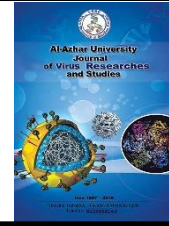




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Head Perineum Distance Measurement as a Predictor of Delivery Outcome Using Transperineal Sonography

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Abstract

Digital vaginal examination has been used to determine the possibility of vaginal delivery because many women find vaginal birth difficult. The use of transperineal ultrasonography, which allows direct visualisation of the fetal skull, to forecast the direction of labor has recently become popular. Ultrasound can assist obstetricians in advising patients and predicting the mode and outcome of labor. The aim of work to determine the role of transperineal ultrasonography in measuring the fetal head perineum distance as a predictor of labor course and outcome, with the objective of lowering complications for both the mother and the newborn as a result of prolonged labor. A total of 100 primigravida women in the active phase of labor were admitted to the labor unit at AL-Zahraa University Hospital and Al- Shatby University Hospital for this study. Vaginal delivery was achieved in 100 percent of the cases studied when the HPD was less than 40 mm. When the distance was between 40 and 50 mm, 89 percent of women had a vaginal birth, whereas 51.9 percent had a vaginal delivery when the distance was more than 50 mm. In monitoring labor progress, intrapartum transperineal ultrasonography evaluation of head perineum distance is accurate. It's simple and quick to measure, with the added benefit of data storage.

Keywords: Angle of progression; fetal head; Head-perineum; Transperineal ultrasound, Vaginal delivery.

1. Introduction

Over the last decade, Ultrasound examination during labor was studied for a variety of purposes, ranging from basic uses like determining presentation of the fetus and to identify the beat of fetal heart to advanced topics like mode of delivery prediction, fetal head station, and cervical

dilatation evaluation [1]. The relevance of non-invasive therapies, documentation dependability and reproducibility, infection control trends, changes in non-progress of labor (NPL) criteria, and measures to lower the risk of caesarean birth have all evolved in recent years. The presence of NPL is the

most common cause for a primary caesarean section [2]. Many studies have found that using various methodologies, ultrasonography evaluations of head descent in labor are related to delivery progress and outcome [3]. The use of Sonography in the determination of birth progress degree may be preferable to digital examination for a various reason: by removing the need for individual experience in doing vaginal examination. May be preferred by women who are uncomfortable with vaginal examinations. The ultrasonic settings have also been demonstrated to be quite repeatable. Kahrs et al. [3] observed that head station zero correlates to a 36 mm HPD. [5] discovered that head station zero corresponds to a 35-mm HPD, whereas Ghi T et al. [6] discovered that a 38-mm HPD corresponds to midcavity. The purpose of this study was to investigate if measuring the fetal head perineum distance using transperineal ultrasonography might be used to predict the course and outcome of labor, with the hopes of avoiding complications for both the mother and the newborn caused by protracted labor.

2. Patients and Methods

In this prospective observational study, 100 primigravida pregnant women in the active phase of labor were admitted to the labor ward at AL-Zahraa University Hospital and AL-Shatby University Hospital. Verbal consents were taken after explaining the aim of the study for all cases on the day of admission. The study was carried out with the approval of the Departmental and Ethical Committee. They were picked using a set of criteria that were both broad and narrow.

2.1 Inclusion criteria:

Primigravida, 18 to 32 years old, term pregnancy, viable singleton pregnancy, cephalic presentation (occipito anterior or occipito transverse), true labor pain (cervix

dilated more than 3 cm), normal uncomplicated pregnancy, and average fetal weight are all factors to consider (2500 to 3500 gm.).

2.2 Exclusion criteria:

The Maternal chronic medical condition (e.g., diabetes, hypertension, etc.), maternal spine and/or pelvic disease or fractures, and contracted pelvis or cephalo pelvic disproportion determined by clinical pelvimetry. Fetal: Abnormal presentations and postures, congenital fetal deformities, amniotic fluid or placental abnormalities, abnormal CTG, and preterm membrane rupture lasting more than 24 hours.

2.3 Method:

Computer residency, marital status and duration of marriage, occupation). Contraceptive history and Menstrual history including last menstrual period LMP and last normal menstrual period LNMP (regularity, duration, frequency, amount and presence of dysmenorrhea). Present history including full history taking of the present pregnancy to stress on sure date of LMP, those women who had a report of ultrasound examination in the first trimester or early second trimester were reviewed for accurate estimation of gestational age and LMP and LNMP were recorded, course of pregnancy was reviewed with pregnant women as regard antenatal care visits and any problem as UTI, Vaginal bleeding, leakage of fluids, fetal movements, any medical or surgical diseases and any current medications. Past history (past medical, surgical and obstetric history). General examination: Evaluation of the patient's general health, weight and height to determine BMI (kg/m²), colour (pallor, Jundice, and cyanosis), vital signs (pulse, blood pressure, temperature), and heart and chest auscultation. Abdominal examination: Fundal level, fundal grasp, umbilical grip, and pelvic grip are all assessed during an abdominal examination.

Vaginal examination including: Following Cunningham et al.,[7] Confirmation of the start of active stage of labor (If the dilatation of the cervix is ≥ 3 cm in the presence of regular uterine contractions, the active labor can be reliably diagnosed). Ultrasound examination: Transabdominal ultrasound was done to assess Gestational age, Fetal biometry, estimation of fetal weight, Fetal presentation, liquor volume and biophysical profile. Transperineal ultrasound following Tutschek et al, [8]. The transducer was placed in a transverse sector over the dorsal commissure and ischial tuberosities for HPD measurement, with pressure but without causing any discomfort to the woman. By tilting and angling the transducer, the shortest distance between the perineal skin surface and the outmost bony limit of the foetal skull in a transverse view was determined between uterine contractions. The tests were performed every two hours from the time of admission until delivery. All of the measurements were taken by the same individual. The ultrasound results and clinical observations were unknown to both the delivery attendant and the ultrasonographer.

