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Impact of Uterocervical Angle on Preterm Birth

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Abstract

Introduction: Preterm birth is defined by ACOG as birth between 28 weeks of gestation to 37 weeks of gestation. Preterm birth complications are the leading cause of neonatal death. preterm babies are at increased risk of neuro developmental impairments, respiratory and gastrointestinal complications, sepsis etc. Approximately 40-50% of all preterm births are idiopathic,30% is attributable to PPROM,15-20% are elective due to medical reasons. Prediction of preterm is one of the most difficult and important tasks. Among them uterocervical angle have major impact on preterm birth which is a simpler technique that can be measured by transvaginal ultrasonography.

Aim & Objective: To study the impact of uterocervical angle by transvaginal ultrasonography on preterm birth.

Methodology: This study was conducted in tertiary care hospital over a period of one year among 110 patients. patients will be selected according to the inclusion criteria and they are explained about the nature of study and informed consent was obtained in their own language A complete history was taken .Transvaginal ultrasonography was done along with their routine antenatal scans in 2nd trimester(anamoly scan),3rd trimester (growth scan) for the measurement of uterocervical angle. Two measurement were obtained in each patient during the course of examination and shortest measurement was used for reporting. If uterocervical cervical angle was more than 95 degrees at any time of examination, I will treat the patient accordingly. After that all women were followed- both normal angle and abnormal angle patient with intervention throughout the course of gestation and delivered in our hospital. After delivery POG, weight of newborn, sex, APGAR, need for ICU were noted and analysed.

Results: Among 110 patients in 3rd trimester, 64 patients have angle less than 95, In that 60 patients delivered at term and 4 patients were delivered preterm.46 patients have angle more than 95, In that 33 patients were delivered preterm and 13 patients were delivered term.so we concluded that acute angle delivered at term and wider the angle more prone for preterm delivery even if we intervene if the angle is wider. Mean UCA at second trimester preterm delivered patients was 118° for less than 34 weeks,96 for 34-37weeks which was significantly higher as compared to the patients with term delivered group 91°.Mean UCA value at third trimester of preterm delivered patients was 122° for those who delivered less than 34 weeks,100° for those who delivered between 34-37 weeks which was significantly higher as compared to term delivered patients which was 94 So it is concluded that patients with greater UCA had significantly higher chances of preterm delivery even after the intervention made if the angle is high and it was also seen in our study UCA value keeps on increasing with gestational age and mean UCA at every trimester predicts spontaneous preterm birth with equal predictive value and efficacy.

Conclusion: Uterocervical angle have major impact on preterm birth and it was concluded that a wide uterocervical angle ≥95 and ≥105 degrees detected during any trimester was associated with an increased risk for spontaneous preterm birth <37 and<34weeks, respectively. The advantage of uterocervical angle is that its measurement in each trimester has also shown very good results in prediction of preterm labour. It can be measured at the time of routine antenatal ultrasound (ANOMALY SCAN, GROWTH SCAN) thus obviating the need for additional ultrasounds. This can lead to its application for the prediction of spontaneous preterm labour both in low and high risk population. Thus, it helps for early intervention and prevention of complications in preterm birth.

Keywords: preterm birth, uterocervical angle, transvaginal ultrasound, antenatal patient, trimester

Introduction

Pregnancy is one of the most cherished events in women's life. Any complication affecting fetal prognosis may leave adverse impact on mother. Preterm birth (PTB) is the leading cause of perinatal morbidity and mortality worldwide. Preterm birth is defined as birth between the age of fetal viability and 37 completed weeks of gestation.[1]In the United Kingdom, PTB includes deliveries between 24^{+0} and 36^{+6} weeks' gestation. In many developed and developing countries all births in which the birth weight is 500gm are included in the PTB statistics. Globally, an estimated 15 million babies are born prematurely each year, representing 11.1% of all live births .One million of them die from the complications of PTB[2]. Infants who survive PTB make up most of the cases of serious morbidity and mortality in infants younger than 5 years of age[3]. Recent advances in neonatology have resulted in increased survival rates, particularly amongst extremely premature infants, but this has also been associated with an increased morbidity. Preterm babies are at increased risk of neurological impairments, respiratory and gastrointestinal complications, sepsis etc[4].

Approximately, 40-50% of preterm birth are idiopathic,30% due to PPROM, 15-20% are due to medical reasons. Prediction of Preterm labour is one of the most important tasks faced by the clinician's .Many studies have been conducted to found a suitable predictive factor for preterm labour, for its early prediction and appropriate treatment. Various etiological

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factors for preterm birth include low BMI, Caucasian descent, Mullarian anomalies, smoking, maternal a.ge<18yrs or >35 yrs, previous cervical dilation, occupational, genetic factors, periodontal disease and infections. An infection contributes 25-35% causes of PTB.

Cal tissue composed of matrix of collagen fibers and it is supported by the cardinal ligaments and uterosacral ligaments[8, 9, 10]. The cervix exerts the pressure from surrounding pelvic organs and withstands forces from pregnant uterus. A combination of both physiological pressures and individual anatomy affect the internal os and cervical function[8, 9].

