ORIGINAL ARTICLE

Three dimensional transvaginal ultrasonography: Can it improve management in cases of laterally located minor placenta previa?

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Abstract *Objective:* To improve management of cases of minor placenta previa that is located laterally by more accurate measurement of edge-to-os distance using 3D transvaginal ultrasonography.

Methods: Fifty cases of laterally located minor placenta previa in the third trimester were included in the study. 2D TVS was done for all cases to measure the edge-to-os distance, then a 3D volume was taken for all cases and manipulated to get the coronal plane of the cervical canal, and the distance between the lateral edge of the internal os and the placental edge was measured and compared to 2D distances in each case.

Results: In 46/50 cases (92%), distances measured by 3D ultrasound were less than those measured by 2D ultrasound. The decision about mode of delivery was changed from attempt of vaginal delivery to cesarean delivery in 39/50 cases (78%), as 2D distances that were ⩾20 mm were actually <20 mm by 3D examination in these cases.

Conclusions: In most cases of laterally located minor placenta previa, edge-to-os distances measured by 3D TVS were shorter than those measured by 2D TVS, thus changing management options in a considerable number of cases from attempt of vaginal delivery to elective cesarean section.

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1. Introduction

Placenta previa has considerable maternal and fetal morbidity and mortality, including antepartum hemorrhage, placenta accreta, postpartum hemorrhage and prematurity. The number of cases of placenta previa and its complications will continue to increase as a result of the rising incidence of cesarean sections combined with increasing maternal age (1–5).

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Ultrasound plays a central role in the diagnosis and management of placenta previa. Now, most cases are diagnosed at the time of the routine second-trimester ultrasound examination (6–8). It provides better prediction of which cases will persist to term. Moreover, it helps to identify which women require hospitalization and to determine candidates for vaginal delivery (9).

Placenta previa is considered a major previa if the placenta lies over the internal cervical os, and a minor or partial previa if the leading edge of the placenta is in the lower uterine segment but not covering the cervical os (10). The distance from the placental edge to the internal os is essential in determining the mode of delivery (11). A distance of 2 cm or more was usually associated with a successful attempt at vaginal delivery (12–15). Measurement of the distance from the placental edge to the internal os is done routinely by 2D transvaginal ultrasound (14). The reproducibility and interobserver reliability of this measure are unknown (11).

We have noticed that, some cases presented clinically by antepartum hemorrhage and diagnosed ultrasonographically as having laterally located placenta previa with an edge-to-os distance more than 2 cm, bled severely on attempt to deliver vaginally to an extent that necessitated immediate cesarean section. It was suggested that the edge-to-os distance might be actually less than that measured by the standard 2D TVS technique. So, we aimed in this study to evaluate the role of 3D TVS in accurate measurement of edge-to-os distance in cases of laterally located placenta previa.

2. Materials and methods

Fifty women were recruited in this descriptive cross sectional study between January 2012 and February 2014. This study included patients in the third trimester (more than 27 weeks gestation) diagnosed ultrasonographically as having placenta previa in lateral position.

A transvaginal examination (TVS) was conducted by the same sonographer for all cases, using a MyLab 60 (Esaote, Italy) ultrasound machine, equipped with endocavitary high frequency convex 3D/4D transducer (BE1123). According to Bhide et al. (14), the probe was positioned to obtain a two-dimensional (2D) mid-sagittal plane of the cervix; showing the whole length of the cervical canal (from internal to external os). The distance between the internal os and the lower placental edge (edge-to-os distance) was measured (Fig. 1a). Then the probe was rotated in both directions, with the cervical canal still in view, and the shortest distance between the internal os and the lower placental edge was measured (Fig. 1b).

Three-dimensional (3D) ultrasound acquisition was done using an angle of (95°). Acquisition was performed in the absence of contractions and body movements. It included the cervix and part of the lower uterine segment containing the placental edge.

In the multiplaner view, the central point was placed at the internal os in the sagittal pane. In the transverse plane, the internal os appeared as a slit. The central point was then positioned in the middle of this slit. Rotation around the three axes was performed, so that the cervical canal and the internal os slit were horizontally aligned in the sagittal and transverse planes respectively. The reference point was then in the center of the internal os in all three planes, and the whole cervical canal, or most of it in cases of curved canal, is seen in the coronal plane.

In the coronal plane of the cervix, the cervical canal appeared as an echogenic rectangle with a hypoechoic line on each side. The distance is measured from the upper angle of the rectangle, which corresponded to the lateral edge of the internal os, and the lower placental edge (edge-to-os distance) (Fig. 1c and d).

An edge-to-os distance of 2 cm or more is considered the cut off for attempt of vaginal delivery in our study.

3. Statistical methods

Data were processed by SPSS version 10 software package. Qualitative data were presented as frequency and percentage. Quantitative data were presented as mean $\pm$ SD when normally distributed. Kappa was used as a measure of agreement (<0; less than chance agreement, 0.01–0.20; slight agreement, 0.21–0.40; fair agreement, 0.41–0.60; moderate agreement, 0.61–0.80; substantial agreement, 0.81–0.99; almost perfect agreement). P value <0.05 is considered significant.

4. Results

Fifty pregnant women in the third trimester diagnosed by ultrasound as having lateral placenta previa were included in this study. Their ages ranged from 19 to 42 years with mean $\pm$ SD of 29.4 $\pm$ 6.4 years. The gestational ages ranged from 28 to 36 weeks gestation with mean $\pm$ SD of 31.5 $\pm$ 2.4 years.

All cases were examined firstly by 2D transvaginal ultrasound to measure the shortest edge-to-os distance. The 2D distances of all cases ranged from 11.6 to 45 mm with mean $\pm$ SD of 30.8 $\pm$ 8.9 mm. By 2D examination, 42/50 cases (84%) had distances $\geqslant 20$ mm (cut-off for attempt of vaginal delivery). Only 8/50 cases (16%) had distances <20 mm.

All cases, then, were examined by 3D transvaginal ultrasound to measure the edge-to-os distances in the coronal plane. The 3D distances of all cases ranged from 5.2 to 37 mm with mean $\pm$ SD of 16.4 $\pm$ 4.8 mm. By 3D examination, only 3/50 cases (6%) had distances $\geqslant 20$ mm, and 47/50 cases (94%) had distances <20 mm.

In 46/50 cases (92%), distances measured by 3D ultrasound were less than those measured by 2D ultrasound. Only in 4/50 cases (8%), distances measured by 3D ultrasound were more than those measured by 2D ultrasound.

As regards management, decision regarding the mode of delivery was the same depending on both 2D and 3D ultrasound examination in 11/50 cases (22%); in 3/50 cases (6%) attempt for vaginal delivery was decided as both 2D and 3D distances were $\geqslant 20$ mm. In 8/50 cases (16%), cesarean delivery was decided from the start, as both 2D and 3D distances were <20 mm. However, the decision was changed from attempt of vaginal delivery to cesarean delivery in 39/50 cases (78%), as 2D distances that were $\geqslant 20$ mm were actually <20 mm by 3D examination in these cases (Table 1).

Kappa was used to measure the overall agreement between edge-to-os distances measured by 2D transvaginal ultrasound and those measured by 3D technique. There was no agreement between both methods as kappa was 0.2 ($p = 0.44$).