Original Article

Comparison of Umbilical Artery Doppler and Amniotic Fluid Index in Prediction of Obstetrical and Perinatal Outcome ≥34 Weeks of Gestation

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Abstract

Objective: To compare the frequency of perinatal outcomes among patients with normal and abnormal Doppler.

Methodology: *This d*escriptive case series study was conducted at the Department of Obs & Gynae, Pakistan Atomic Energy General Hospital H-11/4 Islamabad from June 2021 to December 2021. The included patients were evaluated by the researcher during the interview by filling out the Performa. Ultrasound was performed by the researcher. Doppler was performed in all oligohydramnios by the radiologist. Patients were divided into 2 groups, normal and abnormal Doppler. Perinatal outcome was compared between normal and abnormal Doppler by chi- square test. P value ≤ 0.05 was significant.

Results: In this study, the rate of LSCS was significantly higher in women whose Doppler findings were abnormal, i.e., normal: 23% vs. Abnormal: 61%, p-value=0.000. Women who had abnormal Doppler findings among them NICU admission rate was significantly higher as compared to women with normal Doppler findings.

Conclusion: Umbilical artery Doppler is an effective modality in women with oligohydramnios to rule out adverse maternal and neonatal outcomes. This modality can effectively be used to reduce and minimize the burden of adverse obstetric and perinatal outcomes.

Key words: Color Doppler, Oligohydramnios, Umbilical Artery, amniotic fluid index, perinatal outcome

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Introduction

Amniotic fluid volume measurement forms an integral part of antenatal fetal monitoring in routine obstetric scans. Oligohydramnios has been identified as the leading cause of increased perinatal morbidity and mortality. Doppler ultrasound is extremely helpful in evaluating maternal and fetal hemodynamics in this scenario.

Umbilical Artery Doppler is direct measure of uteroplacental function. It is a valuable non-invasive tool for evaluation of high risk pregnancies.

The last trimester Umbilical Artery Doppler normally shows high diastolic flow and low resistance, but in complicated pregnancies reduced flow due to increase resistance.[1]

Amniotic fluid index is an indirect measure of fetoplacental function. It occurs 0.5-5% pregnancies in the 3rd trimester and leading cause of induction of labour.[4] Most common cause of oligohydramnios is idiopathic 50% and 25% due to pregnancy induced hypertension. Placental insufficiency occur in 7% on Umbilical Artery Doppler. Pregnancies with oligohydramnios are more likely to have foetal growth restriction, cord compression, meconium aspiration, non-reactive CTG, and poor labour tolerance due to foetus birth asphyxia and low Apgar scores.[2]

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Third trimester care should be provided to all high risk pregnancies such as with raised blood pressure, deranged sugar level, elderly prim gravida and fetal growth restricted fetuses.[3] There is strong association between amniotic fluid index and Umbilical Artery Doppler. Both of these tests are integral part of fetomaternal surveillance. Umbilical Artery Doppler is better than amniotic fluid index in predicting perinatal and obstetrics outcome in high risk pregnancies. Umbilical Artery Doppler has higher sensitivity specificity positive and negative predictive value than amniotic fluid index.[3]

The prevalence of abnormal artery Doppler among oligohydramnios amniotic fluid index < 5 cm was 21/50 =42%. Abnormal Umbilical Artery Doppler shows adverse perinatal outcome 11.5% as compared to normal Doppler 1.3%. Umbilical Artery Doppler has high sensitivity and specificity for pregnancy induced hypertension 90% patients have increase S/D ratio in pregnancy induced hypertension.[2]

Induction of labor occur 52% with abnormal Doppler as compared to decrease amniotic fluid index 26%. Abnormal Umbilical Artery Doppler shows 23% meconium stained liquor as compared to normal Doppler 17%. LSCS with deranged Doppler 74% compared with decreases amniotic fluid index 17%. Incidence of LSCS 85.7% with abnormal Doppler compared with normal Doppler only 56%. Normal vaginal delivery is 27.5% with normal Doppler compared to 9.5% with abnormal Doppler. Most common indication of LSCS is fetal distress due to cord compression or fetal growth restriction and meconium 7% have fetoplacental insufficiency. [1] Low APGAR score, intrauterine growth restriction, NICU admission 38%, 80%, 76% with abnormal Doppler respectively compared to normal Doppler 27%, 34% and 44% respectively. [1]

Umbilical artery Doppler is non-invasive modality which can be used for early detection interventions and preventions of complications such as intrauterine growth restriction cord compression fetal distress induction of labor NICU admission Emergency LSCS and Low APGAR. Umbilical Artery Doppler helps to improve obstetric decision in high risk pregnancies. Abnormal Doppler detects several hour to days before any abnormality in CTG tracing. So the burden of adverse obstetric and perinatal outcome in oligohydramnios can be reduced by umbilical artery Doppler.

Normal Umbilical Artery Doppler has saw tooth appearance of arterial flow in one direction and continuous umbilical vein flow in other direction. As placental vascular resistance increases diastolic flow decreases and further increase in vascular resistance leads to reverse diastolic follow. High rate of perinatal mortality is associated with absent and reverse diastolic velocities in Umbilical Artery Doppler at term. [6]

Methodology

This descriptive case series study was conducted at Department of Obs & Gynae, Pakistan Atomic Energy General Hospital H-11/4 Islamabad from June 2021 December 2021. Consecutive (non-probability) sampling was used. The sample size was calculated according to WHO calculator confidence level 95% anticipated population 42% absolute precision 10% n=100 in each group. After approval from institutional Ethical and Research Committee and written informed consent from patients. Included patients were evaluated by the researcher by filling the Performa by researcher during interview.

