type of imperforate anus. In this descriptive analytical study, 44 neonates with imperforate anus referred to Tabriz Children hospital were evaluated in a 15-months period. The transperineal sonography was performed with a 7-10 MHz linear array transducer and distance between the distal rectal pouch and the perineum was measured. The sonographic findings were compared with surgical ones. Forty four neonates with imperforate anus were evaluated. Based on surgical results, the low and high type of anomaly were confirmed respectively in 24 and 20 cases. The type of anomaly were correctly diagnosed by the use of transperineal sonography in 35 of the 44 patients (80%). In 20 of the 24 patients (83%) with a low type imperforate anus and in 15 of the 20 patients (75%) with a high type imperforate anus sonographic findings were concordant with surgical findings. This study demonstrated that in neonates with imperforate anus a transperineal sonography is a noninvasive useful method for differentiating low and high types of imperforate anus.

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1. Introduction

An imperforate (AI) anus are birth defects in which the rectum is malformed. AIs are a spectrum of different congenital anomalies in males and females, that varies from fairly minor lesions, as well as complex anomalies.(Witters et al. 2012a; Thomas et al. 2013a; Salehi R et al. 2013a) The cause of AIs is unknown, the genetic basis of these anomalies is very complex because of their anatomical variability, in an 8% of patients genetic factors are clearly associated with AIs.(de et al. 2013a; Teo et al. 2012a; Ganjpour Sales J et al. 2013) Optimal surgical management of the newborn with imperforate anus depends on accurate determination of the level of the rectal pouch. High colonic arrest is managed by a colostomy followed by a pull-through operation, named posterior sagittal anorectoplasty (PSARP).(Hasselbeck and Reingruber 2012a; Caldaro et al. 2012; Soleymanpour J et al. 2013) Low lesions may be managed by perineal surgery with anoplasty or dilation of an ectopic perineal orifice; whereas intermediate lesions are managed as high lesions.(Sangkhathat et al. 2012; Chern et al. 2012; Nemati M et al. 2013) Within the high group, defects such as rectoprostatic fistula and rectobladder neck fistula are both considered high, yet the former can be repaired via posterior sagittal entry only, and the latter requires an additional laparotomy.(Patra and Purkait 2012; Goossens et al. 2011; Qadim HH et al. 2013) Anorectal malformation represents such a wide

spectrum of defects; that, the terms low, intermediate and high are arbitrary and not useful in therapeutic or prognostic terms.(Castle et al. 2011; Ochoa et al. 2012; Salehi R et al. 2013b) Early assessment and accurate diagnosis of the type of imperforate anus are essential for determining treatment. In addition to clinical indexes, several imaging techniques are used, including sonography, CT, and MRI with the patients under anesthesia.(Tonni et al. 2011a; Kumar et al. 2011; Gharabagy PM et al. 2013) Noninvasive procedures without ionizing radiation are desirable, particularly in the case of neonates and infants. Initial studies of sonography showed that measurement of the distance between the distal rectal pouch and the perineum may be helpful in differentiating high and low imperforate anus.(Vijayaraghavan et al. 2011; Mujuru et al. 2010; Babaei Nejad S et al. 2013) However, the studies had only small sample sizes (fewer than 20 infants) and were conducted with different approaches to the sonographic examination, including the transabdominal and transperineal approaches.(O'Neill et al. 2010; Khatib et al. 2010; Azimi H et al. 2013) Reported cutoff values to differentiate low from intermediate and high imperforate anus range from 10 to 25 mm. The diagnostic criteria are not well defined, and the sensitivity and specificity have not been calculated.(Le Bayon et al. 2010; Garalejic et al. 2010; Goldust et al. 2012) For the past 10 years, we have been using transperineal sonography to

determine the type of imperforate anus in infants by measuring the distance between the distal rectal pouch and the perineum. The aim of this study was to evaluate the diagnostic value of transperineal ultrasonography in determining type of imperforate anus.