Radiological measures like Cervical length and uterocervical angle has been studied as predictive factor for preterm birth .Both USG and digital examination of the cervix show that short cervix is a risk factor for preterm delivery .Asymptomatic women , at 24 weeks of GA ,a cervical length of less than 25 mm signifies increased risk of PTB. The shorter the cervix, the greater the risk.

Our study deals with impact of uterocervical angle on preterm birth. Uterocervical angle (UCA) is a simple technique that can be measured on a mid-sagittal transvaginal cervical image. It is the triangular segment measured between the cervical canal and uterine segment, yielding a measurable angle. This concept of UCA had been already utilized as early as 1950's, by vaginal pessary. Pessary was thought to create an immunological barrier and mechanically change the inclination of the cervical canal, thereby distributing pelvic force away from cervix. The concept behind this is based on the mechanical properties of this angle, which seems to be act as protective barrier when it is acute. An Acute or when the angle is narrow, UCA supports an anatomical geometry that would exert less force on the internal os, which is protective from deformation. An Obtuse or wide, UCA lends to direct, linear outlet of uterine contents onto the cervix. Altered uterocervical angle to a more acute, or narrowed angle, angle after vaginal pessary placement has been confirmed by MRI.

Aim & Objective: To study the impact of uterocervical angle by transvaginal ultrasonography on preterm birth.

Methodology: This study was conducted in Tertiary care hospital over a period of one year among 110 patients. patients will be selected according to the inclusion criteria and they are explained about the nature of study and informed consent was obtained in their own language A complete history was taken .Transvaginal ultrasonography was done along with their routine antenatal scans in 2nd trimester (anamoly scan),3rd trimester (growth scan) for the measurement of uterocervical angle. Two measurement were obtained in each patient during the course of examination and shortest measurement was used for reporting. If uterocervical cervical angle was more than 95 degree at any time of examination, I will treat the patient accordingly. After that all women were followed- both normal angle and abnormal angle patient with intervention throughout the course of gestation and delivered in our hospital. After delivery POG, weight of newborn, sex, APGAR, need for ICU were noted and analysed

Inclusion Criteria

- Singleton antenatal patients in 2nd trimester(20-24 wks)of gestation at the time of enrollment
- 18-40years of age
- Primigravida without any high risk factors requiring preterm delivery

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- Multigravida without any history of preterm birth

Exclusion Criteria

- Patient who refused to give valid consent
- Congenital malformation of uterus and fetus
- Any placental abnormality
- Patient with cervical length <2.5cm
- IVF/IUI conceived pregnancy
- Previous history of preterm labour, any cervical surgery, unexplained IUD

Results

Mean height distribution of patients

Height	UCA <95	UCA ≥95
< 155	6	13
156 - 160	33	31
> 160	17	10
Total	56	54
Mean	158.893	157.963
SD	3.409	3.539
P' value	0.163 Not significant	

Weight Distribution of Patients

Weight	UCA <95	UCA ≥95
< 60	20	33
61 - 65	18	6
> 65	18	15
Total	56	54
Mean	61.714	60.5
SD	5.733	7.147
P' value	0.327 Not significant	

BMI value of patients

BMI	UCA <95	UCA ≥95
< 23.0	17	23
23.1 - 26.0	27	18
> 26.0	12	13
Total	56	54
Mean	24.379	24.263
SD	2.259	2.781

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P-value	0.811 (Not significant)

Comparison of Parity

Parity	UCA <95	UCA ≥95
Primi	33	25
Multi	23	29
Total	56	54
P-value	0.256 (Not significant)	

The comparison of Parity value of patients and their standard deviation were calculated. The probability value of BMI of patients was also calculated; p-value is 0.256 > 0.05 statistically not significant.

Intervention of patients: The intervention of patients have been measured for this study. Majority of patients no intervention in UCA <95 – 55, similarly, the majority of patients having intervention in UCA ≥95 = 42. The probability value of intervention of patients have been calculated; p-value is 0.001 < 0.05 statistically significant.

Intervention of patients

Intervention	UCA <95	UCA ≥95
Yes	1	42
No	55	12
Total	0	0
P' value	<0.001 Significant	

H/O Threatened Preterm

H/O Threatened Preterm	UCA <95	UCA ≥95
Yes	0	7
No	56	47
Total	0	0
P' value	0.017 Significant	

Mode of Delivery

Mode of Delivery	UCA <95	UCA ≥95
LSCS	34	26
NVD	22	28
Total	56	21
P' value	0.258 Not significant	

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UCA Vs NICU Admission

In this study, UCA Vs NICU admission ratio have been calculated and given. Most of the patients was not admitted in NICU, only few patients was admitted in NICU UCA <95 = 15 and UCA ≥95 = 18. Probability value is 0.588 > 0.05 statistically not significant

UCA Vs NICU Admission

NICU Admission	UCA <95	UCA ≥95
YES	15	18
NO	41	36
Total	0	0
P' value	0.588 Not sig	

POG at Delivery

The POG at delivery, USA mean value and standard deviation of POG at delivery have been calculated. Higher mean value with lower standard deviation was observed in POG at delivery < 34 (4) =122.75±6.602. Similarly, lower mean value with higher standard deviation was observed in > 37 (73) =94.10±7.463 and Probability value is 0.001 < 0.05 statistically significant.

