

## Two-Dimensional Ultrasonography in the Assessment of Nuchal Cord

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### Abstract

**Objectives** The aim of this was to evaluate the accuracy of two-dimensional (2D) ultrasonography in the diagnosis of nuchal cord to enable us determine if it can be recommended for its antenatal diagnosis.

**Materials and Methods** Between 01 January and 30 April 2012, 93 singletons pregnancies in cephalic presentation with 2D ultrasound scan done at term but within 24 h before onset of labor for exploration of the presence or absence of nuchal cord were reviewed. The procedure was carried out using the same equipment (Voluson 730 Expert) and by the same radiologist who had good training in the ultrasonographic diagnosis of nuchal cord.

**Results** Among the 38 cases of nuchal cord present at delivery, the diagnosis by means of 2D ultrasonography was done in 32 cases (sensitivity: 84.2 %). The diagnosis was also correct among 47 of the 55 absent nuchal cords at delivery (specificity: 85.4 %). In eight cases, nuchal cord diagnosed by 2D ultrasonography was not observed at delivery (positive predictive value: 80 %). Furthermore, six

cases of nuchal cord were undiagnosed by 2D ultrasonography (negative predictive value: 88.7 %).

**Conclusion** Two-dimensional ultrasonography for the antenatal diagnosis of nuchal cord by a skilled radiologist can reach sensitivity and specificity of more than 84 %. Therefore, in settings where only 2D ultrasonography is available, efforts should be made by operators for antenatal diagnosis of nuchal cord.

**Keywords** Nuchal cord entanglement ·  
Two-dimensional ultrasonographic diagnosis ·  
Sensitivity · Specificity

### Introduction

Cord accidents increase perinatal morbidity and mortality [1, 2]. The most frequent cord accident is nuchal cord [2]. Antenatal diagnosis through ultrasonography—although not always easy—requires good follow up of pregnancy during the last few weeks of and during delivery [3–5]. Antenatal diagnosis of nuchal cord depends not only on the type of apparatus used, but also on the skill of operator. The sensitivity of bidimensional ultrasonography is 69 % [6], while that of color Doppler ultrasonography varies between 83 and 97 % [4–6]. The accuracy of diagnosis of nuchal cord might be higher with three-dimensional (3D) ultrasonography than with two-dimensional (2D) ultrasonography. Some authors found out that, there were no

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statistically significant differences in the sensitivity among the three techniques [6]. Color and 3D ultrasound apparatus are more expensive. Therefore, they are less available for use in most developing countries like Cameroon. Furthermore, even when they might be available, the cost of an ultrasound scan is sometime unaffordable for the majority of women. That is why in our environment, 2D ultrasound scans are the ones usually performed. In our country, no study has evaluated the accuracy of 2D ultrasonography in the diagnosis of nuchal cord. The aim of this study, therefore, was to evaluate the accuracy of 2D ultrasonography in the antenatal diagnosis of nuchal cord.

## Materials and Methods

This prospective cohort study was conducted in the maternity ward of the University Teaching Hospital (CHU) Yaoundé, Cameroon from January 1st till April 30th 2012 (4 months). Singletons pregnancies in cephalic presentation with 2D ultrasound scan done at term—but within 24 h before onset of labor—for exploration of the presence or the absence of nuchal cord were recruited. The examination was carried out with the same equipment (Voluson 730 Expert) and by the same radiologist who had good training for the ultrasonographic diagnosis of nuchal cord.

Data recorded after delivery included maternal age and parity, gestational age at delivery and presence or not of the nuchal cord. This study was approved by the institutional ethics committee and an informed consent form was obtained from each patient. Data were analyzed using SPSS 18.0.

## Results

A total of 93 ultrasound scans were performed. Maternal age varied between 15 and 40 years with a mean of  $28.3 \pm 4.6$ . Mean parity was  $2.4 \pm 1.7$  with a range between 1 and 10. Gestational ages varied between 37 and 43 weeks with a mean of  $39.7 \pm 1.8$ .

