

Diagnostic Accuracy of Grayscale Divot Sign and Doppler Ultrasound for Diagnosis of Nuchal Cord - Cross Sectional Study.

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ABSTRACT

Nuchal cord is defined as 360 degrees rapped around the fetal neck with overall prevalence of 25%.

Aim: To determine the predictive accuracy of grey scale divot sign and Doppler ultrasound for the diagnosis of nuchal cord.

Study design: Cross-sectional study.

Methodology: Patients (n=325) of nuchal cord were enrolled to carry out this study at Tariq Clinic, Lahore, for 9 months. The age, gestational age sonographic and clinical, AFI, presence of nuchal cord diagnosed by grey scale with divot sign and on Doppler ultrasound were noted. Data analyzed by SPSS 24.0v. Mean \pm SD for age whereas frequency and percentages were given for qualitative parameters. Significant p-value was of ≤ 0.05 .

Results: The mean age of patients was 28.99 ± 5.16 years with range (19-41years). Out of 325 patients, 251 patients were diagnosed on grey scale with divot sign and Doppler ultrasound with sensitivity, specificity, PPV and NPV of 70.59%, 91.61%, 61.02% and 94.36% respectively.

Conclusion: It was concluded that on the basis of divot sign, nuchal cord can be diagnosed where Doppler ultrasound is unavailable. On Doppler ultrasound nuchal cord can be confirmed with high accuracy.

Keywords: Divot sign, Nuchal cord, accuracy of grey scale and Doppler.

INTRODUCTION

Nuchal cord is defined as 360 degrees wrapped around the fetal neck with prevalence of about 25%. Two or more loops of nuchal cords may present and its effect on pregnancy is between 2.4 percent to 8.3%¹. During pregnancy nuchal cord in one of the accidental finding, the incidence increases by advancing the gestational age². Nuchal cord accidents increase perinatal mortality and morbidity such as intrapartum fetal heart decelerations, growth restriction, cerebral palsy, hypovolemic shocks, low Apgar score, meconium stained amniotic fluid and dystocia, this may cause the increase risk of caesarean section^{3,4}.

Nuchal cord can be classified by their number of loops and their nature, number of loops can be single, double and multiple and nature can be tight or loose nuchal cord⁵. Two or more loops are present in about 2.4-8.3% of pregnancies. The multiple loops of nuchal cord can cause higher incidence of fetal distress and death⁶. It can occur in shorter cords, in which cord tend to be more tightly wrapped around the neck. Nuchal cord can be diagnosed by ultrasound. Firstly ultrasound diagnosis of nuchal cord was described in 1982⁷. Although Doppler ultrasound is superior but it has a high false positive rate than grey scale for diagnosing nuchal cord. This is probably due to seeing the cord beside rather than around the neck⁸. That is because during the course of pregnancy the position of the cord may change.

In a study the grey scale ultrasound was compared with the Doppler for predicting cord around neck in singleton pregnancies, the result showed: gray-scale (sensitivity 70.3 percent, specificity 89.7 percent), color Doppler (sensitivity 96.8%, specificity 87.9%)⁹. On grey scale ultrasound, the fluid is seen anterior to the neck and is not displaced by putting pressure by the transducer. The

resultant compression of fetal neck, causes small dent or impression to appear which is known as "divot sign"¹. Nuchal cord's sonographic diagnosis is possible by grey scale visualization of the 'Divot sign'. Care should be taken not to confuse this finding with posterior cystic mass, amniotic fluid pockets or skin folds. Grey scale ultrasound coupled with color Doppler can now be potentially used for cord position¹⁰.

Due to the high incidence of nuchal cord among Pakistani pregnant females with limited data available regarding its diagnosis due to limited resources, we planned the current study to access the predictive accuracy of grey scale divot sign and Doppler ultrasound for the diagnosis of nuchal cord.

The objective of the study was to study the predictive accuracy of grey scale divot sign and Doppler ultrasound for the diagnosis of nuchal cord.

METHODOLOGY

Patients (n=325) of nuchal cord were enrolled to carry out this study at Tariq Clinic, Lahore, for 9 months. Toshiba Nemio, convex transducer, frequency 3.5 to 5 MHZ was used for the scan. Patients were lied supine on the couch, convex ultrasound probe used with this approach. In general, nuchal cord evaluation during pregnancy was accomplished with the transabdominal approach. Divot sign was noted on grey scale ultrasound by transverse and longitudinal sections of the fetal neck, the presence of single and multiple loops were noted and then confirmed with color Doppler ultrasound as shown in Figure-1. All pregnant women with NC, singleton pregnancies and pregnancy with polyhydramnios are included and all non-gravid women and pregnant with other abnormalities and multiple pregnancies are excluded.

Statistical analysis: Data analyzed by SPSS 24.0v. Mean \pm SD for age whereas frequency and percentages were given for qualitative parameters. Significant p-value was of ≤ 0.05 . Sensitivity, specificity, PPV, NPV, FPR and FNR of ultrasound were calculated.

