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The Impact of the Fetal Occiput-Spine Angle During the First Stage of Labor on the Progress and Outcome of Labor

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ABSTRACT

Background: Labour is a physiologic procedure in which the products of conceptions (i.e. the fetus, umbilical cord, membrane, and placenta) are barred out of the uterus.

Aim of the work: To find out if a parameter resulting from U-S examinations (the occiput-spine angle (OSA)) had a correlation with the course and labour outcome.

Patients and methods: this was a prospective observational study was conducted, consisted of 120 pregnant women attended to Al Azhar university El-Hussine hospital.

Results: the mean of Occiput-spine angle in normal vaginal delivery group was 123.49 (± 5.16 SD) with range (116.00-135.00) while the mean of OSA in caesarian section delivery group was 115.55 (± 6.09 SD) with range (105.00-124.00). A highly significant change was found among the study groups regarding Occiput-spine angle.

Conclusion: the prenatal sonographic evaluation of the flexion degree of the embryonic head by the OSA in fetus could be used to predict course and outcome of labor.

Keywords: *Occiput-Spine Angle; Fetal Head Deflexion; Sonographic Index.*

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INTRODUCTION

Fetus head "attitude" (connection of embryonic head to spine) in the 1st phase of labour can have a considerable influence on the outcome.

Diagnosing the embryonic head deflexion conventionally is founded on digital examinations in labour, while the usage of U-S to support clinical examination was lately described.

The arrest of labour development is the main reason of obstetric treatment, counting CS and instrumentally vaginal birth. [1]

In a try to reduce the occurrence of primary CS, the classical description of anomalous labour course has been studied lately and an extended period of the 2nd stage has been professed as suitable before the diagnosis of labor arrest (≥4 hrs in nulliparous and ≥3 hrs in parous with extradural). [2]

Some researchers, however, have faced this new statement claiming that built on the existing suggestion; a second stage of labour beyond 3 hrs is dangerous for the unborn baby. [3]

Deflexed cephalic symptoms are significant cause of filled labor [4] and account for 33% of CS as the consequence of labour arrest. [5]

Unsuccessful labour cannot be clarified by embryonic size only as most patients with disproportion have ordinary range of embryonic delivery weight. Consequently, other influences as head mal-positions and mal-presentations can result in obstructions. These comprise asynclitism, occiput back location, and face and brow presentation. [6]

Usually late in gestation, a typical attitude is supposed by the fetus. It becomes doubled upon itself so that it makes its back decidedly convex with a abruptly bent head abruptly making the chin contacting the chest. Deflexed head may result in arrest of labour and accounts for 33% of CSs done for that arrest. [7]

The utilization of transabdominal U-S at the suprapubic zone may notice theses minor degrees which can be accountable for irregular development of labour.

The aims of this study were to show if a parameter resulting from U-S examinations (OSA) has association with the labour course and outcomes.

PATIENTS AND METHODS

This study was a prospective observational study carried out at Al Azhar university El-Hussin hospital from September 2021 till March 2022. The study population comprises women, fulfilling inclusion criteria, attending Al Azhar University El-Hussin hospital during the study period, who are fullfilling the inclusion criteria.

Inclusion criteria: Ages ranged from 18 to 35 yrs, BMI <30, the gestational ages ranged from 37 to 42 weeks. (determined by LMP or 1st trimester US), singleton gestation, vaginal birth history, occiputo frontal location and active phase of 1st phase of labour

Exclusion criteria: Ages (less than18 or more than 35), primi-gravida, occiputo back location, signs of CS like mal-presentations, macrosomia, placenta previa, preceding CS, multi pregnancies and medical conditions like HTN, DM, liver or renal disorders.

Sample size: 120 pregnant women have been enrolled in the work fulfilling the following inclusion criteria.