Females with gestational age ≥34week, intact membrane, oligohydramnios amniotic fluid index ≤5cm, singleton pregnancy with cephalic presentation were included. Females with multiple pregnancy, congenital anomaly, per vaginal leaking, maternal morbidity were excluded from the study.

Ultrasound was performed by Researcher. Doppler was performed in all oligohydramnios by Radiologist. Patients were divided into 2 groups, normal (S/D ratio of flow velocity < 3, where 'S' stand for systolic and 'D' stand for diastolic) and abnormal Doppler (S/D ratio of flow velocity > 3).

Perinatal outcome was compared between normal and abnormal Doppler by chi- square test. P value ≤ 0.05 was significant. Data was entered and analyzed using statistical package for social science SPSV21. Frequency of abnormal Doppler in oligo, intrauterine growth restriction, emergency LSCS, Low APGAR score & NICU admission was calculated. Means standard deviation was calculated for age of patient and gestational age.

Results

Mean age of women in this study was 28.98±5.29 and 29.17±5.85 years respectively. Mean gestational age of women in this study was 36.93±1.37 and 37.03±1.34 weeks respectively. (Table I)

Rate of LSCS was significantly higher in women with abnormal Doppler findings i.e. Normal: 23% vs.

Abnormal: 61%, p-value=0.000. NICU admission for neonates was significantly higher in women with abnormal Doppler findings i.e. Normal: 16% vs. Abnormal: 54%, p-value=0.000. (Table II)

Table I: Demographics of patients (n=100)

	Normal Doppler	Abnormal Doppler
Age (years)	28.98±5.29	29.17±5.85
Gestational Age (weeks)	36.93±1.37	37.03±1.34

Table II: Comparison of outcome in both Groups

LSCS	Doppler Findings		P-value
	Normal	Abnormal	
Yes	23(23%)	61(61%)	**0.000**
No	77(77%)	39(39%)	
NICU Admission			
Yes	16(16%)	54(54%)	**0.000**
No	84(84%)	46(46%)	

Discussion

Umbilical artery Doppler assessment has been shown to reduce perinatal mortality and morbidity in high risk obstetric situations. [3] The fetal umbilical artery Doppler velocimetry evaluates the downstream impedance to the flow in the umbilical arteries. An abnormal umbilical artery Doppler velocimetry is an index of fetal peripheral vasoconstriction and associated with higher incidence of perinatal complications.[4]

In this study, the rate of LSCS was significantly higher in women whose Doppler findings were abnormal. i.e. Normal: 23% vs. Abnormal:61%, p-value=0.000. Women who had abnormal Doppler findings among them NICU admission rate was significantly higher as compared to women with normal Doppler findings.

An Indian study reported higher LSCS in women with abnormal Doppler findings which is consistent with the results of this study.[5] Young Ji Byun in his study reported no significant association of umbilical artery S/D ratio with LSCS and NUCU Admission.[6] These findings contradicts the results of this study.

In a study by carol et al, out of 81 cases of oligohydramnios, 50 patients (61.7%) had normal S/D ratio, out of which 12 patients (24%) were associated with identifiable perinatal morbidity where as in 31 patients (38.3%) with abnormal Doppler findings, 74% had adverse perinatal outcome.[7]

Manoj Mathur from India in his study reported that out of 50 cases, 31 (62%) had normal umbilical artery Doppler velocimetry and adverse perinatal outcome was 42% and 19(38%) had abnormal umbilical artery Doppler velocimetry and adverse perinatal outcome was 89.5%.[8]

Previous studies showed that, in pregnancies accompanied by FGR, the umbilical artery Doppler velocimetry can discriminate those at high risk for adverse perinatal outcome and predict neonatal outcome.[7, 18-21] it has also been emphasized that FGR with normal umbilical artery

Doppler velocimetry is a disease entity different from those with abnormal umbilical artery Doppler blood flow,[9] which may be managed by outpatient care,[10] and that SGA fetuses with normal umbilical artery S/D ratios do not show increased morbidity compared to AGA pregnancies.[11]

In addition, it has been reported that, if the umbilical artery S/D ratio and amniotic fluid volume are normal, adverse outcomes will occur only during delivery of the baby, and therefore, close antenatal surveillance may be unnecessary.[12] Furthermore, in cases of SGA fetuses with normal umbilical artery Doppler velocimetries, the frequency of fetal surveillance could be reduced from twice weekly to fortnightly, because no differences in neonatal outcomes were detected between antenatal cares provided twice a week and every two weeks.[13]

Umbilical artery Doppler velocimetry in cases with oligohydramnios would help in identifying high risk cases for poor perinatal outcome. Hence in all patients with oligohydramnios umbilical artery Doppler should be done to recognize the compromised fetus which will guide suitable interventional and management measures thereby reducing the perinatal morbidity and mortality.

Conclusion

Results of this study showed that Umbilical artery Doppler is an effective modality in women with Oligohydramnios to rule out adverse maternal and neonatal outcome. This modality can effectively be used to reduce and minimize the burden of adverse obstetric and perinatal outcome.

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