

Prediction of fetal sex by early pregnancy ultrasound localizing the implantation site lateralization

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Abstract

The Prediction of fetal sex by early pregnancy ultrasound localizing the implantation site lateralization consider a very important step in investigation, in this work will be questionable results, the genetic factor, fetal sex determination might be influenced by other factors. Why male sex has a predilection for right-sided implantation while female sex implanted on the left side of the uterus so this study aimed to assess the accuracy of fetal sex prediction by localization of the implantation site at 5-7weeks of gestation using the two dimensional trans-abdominal U/S.

Keywords: site lateralization, fetal sex, pregnancy ultrasound

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Introduction

Assessment of fetal sex in the antenatal period can be performed according to the request of the parents using a non-invasive mid-trimester ultrasound examination regarded as a highly accurate method.⁽¹⁾ Early, in the first trimester, ultrasonic assessment of fetal sex using two-dimensional (2D) ultrasound (2-4). In 2001, V. Mazza et al. had mentioned that "Fetal sex expectation can be with a promising accuracy at 69 days from the date of fertilization ⁽⁵⁾. Moreover when using three-dimensional (3D) ultrasound for the diagnosis of fetal sex looking in the mid-sagittal plane at the genital tubercle and the phallus direction and orientation either upward to predict the male fetal sex or downward direction to predict the female fetal genitalia ⁽⁶⁾. To avoid technical errors during the examination of the position of the genital tubercle and phallus direction, repetition of the assessment at the end of the examination with both views (in the sagittal and transverse planes) is better to be done and to raise the degree of the accuracy ⁽⁷⁾. Ramzi in 2011 published his work that explains the possible association between placental site lateralization and fetal sex ⁽⁸⁾, while L. van Leijden et al in 2012 said a male fetus is associated with higher nuchal translucency measures ⁽⁹⁾. Assessment of fetal DNA in the maternal serum is another way to predict fetal sex as early as the 5th week of gestation ⁽¹⁰⁾. In our study, we aimed to assess the accuracy of fetal sex prediction by localization of the implantation site at 5-7weeks of gestation using the two dimensional trans-abdominal U/S.

Materials and methods

A prospective study was done In a private clinic for 18 months period which extended from April / 2018to October / 2019, the prediction of sex of fetuses by utilizing early two-dimensional transabdominal ultrasound was performed in 620 pregnant women at (5-7) weeks of gestation by determining the site of implantation of the gestational sac in right or left-sided of uterus which predicts the site of attachment of placenta in future. A single sonographer performed all ultrasound examinations, for all patients, at both 5-7 weeks gestation and (18 - 20) weeks of gestation. The gestational age of the fetus was assessed by measuring gestational sac diameter or crown-rump length in the first trimester of pregnancy and by measuring biparietal diameter, and femur length in the second trimester of pregnancy. Verbal consent was obtained from all women for participation in the study.

Assessment of site of implantation of gestational sac was performed in all cases by utilizing VENO 20 transabdominal ultrasound (F2-5C Convex probe Vinno Company 2-6.5mhz) at 5-7 weeks of gestation by performing scans in sagittal plane (fundo anterior and fundo posterior) for assessment of implantation position, in addition to scan on transverse plane (left lateral, right lateral, anterior left, posterior left, anterior right). Sixty-three women were excluded because they developed abortion or they were lost from follow up and the remaining 557 women were followed up by 2nd trimester U/S at 18 – 20 weeks gestation to assess the sex of fetuses and placental position which were determined. For obtaining an accurate assessment of fetal sex in the second trimester and in third trimesters, multiple views were obtained including axial, transverse and coronal views. Ultrasound scanning of the uterus in both sagittal and transverse planes was performed initiating from midline to the right then to the left of midline.

Women with ectopic pregnancy, multiple pregnancies, pregnancy with centrally located gestational sac, fetal death or refusal of patients were excluded from the current study. Examination of the genital area by utilizing both horizontal plane and midsagittal plane with fetal sex was diagnosed as male (by the presence of penis with a scrotum) or female (detecting 2-4 lines sign of labia), with confirmation of sex of babies later on the following the delivery.

Results

The studied women's ages range between (14 - 46) years with mean of (25.42 ± 6.41) years, about 50% of them was housewives and the remaining women having jobs (educated of the university, institutional or secondary school levels). The parity of them ranged between (0 – 9), 231 (41.47%) women were nulliparous, and 326 (58.52%) were multiparous women. One hundred twenty-nine women (22.15%) presented with a history of abortion ranging between (1 - 6) abortions, 9 (1.61%) of them presented with habitual abortions (more than 3 consecutive abortions) Table (1).