POG at Delivery and USA mean value

POG at Delivery	UCA Mean	SD
< 34 (4)	122.75	6.602
34 - 37 (33)	100.52	13.959
> 37 (73)	94.10	7.463
p value	< 0.001 Significant	

POG at Delivery vs 2nd Trimester UCA Mean

2nd Trimester	UCA	
POG at Delivery	Mean	SD
< 34 (4)	118.25	6.238
34 - 37 (31)	96.71	13.317
> 37 (75)	91.23	7.889
p value	< 0.001 Significant	

The POG at Delivery and 2nd Trimester UCA mean value and standard deviation of POG at delivery have been calculated and tabulated in Table. Higher mean value with lower standard deviation was observed in POG at delivery < 34 (4) =118.25±6.238. Similarly, lower mean value with higher standard deviation was observed in > 37 (73) = 91.23 ± 7.889 .Probability value is 0.001 < 0.05 statistically significant.

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POG at Delivery vs 3rd Trimester UCA

The POG at Delivery and 3rd Trimester UCA mean value and standard deviation of POG at delivery have been calculated and tabulated in Table 5.11. Higher USA value observed in > 37 (73) = >95 (60); 34 - 37 (33) = 95 – 105(19); 34 - 37 (33) = > 105 (10). Similarly, lower mean value observed in < 34(4) = <95 (0); < 34 (4) = 95 – 105 (0); > 37 (73) = > 105 (1). Probability value is 0.001 < 0.05 statistically significant.

POG at Delivery vs 3rd Trimester Mean UCA

POG at Delivery	UCA		
	<95	95 - 105	> 105
< 34 (4)	0	0	4
34 - 37 (31)	4	18	9
> 37 (75)	60	13	2
Total	64	31	15
P' value	<0.001 Significant		

Discussion

This is study to find the impact of uterocervical angle on preterm birth and to study the impact of uterocervical angle by transvaginal ultrasonography on preterm birth.

Majority of patients no intervention in UCA <95 = 63, similarly, the majority of patients having intervention in UCA ≥95 = 46. P-value is 0.001 < 0.05 statistically significant. The majority of patients in H/O Threatened Preterm; UCA <95 = 63 and ≥95 = 39. P-value is 0.017 < 0.05 statistically significant.

In LSCS procedure having UCA <95 = 34, UCA ≥95 = 26; in NVD having UCA <95 = 22, UCA ≥95 = 28. Probability value is 0.258 > 0.05 statistically not significant. UCA<5 = 2.85 having higher birth weight compare to other.

Most of the patients was not admitted in NICU, only few patients was admitted in NICU UCA <95 = 15 and UCA ≥95 = 18. Probability value is 0.588 > 0.05 statistically not significant.

Higher mean value with lower standard deviation was observed in POG at delivery < 34 (4) =122.75±6.602. Similarly, lower mean value with higher standard deviation was observed in > 37 (73) =94.10±7.463. Probability value is 0.001 < 0.05 statistically significant.

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Among 110 patients in 3rd trimester, 64 patients have angle less than 95, In that 60 patients delivered at term and 4 patients were delivered preterm.46 patients have angle more than 95, In that 33 patients were delivered preterm and 13 patients were delivered term.so we concluded that acute angle delivered at term and wider the angle more prone for preterm delivery even if we intervene if the angle is wider. Mean UCA at second

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Bafali O et al.[21] in 2018 studied 82 singleton pregnant women between 24 and 34 weeks of gestation. Bishop scores were calculated, and cervical length and UCA measurements were performed by transvaginal ultrasound. Among the etiological factors, only multiparity and abortion history were found significantly high in pregnant woman who had preterm delivery. The cut-off value for UCA measurements was determined to be 80.5%. the prevalence of UCA >80.5degree in women who delivered before 37 weeks of gestation was found to be 75% and it was significantly higher than the term cases (p=0.007).For this value, it was found that UCA sensitivity was 75 %, specificity was 58% ,positive predictive value was 53% and negative predictive value was 77%. In our study also UCA has better predictive value.

Sochacki-Wojcicks et al.[18] in 2015, revealed the detection rates of UCA for spontaneous PTB of 61.1% in the first trimester and 66.7% in the second trimester which were superior to cervical length (CL) in their study. Like this in our study also measuring UCA length has positive predictive value.

Conclusion

Uterocervical angle have major impact on preterm birth and it was concluded that a wide uterocervical angle ≥95 and ≥105 degrees detected during any trimester was associated with an increased risk for spontaneous preterm birth <37 and<34weeks, respectively. The advantage of uterocervical angle is that its measurement in each trimester has also shown very good results in prediction of preterm labour. It can be measured at the time of routine antenatal ultrasound (Anomaly Scan, Growth Scan) thus obviating the need for additional ultrasounds. This can lead to its application for the prediction of spontaneous preterm labour both in low and high risk population. Thus, it helps for early intervention and prevention of complications in preterm birth.

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