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Research Article

Maternal Intuition and Ultrasound: Evaluating Fetal Sex Determination in Early Pregnancy

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Abstract

Objective: *To verify the accuracy of maternal intuition and ultrasound for the determination of fetal gender in the first trimester.*

Methods: *This is a prospective cohort study that enrolled patients with a singleton gestation presenting for the first-trimester ultrasound. Before their exam, each woman was asked about her maternal intuition. Data on the newborn gender was recorded postnatally.*

Results: *The sonographic determination is sufficiently accurate with a margin of error of 7%. The accuracy of maternal intuition was not significantly different from chance (51.16 % vs. 50.0%, p = 0.87). On the other hand, no association was found between maternal intuition and maternal characteristics and behavioral changes.*

Conclusion: *Maternal intuition isn't accurate for fetal gender determination in the first trimester.*

Keywords: *fetal gender, ultrasound, maternal intuition, prenatal diagnosis*

Introduction

Curiosity is a hallmark of human experience. Since the beginning of time, a proportion of pregnant women and couples as well as the neighborhood and local society wishes to know the fetal gender. Many experimental techniques and unproven ways were described to predict or guess fetal gender before the era of ultrasound. Some use the shape or the height of the bump with high meaning a girl and low meaning a boy, others use the wedding ring on a string trick, or the morning sickness, or sweet versus savory, or Chinese gender chart, and many other ways and tricks [1]. The introduction of fetal ultrasound in the management of pregnancies made the determination of the fetal gender more sensitive with an accuracy of 97.1% in the second trimester [2]. First trimester gender determination was also described with a correct determination ranging between 70 and 95% [3,4]. According to ISUOG practice guidelines for first-trimester fetal ultrasound scan, the gender evaluation is optional and is based on the orientation of the genital tubercle in the midsagittal plane, but it is not considered sufficiently accurate for clinical purposes [5]. On the other hand, many patients express their feelings and their guesses concerning fetal gender. Although some pregnant women perceived their fetal gender in first trimester, there is not enough data in the literature evaluating the accuracy of maternal intuition.

In front of this pressure to identify the fetal sex as soon as possible, we conducted this study with the aim of evaluating the accuracy rate of fetal gender by ultrasound and by maternal intuition in the first trimester of gestation.

Methods

A preliminary study was conducted first to assess the proportion of patients requesting fetal sex discernment in the first trimester. Then a prospective cohort study that includes all pregnant women with singleton pregnancies undergoing first trimester fetal ultrasound scan in our institution for prenatal diagnosis Clinique de Diagnostic Prenatal was conducted. All patients were between 11 and 13+6 weeks of gestation. Demographical maternal characteristics and behavioral changes during the first trimester are assessed. Patients knowing their fetal gender by Non-Invasive Prenatal Test were excluded. Before their sonographic examination, each patient was asked by a midwife about her maternal intuition for her fetal gender. Answers were: Boy, Girl, I don't know. Moreover, the ultrasound scan was performed by two-dimensional imaging using a volumetric US probe (GE E6, GE Voluson 730, Medical Systems, Zipf, Austria), and was performed by the same expert operator. Transverse and mid-sagittal planes for the genital tubercle were used to identify the fetal gender. The sonographic diagnosis was blinded to maternal intuition. The gender of the fetuses included was checked postnatally. The objective of this study is to evaluate the diagnostic accuracy of ultrasound and maternal intuition for the identification of fetal gender. Statistical analysis was performed with Statistical Package for the Social Sciences software SPSS 25. The normality of distribution was studied using skewness and kurtosis. Normal continuous variables were analyzed using the Student t test. Proportions were compared using the Chi-square test and McNemar Test. A probability value $p < 0.05$ was considered to be statistically significant.

Of concern, all procedures performed in this study involving human participants were in accordance with the Helsinki Declaration. An informed consent has been obtained from all the participants involved.

Results

At their visit for routine first-trimester ultrasound in our center, most of our patients, 98% according to the preliminary study requested fetal sex discernment. During the period study, one hundred pregnant women were included in the study. Maternal characteristics and behavioral changes are summarized in table 1. The average gestational age was 12.56 weeks, with an average gravida of 2. Of 100 patients, 57% expressed having no intuition of fetal gender (24 patients predicted a female while 19 women predicted a male), 22% had correct

intuition and 21% had a wrong feeling. On the other hand, 93% of sonographic determinations of fetal gender were correct, and 7% were incorrect. Of concern, three male live births were labeled as female, while four female births were diagnosed as male based on first trimester ultrasound. The accuracy of the diagnosis of fetal gender based on the first trimester ultrasound was significantly higher in comparison with the maternal intuition (chi-square = 3.078, df = 1, $p < 0.0001$). Data showed that none of the maternal characteristics were significantly associated with the accuracy of maternal intuition and sonographic determination (table 2). Further analysis showed that the accuracy of maternal intuition of fetal gender was not significantly different from chance (51.16 % vs. 50.0%, chi-square = 0.02, df = 1, $p = 0.87$); whereas the ultrasound provided significantly better accuracy than chance (93% vs. 50.0%, chi-square = 73.9, df = 1, p-value < .0001). 25% of our patients were diagnosed for fetal gender before 12 weeks of gestation with a range of 11+2 - 13+6 weeks. The seven false diagnoses were at 11+3, 12, 12+1, 12+1, 12+4 (x2), and 14 weeks. Of concern, we did not find a significant association between ultrasound accuracy and gestational age (p=0.57, student test). On the other hand, we did not find an association between the maternal intuition of fetal gender (boy or girl) and maternal characteristics and behavioral changes: weight gain (p=0.15), nausea/vomiting (p=0.06), type of pregnancy (p=0.53), smoking (p=0.7), diet change (p=0.11).