Among the 38 cases of nuchal cord present at delivery, the diagnosis with 2D ultrasonography was done in 32 cases. The diagnosis was also correct among 47 of the 55 absent nuchal cords at delivery. In eight cases, nuchal cords diagnosed by 2D ultrasonography were not observed at delivery. Furthermore, six cases of nuchal cord were undiagnosed by 2D ultrasonography giving a sensitivity, specificity, positive predictive value, and negative predictive value of 84.2, 85.4, 80.0, and 88.7 %, respectively.

The likelihood ratio for a positive test result was 6.47, while the likelihood ratio for a negative test result was 0.18 (Table 1).

**Table 1** Accuracy of 2-D ultrasonography in the diagnosis of nuchal cord

	Nuchal cord at delivery		
	Present	Absent	Total
Antenatal ultrasound diagnosis			
Present	32 (a)	8 (b)	40 (a + b)
Absent	6 (c)	47 (d)	53 (c + d)
Total	38 (a + c)	55 (b + d)	93 (a + b + c + d)

Sensitivity (SS):  $a/a + c = 32/38 = 84.2 \%$

Specificity (SP):  $d/b + d = 47/55 = 85.4 \%$

Positive predictive value:  $a/a + b = 32/40 = 80.0 \%$

Negative predictive value:  $d/c + d = 47/53 = 88.7 \%$

Likelihood ratio for a positive test result:  $SS/1 - SP = 84.2 \%/1 - 87 \% = 6.47$

Likelihood ratio for a negative test result:  $1 - SS/SP = 1 - 84.2 \%/85.4 \% = 0.18$

## Discussion

The sensitivity of 2D ultrasonography in the diagnosis of nuchal cord in our series (84.2 %) was higher than that of 69 % observed elsewhere [6]. This might be because in our series; the examination was done by the same operator who has had training in diagnosis of nuchal cord, therefore who has more skills. Sensitivity with color Doppler ultrasonography in the diagnosis of nuchal cord varies between 83 and 97 % in the literature [4, 6]. The sensitivity of 2D ultrasonography in diagnosing nuchal cord in our series falls within this range. Therefore, the sensitivity of 2D ultrasonography in the diagnosis of nuchal cord when the procedure is done by a skilled operator might be comparable to that of color Doppler ultrasound scan.

Some authors have noticed that sensitivity was 69 % for 2D sonography against 71 % for 3D sonography. They concluded that 3D imagings do not provide more useful diagnostic information compared with 2D and color Doppler ultrasound for detecting nuchal cord in utero. The only advantage of 3D sonography from the point of view of these authors was the ability to view the nuchal cord [6].

The specificity of 2D ultrasonography in the diagnosis of nuchal cord observed in our series (85.4 %) was close to that of 87 % observed by some authors with color Doppler ultrasonography [5]. 2D ultrasonography might also be efficient enough for antenatal diagnosis of nuchal cord.

The positive predictive value in our study (80 %) was slightly lower than that of 89 % observed by Ertan and Anyaegbunam [4], but close to 81 % noticed by Romero Gutierrez et al. [5].

The negative predictive value in this study (88.7 %) was slightly lower than 96 and 95 % as found by Ertan and Anyaegbunam and Romero Gutierrez et al., respectively [4, 5] by means of color Doppler ultrasonography.

Color Doppler and 3D ultrasound apparatus are more expensive than 2D ultrasound apparatus. Hence, the first two are less used in low-income resource countries like Cameroon. Operators using 2D apparatus should receive proper training to increase their diagnostic ability of nuchal cord, because antenatal diagnosis of nuchal cord requires a close intrapartum follow up for early diagnosis of fetal distress, thus, reducing fetal and neonatal morbidities and mortalities.

### Conclusion

Sensitivity and specificity of 2D ultrasonography for the antenatal diagnosis of nuchal cord can be more than 84 % with skilled operator. Therefore, in settings where only 2D ultrasonography is available, efforts should be made by operators for antenatal diagnosis of nuchal cord.

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