2. Material and Methods

In this descriptive analytical study, 44 neonates (24 boys and 20 girls) with diagnosis of imperforate anus referred to Tabriz Children hospital were evaluated in a 15-months period (between July 2011 to October 2012). The mean patient age at the time of diagnosis was 3.5 months (age range, 1 day to 12 months). This study was approved by ethic committee of Tabriz university of medical sciences. Written consent was obtained from all the patients parents. All of the neonate were placed in the supine position and transperineal sonography was performed with a 7-10 MHz linear array transducer. Transducer was placed in the midsagittal plane through perineum and the rectal distal pouch was identified on the basis of recognize of coccyx bone and presence of meconium or gas within the rectum (Fig 1).



Fig1. Sagittal sonogram in 1 day old boy with low imperforate anus shows relationship between coccyx, meconium field distal pouch of rectum (curved line) and uterine (U).

A thick layer of gel was applied over the perineum to prevent artifacts due to the presence of intervening air. Care was taken for avoid of shortening the distance between the distal rectal pouch and the perineum due to child crying or press the perineum with transducer. Single radiologist with twenty three years of clinical experience, respectively, retrospectively reviewed the US images

by consensus on a 2000 × 2000 Picture Archiving and Communication Systems monitor (PACS; Marotech, Seoul, Korea). During the review process, the observers were unaware of the surgical, physical and other imaging findings. The distance between the distal rectal pouch and the perineum was measured. Thereafter sonographic findings were compared with surgical findings.

Statistical analysis

The obtained data was stated as mean ± standard deviation (Mean ± SD), frequency and percentage and SPSS-16 is the used statistical software. Quantitative variables were compared using Student T-test (independent samples) or Paired Samples T-test. Contingency Tables using Chi-Square Test or Fischer's Exact Test (considering conditions) were used to compare categorical variables. Pierson correlation coefficient was used to evaluate correlation. Logistic regression test was used to conduct a multivariable study. In all understudy cases, the results were known as statistically meaningful if $P \leq 0.05$.

3. Results

The patients data and comparison of sonographic and surgical finding for determination of the type of imperforate anus are summarized in Table1. Forty four neonates, 24 males and 20 females with the mean age of 3.5 months, with imperforate anus were enrolled in this study. A final diagnosis of low type imperforate anus was made for 24 patients. At sonographic examination, the mean distance between the distal rectal pouch and the perineum in this group was 9 ± 4 mm (range 5-17 mm). A final diagnosis of high type imperforate anus was made for 20 patients. At sonographic examination, the mean distance between the distal rectal pouch and the perineum in this group was 17 ± 3 mm (range 12-23 mm). Among 24 cases of low type imperforate anus, 20 cases were correctly diagnosed as low type (83.3%) and among 20 cases of high type imperforate anus, 15 cases were correctly diagnosed as high type (78.9%) in transperineal sonography. Throw 44 case of imperforate anus, 35 cases were correctly diagnosed with transperineal sonography (35 of 44, with the sensitivity of 79.5%). On the basis of the 15 mm cutoff point, the sensitivity, specificity and accuracy of transperineal sonography in diagnosis of low type imperforate anus were 83%, 75% and 80% in diagnosis of high type imperforate anus were 75%, 83% and 80% respectively. The positive predictive value of transperineal sonography in diagnosis of low and high types of imperforate anus were 80% and 79% and the negative predictive value were 79% and 80% respectively. Twenty one cases of the 24

neonate (87.5%) with low type imperforate anus and 5 cases of the 20 neonate (25%) with high type imperforate anus had a rectocutaneous or rectovestibular fistula. Among the 21 cases of a low type imperforate anus with an rectocutaneous or rectovestibular fistula, 14 cases were correctly identified (66.5%). For the 5 cases of a high type with fistulas, fistula was not identified by transperineal sonography.