For the implantation site at (5-7) week's gestation in 557 singleton pregnancies, 366 (65.71%) were RT sided implantation site and 191 (34.29%) were implanted on the LT side of the uterus Table (2). By follow up of them in the second trimester U/S at (18-20) weeks for determination of the fetal sex as follow: Regarding the singletons: 334 (91.26%) of the RT sided implantation were males and 32 (8.74%) were females. On the other hand of the 191 LT sided implanted GS, 167 (87.43%) were females and only 24 (12.57%) were males (Table 2). Gender confirmation was done after delivery and all of the U/S determined sex was correct except one woman (0.18%) who was determined to have a girl by U/S but she delivered a boy.

Table 1: Women Characteristics

Singleton Patients group (557)	RT/ SIDED, GS implantation at 5-7 weeks N (%)	U/S FETAL GENDER at 18-20 weeks N (%)		LT/ SIDED GS implantation at 5-7 weeks N (%)	U/S FETAL GENDER at 18-20 weeks	
		MALE	FEMALE		MALE	FEMALE
Singleton (557)	366 (65. 71)	334 (91.26)	32 (8.74)	191 (34. 29)	24 (12.66)	167 (87.34)

Table 2: fetal gender by U/S at 18-20 weeks in relation to GS implantation at 5-7 weeks in singletons:

WOMEN CHARACTERISTICS	RANGE	MEAN \pm SD	N (%)
AGE (YEARS)	14 - 46	25.42 \pm 6.41	557 (100)
PARITY	0 - 9	1.36 \pm 1.57	557 (100)
NULLIPAROUS	0	0	231 (41.47)
MULTIPAROUS	1-9	2.3 \pm 1.42	326 (58.52)
ABORTIONS	1-6	1.67 \pm 1.03	129 (22.15)
EDUCATIONAL LEVEL (N = 557)	UNLEARNED		8 (1.44)
	PRIMARY SCHOOL		271 (48.65)
	SECONDARY SCHOOL		92 (16.52)
	UNIVERSITY & INSTITUTE		183 (32.85)
	HIGHER EDUCATION		3 (0.53)

Discussion

A male or a female fetus is an important parental question once a mom gets pregnant, a traditional ultrasound examination at 16-18 weeks of gestation usually answers this question. Ramzi (2007) adopted his new method for determination or prediction of fetal sex much earlier in gestation and specifically at the 6th week of gestation by locating the laterality of the chorionic villi by performing a Doppler study in addition to 2-dimensional ultrasound⁽⁸⁾. The current study depends on Ramzi's method with slight modification utilizing two-dimensional sonography only for localization of the site of implantation for fetal sex prediction in early pregnancy which is a very early noninvasive method which might help the parents in determining their fetal gender, and any possible-linked health problems⁽⁸⁾.

Routine early dating ultrasound examination is a part of daily practice in the antenatal care unit, therefore adding the gestation sac location determination is an easy and practical, non-invasive way, the most relevant method is the sagittal sign method that performed after the twelfth-week gestation that "orientation of the phallus related to the gender, from 12 weeks onward: caudal with the female fetuses and anterior with the males"⁽⁶⁾. In the current study gender prediction of 91.26% for male with right-sided implantation of gestational sac and 87.43% for female with left-sided implantation of gestational sac, referring to Ramzi's method who's results revealed higher prediction rate approaching to 97.5% for both female and male sexes and this can be explained by the use of Doppler study that was used in that study which revealed the placental vascularity with higher accuracy than the 2D U/S alone in placental localization in early pregnancy (6 weeks)⁽⁸⁾.

Searching the web for resembling method revealed another study by L. Shan and S. (2010) who found that in 89 fetuses the placenta was located on the right side and of these 45 (51%) were males. The placenta was located on the left side in 110 fetuses and 63 (57%) of these were female which was very low detection rate when compared with the genital tubercle angle method at 11-14 weeks gestation, the fetal gender was correctly predicted in 103 of 108 fetuses (95%)⁽¹¹⁾. In addition to the genetic factor, fetal sex determination might be influenced by other factors. Why male sex has a predilection for right-sided implantation while female sex implanted on the left side of the uterus? This could be related to possible uterine polarity? Ovum polarity? Sperm polarity? And even heterogeneous uterine vascularity?⁽¹²⁾. Sperm transport might be influenced by the possible movement of the endometrium^(13, 20).

The majority of animal cells reveal clear polarity, referring to the occurrence of asymmetry at the molecular level. The corner stone was the negative regulation of contractility of actomyosin that was

provoked through sperm action locally^(14, 18). Another study on nematodes showed that the sperm produces a polarity signal in the posterior part of the embryo leading to down regulation of contraction of the cortex⁽¹⁵⁾. The membranes on the surface of sperm reveal differing values of electrostatic potential which is proportionate to sialic acid levels in the sperm surface through its maturation process. A new process for the isolation of sperms with a low level of fragmented DNA depends on utilizing an electrical charge-based technology in IVF⁽¹⁶⁾. A randomized trial conducted by Karimi et al. reported that the Zeta method is a new method to enhance the outcome of assisted reproduction in infertile men⁽¹⁷⁻¹⁹⁾. Further studies need to investigate the real factors behind the association between implantation site and fetal sex.