Methods:

All patients have been subjected to the following:

Detailed personal, obstetric and medical history including: Personal history including age, smoking and level of education, obstetric history including gravidity , parity, number of abortions , modes of delivery in previous pregnancies , 1st day of the last ordinary menstrual period and the gestational age , onset , duration and frequency of labor pains , urinary symptoms (dysurea , frequency , urgency) , vaginal discharge (color , itching) and medical history including Present or Past history of any chronic illnesses (renal, hypertensive, diabetics, hepatic, cardiac…)

Examination: Vital signs: pulse, blood pressure, and temperature, weights, heights, BMIs, abdominal examination for assessment of fundal level and fetal heart sounds, abdominal palpations to notice uterine activities (frequency, period and strength), evaluate embryonic size and presentations and assessment of contraction done to diagnose threatened preterm birth(Contractions must be of four in 20 minutes or eight in 60 minutes each last 30 seconds or more with cervical changes (dilatation ≤ 3 cm, effacement ≤ 80%). Vaginal Examination: Digital vaginal examination to assess degree of cervical dilatation, effacement and fetal presentation were initially recorded. Vaginal examination using Bishop Score: Before induction of labor. A Bishop score ≤5 was taken in to consideration as significant for cervical ripening and satisfactory for labour inductions.

Assessment of fetal well-being: Pelvic ultrasound for assessment of amniotic fluids index and umbilical artery Doppler, assessment of estimated fetal weight. CTG - FHR pattern and indication of uterine activities.

Lab assessment: All results obtained according to standard protocol of PTL in our hospital including complete blood count, CRP and grouping, liver enzymes, kidney functions, random blood sugar, urine analysis and culture, high vaginal swap.

Procedure of Cervical Ripening: When the anterior occiput is the fetal location and the vertex is the embryonic presentation, in the ultrasound machine, the bidimensional sagittal image of the embryonic head and the higher spine was attained and processed.

The offline angle calculation of the tangential line to the occipital bone and the tangential line to the cervical spine of the first vertebral body (OSA) will be accomplished in this image to determine the grade of flexion of the embryonic head relative to the stem.

Advancement of labour with portogram (cervical dilations, effacement, constancy, location and position) and birth mode were evaluated retrospectively for all patients in the studied group. Neonatal assessment: Follow up the neonate for Apgar score at 5 min.

Ethical committee: Agreement from the faculty of medicine ethical committee was as well attained and consent from IRB was gotten. -An knowledgeable verbal agreement from parents of the contributors was taken and privacy of data was guaranteed.

Statistical analysis: collected data had been analyzed via IBMSPSS-20 (USA). Quantitative data have been presented as mean and SD. Qualitative data have been presented as numbers and percent. For comparison of parametric quantitative parameters among 2 groups, Student t test has been used. Qualitative variables have been matched by means of chi-square (X_2) or Fisher's exact tests when frequency less than 5.

RESULTS

	Mode of delivery	
	Normal Vaginal "n=69"	C.S. "n=31"
Age **Range**	20.00-34.00	**20.00-34.00**
Mean	26.72	**28.45**
S.D.	4.59	**3.97**
T	**3.281**	
P	**0.73 N.S.**	

Table 1: Comparison between mode of delivery and maternal age

The mean of age in normal vaginal delivery group was 26.72 (± 4.59 SD) with range (20.00-34.00) and the mean of age in caesarian section delivery group was 28.45 (± 3.97 SD) with range (20.00-34.00). A nonsignificant change was found among the study groups regarding age. Table (1)

	Mode of delivery	
	Normal Vaginal "n=69"	C.S. "n=31"
Gestational age		
Range	37.00-42.00	**37.00-42.00**
Mean	39.30	**39.42**
S.D.	1.63	**1.63**
T	**0.107**	
P	**0.745 N.S.**	

Table 2: Comparison between mode of delivery and gestational age

The mean gestational age (GA) mean in normal vaginal delivery (VD) group was 39.30 (± 1.63 SD) with range (37.00-42.00) and the mean gestational age in caesarian section delivery group was 39.42 (± 1.63 SD) with range (37.00-42.00). A nonsignificant change was found among the study groups regarding gestational age. Table (2)

