

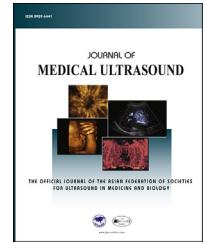


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ORIGINAL ARTICLE

# Learning Curve in Determining Fetal Sex by First Trimester Ultrasound Scan



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Received 26 August 2015; accepted 15 December 2015

Available online 25 January 2016

## KEYWORDS

fetal sex,  
first trimester,  
learning curve,  
ultrasound

**Abstract** *Background:* To obtain the learning curve in determining fetal sex with the first trimester ultrasound scan.

*Methods:* A prospective study was conducted on 400 pregnant patients to determine the fetal sex by ultrasound scan between 11–13+6 weeks of gestation. A midsagittal plane of the fetus was obtained by two sonographers who were newly trained for measuring nuchal translucency. It would be assigned as male if the fetal phallus was in the cranial direction and assigned as female if in caudal direction. The baby sex was confirmed after delivery. The accuracy of each sonographer was analyzed after every 50 ultrasound scans performed.

*Results:* Nearly all the patients requested to be informed about the fetal sex during ultrasound. The accuracy in determining fetal sex by the two sonographers increased with the number of ultrasound scans performed. The two sonographers achieved an accuracy rate of 71.4–78% after 200 ultrasound scans performed. Among different factors which may affect the accuracy in determining fetal sex with ultrasound, a gestational age less than 12 weeks had a significantly lower accuracy than those more than 12 weeks, and male fetuses had significantly higher accuracy than female fetuses. A logistic regression model showed that these two factors remained significant in the equation ( $p < 0.001$  and  $p < 0.001$ ). However, prone position of the fetus and maternal obesity significantly decreased the feasibility for sex assignment in both univariate ( $p < 0.001$  and  $p = 0.002$ ) and logistic regression analysis ( $p < 0.001$  and  $p = 0.012$ ) respectively.

*Conclusion:* Around 200 ultrasound scans will need to be performed by a sonographer to achieve an accuracy greater than 70% in determining fetal sex at the first trimester.

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Conflicts of interest: Nil.

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<http://dx.doi.org/10.1016/j.jmu.2015.12.002>

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## Introduction

Antenatal determination of fetal sex by ultrasound is useful for X-linked diseases such as hemophilia and Duchenne muscular dystrophy as the finding of female sex will exclude the disease which can avoid the risk of invasive tests, while the finding of male sex will implicate a 50% chance of inheriting the disease and require further investigations. Ultrasound determination of fetal sex may also sometimes help in diagnosing and confirming chorionicity in twin pregnancies and also satisfies parental curiosity.

It is usually not difficult to determine the fetal sex during the second trimester ultrasound scan by identifying the penis in a male fetus or labial folds in a female fetus, and the accuracy in identifying fetal sex in an early second trimester was quoted to be 96.7–99.3% [1,2]. On the contrary, it is more difficult to determine fetal sex during the first trimester ultrasound due to the smaller size of the fetus and difficulty in obtaining a true sagittal plane to precisely assess the direction of the fetal phallus [3]. With the widespread practice of measuring the nuchal translucency in the first trimester, many couples would wish to know the fetal sex during nuchal translucency scans instead of waiting for the second trimester morphology scan. In addition, it would be better to determine the fetal sex earlier in the presence of possible X-linked diseases to proceed to invasive tests earlier if necessary.

Various studies showed that the determination of fetal sex with the first trimester ultrasound is highly accurate with accuracy quoted from 85.7–98.6% [4–9]. However, there have not been any prospective studies on the quantitative experience a sonographer would need to perform before he/she can identify fetal sex accurately to confidently disclose the sex to the couple. This study aims to obtain the learning curve for the determination of fetal sex with the first trimester ultrasound scan.

## Methods

This was a prospective study conducted in the antenatal clinic of a regional obstetric training centre from December 2011 to August 2012. All pregnant women in gestation 11+0 to 13+6 weeks with fetal crown rump length between 45 mm and 84 mm were offered first trimester combined Down syndrome screening. Two sonographers had recently been accredited by the Fetal Medicine Foundation (UK) to perform nuchal translucency scans. Patients having nuchal translucency scans by these two sonographers were invited for recruitment into the study with written consent. Patients with multiple pregnancies were excluded from the study.

All the ultrasound examination was performed trans-abdominally using a Voluson 730 Expert machine (GE Medical Systems, Solingen, Germany) with a 4–8-MHz curved array three-dimensional transducer. While measuring the nuchal translucency, a midsagittal plane of the fetus was obtained and an attempt was made to determine the fetal sex as well. The fetus was assigned subjectively either female or male sex according to the direction of the fetal phallus. The fetal phallus in the cranial direction was assigned as male [Figure 1; male

fetus in sagittal section. Note the cranially directed phallus (arrow)] while in caudal direction as female [Figure 2; female fetus in sagittal section. Note the caudally directed phallus (arrow)]. The maximum time attempted was five minutes after measuring the nuchal translucency and failure in assigning the fetal sex was recorded. After delivery, the records of all recruited patients were reviewed through the obstetric database to confirm the baby's sex. If the patients finally delivered in other hospitals, they were contacted by phone for this information.

Yang et al [10] studied the learning curve in measurement of fetal fronto-maxillary facial angle at 11–13 weeks of gestation, and the competence in measurement was achieved after a median number of 90 cases, with a range of up to 140. It was postulated that the learning time of measurement of fetal frontomaxillary facial angle and assigning fetal sex was similar as both of them require the sonographer to obtain a true midsagittal plane. Therefore, 200 cases were recruited for each sonographer. The results were stratified into four blocks of every consecutive 50 cases to compare the accuracy. SPSS version 20.0 was used for statistical analysis (SPSS, Chicago, IL, USA). Chi-square test and Fisher's exact test were used when appropriate. Logistic regression models were tested to depict the parameters that may affect the accuracy in determining fetal sex or affect the ability of assigning fetal sex. All the differences were defined as being statistically significant at  $p < 0.05$ .

This study was approved by the Research Ethics Committee of the corresponding hospital (reference number: KC/KE-11-0161/ER-1).

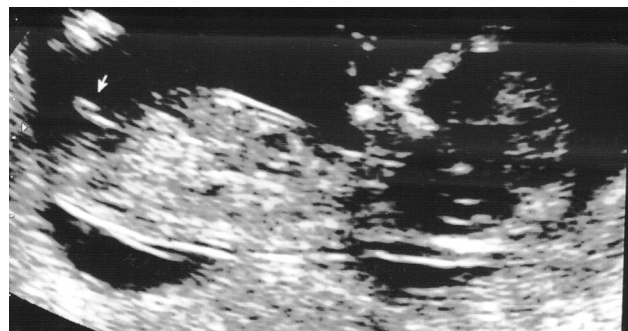


Figure 1



Figure 2

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