Our conclusions for this study provides a simple non-invasive method for early detection of fetal sex by incorporating implantation site localization to the routine dating ultrasound with a high prediction rate.

References:

1. Meagher S. and Davison G. "Early second-trimester determination of fetal gender by ultrasound." *Ultrasound Obstet. Gynecol.* 1996; 8: 322-324
2. Efrat Z, Aknifenwa OO, Nicolaidis KH. "First-trimester determination of fetal gender by ultrasound." *Ultrasound ObstetGynecol* (1999): 13:305-7.
3. Efrat Z., Perri T., Ramati E., Tugendreich D. and Meizner I., "Fetal gender assignment by first-trimester ultrasound". *Ultrasound ObstetGynecol* 2006; **27**: 619–621
4. Whitloe BJ, Lazanakis MS, and Economides DL. "The sonographic identification of fetal gender from 11 to 14 weeks gestation." *Ultrasound ObstetGynecol* (1999): 13:301-304.
5. MAZZA V., FALCINELLI C., PAGANELLI S., CONTU G., MANTUANO S. M., BATTAFARANO S. D., FORABOSCO A. * and VOLPEA. "Sonographic early fetal gender assignment: a longitudinal study in pregnancies after in vitro fertilization." *Ultrasound ObstetGynecol* 2001; 17: 513–516.
6. Youssef A., De Musso F., Montaguti E., Cariello L., Salsi G., Maroni E., Pilu G., Rizzo N., Ghi T. Prospective validation of the use of three-dimensional ultrasound for fetal gender determination in the first trimester. *Ultrasound in Obstetrics & Gynecology, Poster abstracts (p03.06) 2012; 40 (Suppl. 1): 171–310*
7. Pedreira D. A. L., Yamasaki A. and Czeresnia C. E. "In search for the 'third point'". *Ultrasound ObstetGynecol* 2000; 15: 262–3
8. SAAD RAMZI ISMAIL, The relationship between placental location and fetal gender (Ramzi's method). *OBGYN.Net. vol. No. June, 14, 2011*
9. Van Leijden L., Kok N., Snijders R., Pajkrt E. Accuracy of first trimester fetal sex determination in a routine setting. *Ultrasound in Obstetrics & Gynecology, Poster abstracts (p03.05) 2012; 40 (Suppl. 1): 171–310*
10. Heidi Anne Duerr, New Blood Test Reveals Fetus Gender Five Weeks after Conception. *OBGYN.Net. Vol. No. February, 1, 2012.*
11. The S., Chan L. The role of placental location assessment in the prediction of fetal gender. *Ultrasound in Obstetrics & Gynecology, (Poster abstracts P18.17). 2010; 36 (Suppl. 1): 242*
12. Harris V.G. "Relation between placental site and length of gestation." *BJOG* 82.7 (1975): 581-584.
13. Kunz, G., Beil, D., Deininger, and H. "The dynamics of rapid sperm transport through the female genital tract: evidence from vaginal sonography of uterine peristalsis and hysterosalpingoscintigraphy." *Hum Reprod* (1996): 11, 627-632.
14. Johnston D.S. and Ahringer J. Cell Polarity in Eggs and Epithelia: Parallels and Diversity. *Cell* May 28 2010; *141*: 757-774
15. Munro E., Nance J., and Priess, J.R. Cortical flows powered by asymmetrical contraction transport PAR proteins to establish and maintain anterior-posterior polarity in the early *C. elegans* embryo. *Dev. Cell* (2004); 7: 413–424.
16. Simon L1, Ge SQ, Carrell DT. Sperm selection based on electrostatic charge. *Methods Mol Biol.* 2013; 927:269-78.
17. Karimi N, Mohseni Kouchesfahani H, Nasr-Esfahani MH, Tavalaee M, Shahverdi A, Choobineh H. - DGC/Zeta as A New Strategy to Improve Clinical Outcome in Male Factor Infertility Patients following Intracytoplasmic Sperm Injection: A Randomized, Single-Blind, Clinical Trial. *Cell J. 2020 Apr; 22(1):55-59. Epub 2019 Sep 8.*
18. Al-Shareefi, E., Sahib, A.H.A. and Hameed, I.H., 2019. Phytochemical Screening by FTIR Spectroscopic Analysis and Anti-Fungal Activity of Fruit Extract of Selected Medicinal Plant of Rutagraveolens. *Indian Journal of Public Health Research & Development*, 10(1), pp.994-999.
19. Al-Shareefi, E., Sahib, A.H.A. and Hameed, I.H., 2019. In vitro Antibacterial and Anti-Fungal Activities of Methanolic Extract of Menthapulegium. *Indian Journal of Public Health Research & Development*, 10(1), pp.988-993.