Table 1. Patient data and comparison of sonographic and surgical finding for determination of the type of imperforate anus

Characteristic	Low	High	Total
Surgical finding	24	20	44
Sonographic finding	20	15	35
Sex (boys/girls)	14/10	10/10	24/20
Fistula (boys/girls)	12/9	1/4	13/13
Anomaly (boys/girls)	5/4	5/8	10/12
Age (day)			
Median	4	2	-
Range	1-120	1-180	-

4. Discussions

An IA is a relatively common anomaly, which occurs in approximately one of 500 live births, with a slight predilection for male infants. An IA is classified according to the International Classification of 1970 and the proposed "Wingspread" modification of 1986 as a high-type, intermediate-type and low-type.(Tonni et al. 2011b; Moon et al. 2010) These classifications are based on the level of the distal rectal pouch relative to the puborectalis sling of the levator ani muscle. The differentiation of IA types is critical to determine surgical treatment and to predict continence.(Mathew et al. 2009; Husler et al. 2009) Various radiological modalities have been used to determine the level of the distal pouch in infants with IA. The role of the use of a preoperative radiological modality for IA is to determine the level of the distal rectal pouch, to identify the presence and location of internal fistulas and to diagnose any associated anomalies.(Mitani et al. 2009; Choi et al. 2009) The radiologic modalities have been used to determine the level of the distal rectal pouch and to distinguish between low and high imperforate anus.(Witters et al. 2012b; Thomas et al. 2013b) In addition, they have been used to identify the presence and location of internal fistulas and to diagnose any associated anomalies.(de et al. 2013b; Teo et al. 2012b) The differentiation of imperforate anus is critical in the determination of the surgical approach. In this study, 44 neonate with diagnosis of imperforate anus were evaluated with transperineal sonography and authors focused on sonographic measurement of the distance between the distal rectal pouch and the perineum.

Kanamori et al. have reported that a P-P distance of 1.0 cm or less is suggestive of a low-type IA and a P-P distance of 1.5 cm or greater is suggestive of a high-type IA.(Kanamori et al. 2008) Moshekov et al. have stated that a P-P distance of less than 1.5 cm is consistent with a low-type IA.(Moshekov et al. 2005) In our study, at a cutoff point pouch to perineum (p-p) distance of 15 mm, the imperforate anus type was correctly diagnosed by the use of transperineal sonography in 35 of the 44 patients (79.5%). Five of the patients with surgically proven high imperforate anus had a p-p distance less than 15 mm and four of them with surgically proven low imperforate anus had a p-p distance high than 15 mm. Accurate preoperative identification of an internal fistula between the distal pouch and the urogenital tract is very important for optimal surgical management and prevention of a potential injury to the genitourinary tract.(Wax et al. 2009; Haber 2009) In addition, the IA type can be determined based on the internal fistular type. With recent improvements in US resolution, transperineal US has become an excellent diagnostic modality to define the type of the internal fistula for an IA.(Haber et al. 2008; Hung et al. 2008) Our study results have also demonstrated good performance for the use of transperineal US. Hasselbeck et al. reported that in infants without an anocutaneous fistula and with a greater than 15-mm distance between the distal rectal pouch and the perineum, the diagnosis of intermediate or high imperforate anus can be reliably made.(Hasselbeck and Reingruber 2012b) In our study, out of 44 cases, 26 patients had a rectocutaneous or rectovestibular fistulas. Twenty one of the 24 patients (87.5%) with low type imperforate anus had a fistula whereas only 5 of the 20 patients with high type (25%) had a fistulas. Only 14 of 26 fistula were correctly identified by the use of transperineal sonography. Out of 21 rectocutaneous or rectovestibular fistulas of the low type imperforate anus, 14 cases were identified whereas of 5 fistulas of the high type, none of them were visualized. Three of the patients with surgically proven low imperforate anus had a p-p distance higher than 15 mm in our examination and fistulas were identified by transperineal US. Therefore, we believed that however transperineal sonography is a reliable method for determination of the type of imperforate anus, it is not a credible modality for detect of association internal fistula in high type of disease.

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