Table 1: Demographic characteristics and behavioral changes of study population

Maternal Characteristics	N=100
Age < 35 years	76
≥ 35 years	24
Parity: Nulliparous	44
Parous	56
BMI < 30	87
≥ 30	13
Type of Pregnancy: Spontaneous	90
IVF	10
Father's age: <35	45
≥ 35	55
Weight gain: < 3kg	73
≥ 3 kg	27
Nausea: Yes	45
No	55
Smoking: Yes	7
No	93

Diet: sugar	18
Salt	16
Acid	7
Spicy	1
hate coffee and smoking odor	2
no change	56

Table 2: Comparison of maternal intuition (A) and sonographic determination (B) of fetal gender with respect to maternal characteristics

Table 2 A

Maternal characteristics	Maternal intuition of fetal gender			
	Correct	Incorrect	Undetermined	P-value
	N=22	N=21	N=57	
Age < 35 years	17 (77.3%)	16 (76.2%)	43 (75.4%)	0.98
Age ≥ 35 years	5 (22.7%)	5 (23.8%)	14 (24.6%)	
BMI <30	21 (95.5%)	19 (90.5%)	47 (82.5%)	0.26
BMI ≥ 30	1(4.5%)	2(9.5%)	10(17.5%)	
Parity: Nulliparous	12(54.5%)	5(23.8%)	27(47.4%)	0.09
Parous	10(45.5%)	16(76.2%)	30(52.6%)	

Table 2 B

Maternal characteristics	Sonographic determination of fetal gender		
	Correct	incorrect	P-value
	N=93	N=7	
Age < 35 yeas	70 (75.3%)	6 (85.7%)	0.53
Age ≥ 35 years	23 (24.7%)	1 (14.3%)	
BMI <30	81 (87.1%)	6 (85.7%)	0.91
BMI ≥ 30	12 (12.9%)	1 (14.3%)	
Parity: Nulliparous	40 (43%)	4 (57.1%)	0.46
Parous	53 (57%)	3 (42.9%)	

Discussion

The findings of this study demonstrate that sonographic determination of fetal gender in the first trimester (11-13+6 weeks) is sufficiently accurate with a margin of error of 7%. However, the accuracy of the sonographic determination of fetal gender in the first trimester in our series is 93%, which is higher than that found in Berveiller et al. (74%, and 85% excluding undetermined answers) [6]. The proportion of patients requesting fetal sex discernment in the first trimester (98%) is high in comparison with other studies like Larsson et al (57%) [7] and M K Walker et al. (81%) [8]. This high interest in sex determination is mostly explained by our Mediterranean culture which has a preference for Boys over girls and by the trendy phenomenon "the gender reveal party" where the relatives or friends of the pregnant women want to know the gender before the couple in order to prepare a celebration. All of these reasons present a pressure and a challenge to the operator, taking more time and exploring different angles of the genital tubercles in order to determine the gender in the first trimester, and may explain the absence of undetermined sonographic answers in our series. Of concern, based on our results, we found that the sonographic diagnostic accuracy of fetal gender depends on the standardized approach, the operator's experience and the quality of the image, independently of maternal characteristics like age, BMI, parity…

In our series, 25% of our patients were before 12 weeks of gestation. Our data showed that the accuracy of the fetal gender sonographic diagnosis is not associated with gestational age. This finding is in disagreement with the Efrat et al study in which the sex determination accuracy increased with gestation from 70.3% at 11 weeks to 98.7% at 12 weeks [4]. The improvement in the quality of images, the performance of the new generation ultrasound machine, and the experience of the operator are factors that can explain the difference between our study and Efrat et al study. Moreover, the accuracy of the ultrasound in the first trimester is independent of the fetal gender: baby boys or girls.

On the other hand, some pregnant women believe in traditional sex determination techniques and trust their maternal intuition. However, there is a lack of data regarding the accuracy of the mother's intuition. 57% of pregnant women in our series have no intuition of fetal gender in their first trimester of pregnancy, which is higher than the proportion of maternal undetermined answers in Berveiller et al study (13%) [6] but it is the same proportion in the McFadzen et al study (60%) [8]. While 63.6% of patients predicted a male in Genuis et al study [9], 44.18% of women in our series predicted a fetal male gender. Of concern, maternal intuition can be different than maternal preferences. Additionally, no association was revealed between the maternal intuition of fetal gender (boy or girl) and maternal characteristics and behavioral changes. These findings

reflect that our studied population trusts the sonographic examination more than their intuition based on food preference, emesis, weight gain, etc. On the other hand, when we compared the maternal intuition accuracy with chance, we did not find a significant difference. Thus, we can conclude that maternal intuition is not more accurate than flipping a coin.

Conclusion

Overall, fetal gender reveal may be a request to many parents-to-be early in the first trimester of pregnancy. There are many traditional and medical techniques, invasive and non-invasive. The first trimester ultrasound seems to be sufficiently accurate for fetal gender determination. The diagnostic accuracy depends on the standardized approach, the operator's experience and the quality of the image. However, maternal intuition accurately predicts gender in 51.16%, almost similar to the chance.

Declarations of interest: None

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Authors' contributions All authors have contributed equally in the literature search and redaction of this article.

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