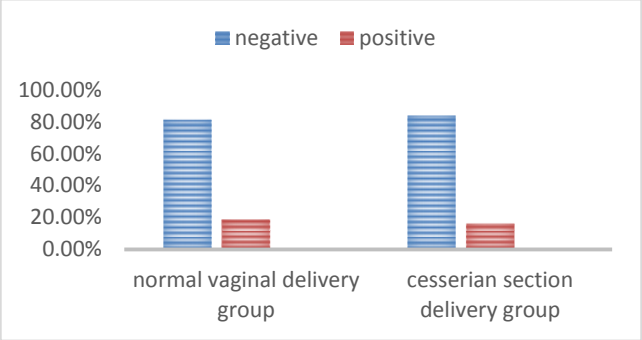

Fig 1: comparing among the studied groups concerning past medical history

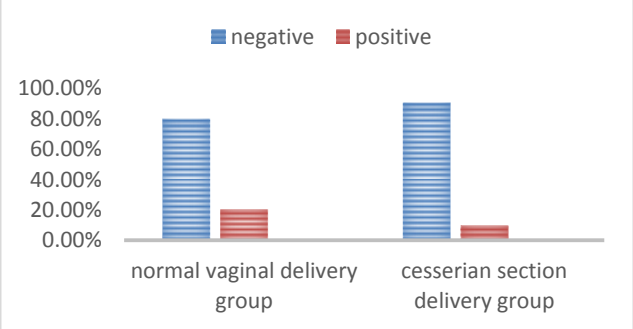

Fig 2: comparing among the studied groups concerning surgical history

56 (81.2%) were negative, 13 (18.8%) were positive, as regard surgical history, 55 (79.9%) were negative, 14 (20.3%) were positive and as regard family history for preterm labor, 57 (82.6%) were negative, 12 (17.4%) were positive. In caesarian section delivery group, as regard past medical history, 26 (83.9%) were negative, 5 (16.1%) were positive, as regard surgical history, 28 (90.3%) were negative, 3 (9.7%) were positive and as regard family history for preterm labor, 27 (87.1) were negative, 4 (12.9%) were positive. A nonsignificant change was found among the study groups regarding past medical history, surgical history and family history for preterm labor. Fig (1, 2)

	Mode of delivery			
	Normal Vaginal "n=69"		C.S. "n=31"	
	No.	**%**	**No.**	%
Fetal presentation **Anterior**				
Transverse	21	30.4	12	**38.7**
Posterior	23	33.3	7	**22.6**
	25	36.2	12	**38.7**
X2	**1.304**			
P	**0.521 N.S.**			

Table 3: Comparison between mode of delivery and Fetal presentation

In normal vaginal delivery group, as regard fetal presentation, 21 (30.4%) were anterior presentation, 23 (33.3%) were transverse presentation and 25 (36.2%) were posterior presentation and in caesarian section delivery group, 12 (38.7%) were anterior presentation, 7 (22.6%) were transverse presentation and 12 (38.7%) were posterior presentation. A nonsignificant change was found among the study groups regarding fetal presentation. Table (3)

	Mode of delivery			
	Normal Vaginal "n=69"		C.S. "n=31"	
	No.	**%**	**No.**	%
Placental maturation				
Mature Not mature	69 0	100.0 0.0	27 4	**87.1** **12.9**
X2		**9.274**		
P		**0.008***		

Table 4: Comparison between mode of delivery and placental maturation

In normal vaginal delivery group, as regard Placental maturation, 69 (100%) were mature while in caesarian section delivery group, 27 (87.1%) were mature and 4 (12.9%) were not mature. A significant change was found among the study groups regarding Placental maturation. Table (4)

	Mode of delivery	
	Normal Vaginal "n=69"	C.S. "n=31"
Occiput-spine angle		
Range	116.00-135.00	**105.00-124.00**
Mean	123.49	**115.55**
S.D.	5.16	**6.09**
T	**45.231**	
P	**0.0001***	

Table 5: Comparison between mode of delivery and occiput-spine angle

The mean of OSA in normal vaginal delivery group was 123.49 (± 5.16 SD) with range (116.00-135.00) while the mean of Occiput-spine angle in caesarian section delivery group was 115.55 (± 6.09 SD) with range (105.00-124.00). A highly significant change was found among the study groups regarding OSA. Table (5)