RESULTS

Among 325 enrolled patients, general characteristics with clinical and ultra-sonographic findings were summarized in Table-1.

Parameters like amniotic fluid index and Divot sign grayscale were presented as frequency and percentage (%) in Table-2. According to the results Out of 325 there were 309 patients of nuchal cord with normal amniotic fluid index (AFI) and 16 presented with polyhydramnios had nuchal cord.

According to table-3, 251 patients were confirmed on grey scale with divot sign and Doppler ultrasound whereas 36 patients were normal who were suspicious but not diagnosed with nuchal cord. Patients (15) were those who were diagnosed with nuchal cord by grey scale divot sign but remained undiagnosed by Doppler ultrasound. Patients (23) were suspicious on grey scale but diagnosed with Doppler ultrasound.

Sensitivity, specificity with diagnostic accuracy of Doppler ultrasound was summarized as percentage (%) in Table-4. Sensitivity of Doppler ultrasound as a diagnostic tool for nuchal cord in our study was 70.59% whereas specificity was 91.61%.

Figure-1: SUG showing Devot Sign

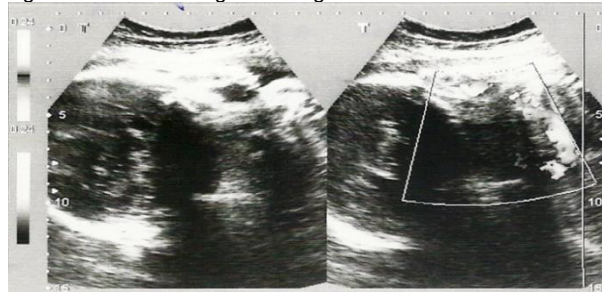


Table-1: General Characteristics Of All Enrolled Patients

Variables	Min.	Max.	Mean \pm SD
Age (years)	19	41	28.99 \pm 5.16
G.Age Clinical(weeks)	16	40	28.22 \pm 4.59
G.Age Sonographic(weeks)	16	40	27.76 \pm 4.54

Table-2: Amniotic fluid index and divot sign grayscale among enrolled patients

Variables	Categories	Frequency	%age
Amniotic Fluid Index	Normal	309	95.1
	Polyhydrominos	16	4.9
Divot sign grayscale	No	59	18.2
	Yes	266	81.8

Table3: Summary of findings on Grey-scale as well as Doppler Ultrasound

	Doppler++	Doppler--	Total
Grey scale Positive	251	15	266
Grey scale Negative	23	36	59

Table-4: Sensitivity & Specificity of Doppler Ultrasound

Variables	Estimate
Sensitivity	70.59%
Specificity	91.61%
PP Value	61.02%
NP Value	94.36%

DISCUSSION

In present study, nuchal cord was found in different gestational ages. The minimum gestational age in which nuchal cord is found was 16 weeks and maximum gestational age was 40 weeks. Nuchal cord was present in different gestational and maternal age groups. In a study, Y. Perlitz et al. was reported that ultrasound is use to scan in case of polyhydramnios. Polyhydramnios is one of cause by which nuchal cord can develop¹¹.

In current study total cases of nuchal cord was 325, in which 309 (95.1%) patients were considered who were normal AFI and 16 (4.9%) patients were with polyhydramnios. Normal patients were also included in nuchal cord diagnosis by grey scale ultrasound and also confirmed on Doppler sonography. In one previous study conducted by Umit Akosy et al. who considered Divot sign on grey scale ultrasound and also confirmed on Doppler ultrasound because Doppler is a noninvasive tool for the diagnosis of Nuchal cord at early menstrual ages, diagnosis of nuchal cord by Doppler ultrasound may lead to false positive result, because during the course of pregnancy the position of cord may change⁹. In another study by E. Peregrine et al who reported that Doppler ultrasound has high false positive rate on the diagnosis of nuchal cord. False positive rate is higher for Doppler ultrasound than for grey scale imaging¹⁰.

Funk et al. reported in his study that the specificity and sensitivity of Doppler sonography for the diagnosis of cord around neck was 97% and 96%, respectively¹¹. One study reported that the sensitivity of ultrasound for detection of cord around neck was 68.1% with the specificity, positive predictive value and negative predictive value of 77.2%, 53.5%, 86.3¹². Another study, discussed in his study that the sensitivity, specificity, PPV, and NPV for the diagnoses of nuchal cord was 84.2%, 85.4%, 80% and 88.7%. In our study the sensitivity of ultrasound for the detection of NC was 70.59% with the specificity, positive predictive value and negative predictive value of 91.61%, 61.02% and 94.36%¹³. On grey scale ultrasound nuchal cord can be diagnosed by Divot sign. However, Doppler ultrasound can improve the diagnosis of nuchal cord but it has high false positive rate.

CONCLUSION

It was concluded that on the basis of divot sign, nuchal cord can be diagnosed where Doppler ultrasound is unavailable. However, Doppler ultrasound nuchal cord can be confirmed with high accuracy.

Limitations: Our study had several limitations including financial constrains and limited resources. It was single centre study.

Conflict of interest: None

Funding: None

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