	Mode of delivery			
	Normal Vaginal "n=69"		C.S. "n=31"	
	No.	**%**	**No.**	%
Congenital anomalies				
Viable	69	100.0	27	**87.1**
Non viable	0	0.0	4	**12.9**
X2		**9.274**		
P		**0.008***		

Table 6: Comparison between mode of delivery and Fetal Viability

In normal vaginal delivery group, as regard Congenital anomalies, 69 (100%) were Viable while in caesarian section delivery group, 27 (87.1%) were Viable and 4 (12.9%) were non-Viable. A significant change was found among the study groups regarding congenital anomalies. Table (6)

Area	**Cut off value**	**P value**	**Asymptotic 95% Confidence Interval**	
			Lower Bound	**Upper Bound**
0.817	118.0	0.0001*	0.730	**0.904**
Sensitivity			**85.0**	
Specificity			**80.0**	
Accuracy			**82.0**	

Table 7: Sensitivity, specificity and accuracy of OSA in predict the outcome of pregnancy.

Occiput spine angle could be used to predict outcome of pregnancy at a cut off value of 118.0, with 85% sensitivity, 80% specificity and 82% accuracy (AUC= 0.817 & p-value = 0.0001). Table (7)

DISCUSSION

Usually late in gestation, a typical attitude is supposed by the embryo. It becomes folded upon itself so that it makes its back evidently convex with a abruptly flexed head abruptly making the chin contacting the chest. [8]

A prospective observational study has been done, consisted of 120 pregnancies attending Al Azhar university El-Hussine hospital.

The aim of this study was show if a parameter resulting from US examinations (OSA) has a association with the labour course and outcomes.

In the present study, mean of age in normal vaginal delivery group was 26.72 (± 4.59 SD) with range (20.00-34.00) and the mean of age in caesarian section delivery group was 28.45 (± 3.97 SD) with range (20.00-34.00). A nonsignificant change was found among the study groups regarding age.

In agreement to our study, Sujatha, [9] showed that mean age of vaginal delivery group was 26.035±0.2 and mean age of cesarean delivery group was 27.31±0.7 with no significant change was found among the groups as regard the basic demographics such as age and Maged et al. [8] reported that no variance among the groups as regard age.

Also, Abd Elfattah et al. [10] conducted a study over 200 women aged 18-35 years.

In our study, the mean GA in normal VD group was 39.30 (± 1.63 SD) with range (37.00-42.00) and the mean GA in CS group was 39.42 (± 1.63 SD) with range (37.00-42.00). A nonsignificant change was found among the study groups regarding gestational age.

In agreement to our study, Sujatha, [9] showed that mean GA of VD group was 38.8±0.9 and mean GA of CS group was 39.0±0.8 with no difference was noted among the groups regarding GA and Maged et al. [8] reported that GA was comparable among the studied groups.

In the present study, in normal vaginal delivery group, as regard Placental maturation, 69 (100%) were mature while in caesarian section delivery group, 27 (87.1%) were mature and 4 (12.9%) were not mature. A significant change was found among the study groups regarding Placental maturation.

Zhou et al. [11] found that in comparison to newborns of VD, those born by CS had a more placental residual blood size [weighted mean difference (WMD), 8.8ml; 95% confidence interval (CI), 2.3ml–15.43 ml]; inferior levels of hematocrit (WMD, −2.9%; 95% CI, −4.16% to −1.6%), Hb (WMD, −0.5 g/dL; 95% CI, −0.7g/dL to −0.3 g/dL) and erythrocyte (WMD, −0.16 × 1012/L; 95% CI, −0.3 × 1012/L to −0.01 × 1012/L) and this came in line with our study.

In our study, in normal vaginal delivery group, as regard amount of liquor, 69 (100%) were adequate while in caesarian section delivery group, 24 (77.4%) were adequate and 7 (22.6%) were not adequate. A highly significant change was found among the study groups regarding amount of liquor.

Chaudhary et al. [12] reported that Oligohydramnios affects the maternally outcomes regarding obstetrical managements like LSCS and this came in line with our study.

Also, Ravi et al. [13] showed that labor inductions, CS and meconium-stained liquor was revealed to be commonest between the cases in group II (anomalous Amniotic fluid index (AFI)) as compared to normal AFI cases and this agreed with our study.

In the current study, the mean of OSA in normal vaginal delivery group was 123.49 (± 5.16 SD) with range (116.00-135.00) while the mean of OSA in caesarian section delivery group was 115.55 (± 6.09 SD) with range (105.00-124.00). A highly significant change was found among the study groups regarding Occiput-spine angle.

In agreement to our study, Sujatha, [9] showed that mean Occiput spine angle (OSA) of normal vaginal group was 126.53 ± 11.1^0 and mean Occiput spine angle (OSA) of caesarian section group was 116.25 ± 9.2^0 with high statistically significant difference between both groups as regard OSA, Dall'Asta et al. [14] reported that a wider OSA has been determined in cases who had VD in comparison with those of CS because of labor dystocia (126±14 versus 115±24; P<.01), Ghi et al. [15] was the first to present the valuation of OSA in literature in 2016 assessed 108 pregnancies in active labour. Of these, 79, 10, and 19 experienced spontaneous VD, surgical VD and CS, respectively. They revealed a smaller OSA in those who practiced CS or instrumental birth caused by arrest of labour. Cases with OSA <125 had an extended period of labour. They reported that births with narrow OSA are more prone to surgical birth and Maged et al. [8] reported a higher frequency of CS among cases with OSA <126° (46.3% in comparison with 5.7% in those with elevated OSA).

Also, Akmal et al. [16]studied the predictive value of occiput location noticed by US performed through active phase of labour as regard mode of birth. They revealed that the risk of CS could be detected via US of occipital location and this came on line with our study, Gamal Abd El-Nasser et al. [17] reported that the OSA was significantly narrower in cases who experienced CS birth because of labour arrest and Abd Elfattah et al. [10] showed that the OSA was significantly narrower in cases who experienced CS birth because of labor arrest.

Furthermore, Fathy et al. [18] found that OSA was statistically significantly lower in women experienced operative birth.

While, Mughal et al. [19] demonstrated that OSA had a sensitivity and specificity of 92% and 98% respectively for prediction of operative birth.

In disagreement with our results, Mukdee et al., [20] revealed that there was nonsignificant change in mean OSA among the VD and CS groups (110 ± 11 degree versus 110 ± 9-degree, p = 0.64).

In our study, Using ROC curve, it was shown that: Occiput spine angle could be used to predict outcome of pregnancy at a cut off value of 118.0, with 85% sensitivity, 80% specificity and 82% accuracy (AUC= 0.817 & p-value = 0.0001).

This cutoff is comparable, but slightly lesser, that that revealed by Maged et al. [8] who stated a cutoff point of 126° with sens. and spec. was 78% and 93.8, resp. and Ghi et al. [15] stated a cutoff of 125°, which is

once more bigger than the value gotten in our work. This came in line with our study.

In agreement to our study, Sujatha, [9] demonstrated that the area under the curve in predicting of VD was 0.79 (P<0.001). A cutoff value of 121° to discriminate between VD and CS in nulliparous cases. With a sensitivity, specificity, PPV and NPV of 80.5%, 87.5%, 94.7%, and 54.53% respectively in prediction of VD in full-term nulliparous cases.

While, Dall'Asta et al. [14] reported that at the AUC was 0.67 (95% CI, 0.538–0.812; P<.01), and the best OSA cutoff value for the discrimination of women of VD and CS was 109°.

The differences between our study and those studies can be attributed to the variances in the studied cohorts.

Limitations: our study was limited mainly with the absence of following-up for the newborns. More multicenter of larger a greater sample size are needed to settle our results so as to guarantee widespread pertinence of our results.

CONCLUSION

To conclude, the antenatal sonographic evaluation of the degree of flexion of the embryonic head via the OSA could be used to predict course and outcome of labor.

Conflict of interest : none

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