2.4 Statistical analysis of the data:

To examine data entered into the computer, the IBM SPSS software package version 20.0 was employed. (Armonk, New York: IBM Corporation) To convey qualitative data, we utilized the words number and percent. To ensure that the distribution was normal, the Kolmogorov-Smirnov test was used. To characterize quantitative data, the range (minimum and maximum), mean, standard deviation, median, and interquartile range were employed (IQR). The significance of the presented data was determined using 5% significance criteria. The tests that were utilized were as follows: The F-test (ANOVA) is used for

comparison of more than 2 groups for normal distribution of quantitative variables. The Receiver Operating Characteristic Curve (ROC) is a curve that depicts the effectiveness of a device. It's calculated by plotting 1-specificity (FP) on the X axis against sensitivity (TP) on the Y axis at various cutoffs. The area under the ROC curve is used to assess a test's diagnostic performance. A satisfactory score of more than 50% is considered good, while a score of more than 100% is considered exceptional. You may also use the ROC curve to compare the results of two tests cycles [30].

3. Results

Table 1 shows the main features of the pregnant women tested (1). The patients were of various ages (from 18- to 32-year-old). (38.49 weeks 1.20 SD) was the average gestational age at the time of delivery Table (1). HPD was related to the fetal head station on admission, and it was found that: The median value for HPD at station (-2) was 53.5 mm, the median value for HPD at station (-1) was 43 mm, the median value for HPD at station (0) was 35 mm and the median value for HPD at station (1) was 29 mm. Table (2)

HPD was related to the fetal head station at full dilatation, and it was found that: The median value for HPD at station (0) was 31 mm, the median value for HPD at station (+1) was 29 mm and the median value for HPD at station (+2) was 18.75 mm. Table (3) the cut off value of HPD in 8 cases where arrest of head descent happened, and CS delivery was done >49 on admission with 87.50 %sensitivity and 81.11% specificity Table (4), Figure (1). For Head Perineum Distance 2 hrs. after admission, the Roc curve demonstrated that sensitivity reached 87.5 and specificity reached 84.52 at cut off value >55 (P-value < 0.001). Table (5), figure (2).

Table (1): Descriptive analysis of the studied cases according to age and gestational age by LMP (n = 100).

| | Min. – Max. | Mean ± SD. | Median (IQR) |
|--------------------------------|-------------|-------------|--------------------|
| Age (years) | 18.0 –32.0 | 24.74 ±4.20 | 24.0 (21.0 –29.0) |
| Gestational age by LMP (weeks) | 36.57 –41.0 | 38.49 ±1.20 | 38.0 (38.0 –39.29) |

IQR: Inter quartile range**SD:** Standard deviation**Table (2):** Relation between HPD and station on admission (n = 100).

| Station on admission | N | HPD on admission | | | F | p |
|----------------------|----------------|-------------------|--------------|--------|----------|---------|
| | | Min. – Max. | Mean ± SD. | Median | | |
| -2 | 26 | 48.0 – 59.0 | 53.58 ± 3.15 | 53.50 | 110.764* | <0.001* |
| -1 | 46 | 34.0 – 51.0 | 43.15 ± 4.38 | 43.0 | | |
| 0 | 24 | 25.50 – 40.0 | 34.98 ± 3.64 | 35.0 | | |
| 1 | 3 | 29.0 – 31.0 | 29.67 ± 1.15 | 29.0 | | |
| 2 | 1 [#] | 14.0 [#] | | | | |

F: F for ANOVA test**p:** p value for comparing between HPD and station on admission**#:** Excluded from the comparison due to small number of case (n = 1)***:** Statistically significant at $p \leq 0.05$ **Table (3):** Relation between HPD and station fully dilated (n = 83).

| Station Fully Dilated | N | HPD Fully Dilated | | | F | p |
|-----------------------|----|-------------------|--------------|--------|---------|---------|
| | | Min. – Max. | Mean ± SD. | Median | | |
| -2 | 0 | – | – | – | 33.488* | <0.001* |
| -1 | 0 | – | – | – | | |
| 0 | 45 | 28.0 – 42.0 | 32.74 ± 3.99 | 31.0 | | |
| 1 | 33 | 25.0 – 38.0 | 29.06 ± 2.16 | 29.0 | | |
| 2 | 4 | 13.50 – 25.0 | 19.0 ± 6.36 | 18.75 | | |

F: F for ANOVA test**p:** p value for comparing between HPD and station Fully Dilated***:** Statistically significant at $p \leq 0.05$ **Table (4):** Validity (AUC, sensitivity, specificity) for HPD on admission to prognosis arrest of labor (n = 8) from NVD (n = 90).

| HPD | AUC | p | 95% C. I | Cut off | Sensitivity | Specificity | PPV | NPV |
|--------------|-------|---------|-------------|---------|-------------|-------------|------|------|
| On admission | 0.923 | <0.001* | 0.845 – 1.0 | >49 | 87.50 | 81.11 | 29.2 | 98.6 |

AUC: Area Under a Curve, **p value:** Probability value, **CI:** Confidence Intervals, **NPV:** Negative predictive value, **PPV:** Positive predictive value, ***:** Statistically significant at $p \leq 0.05$

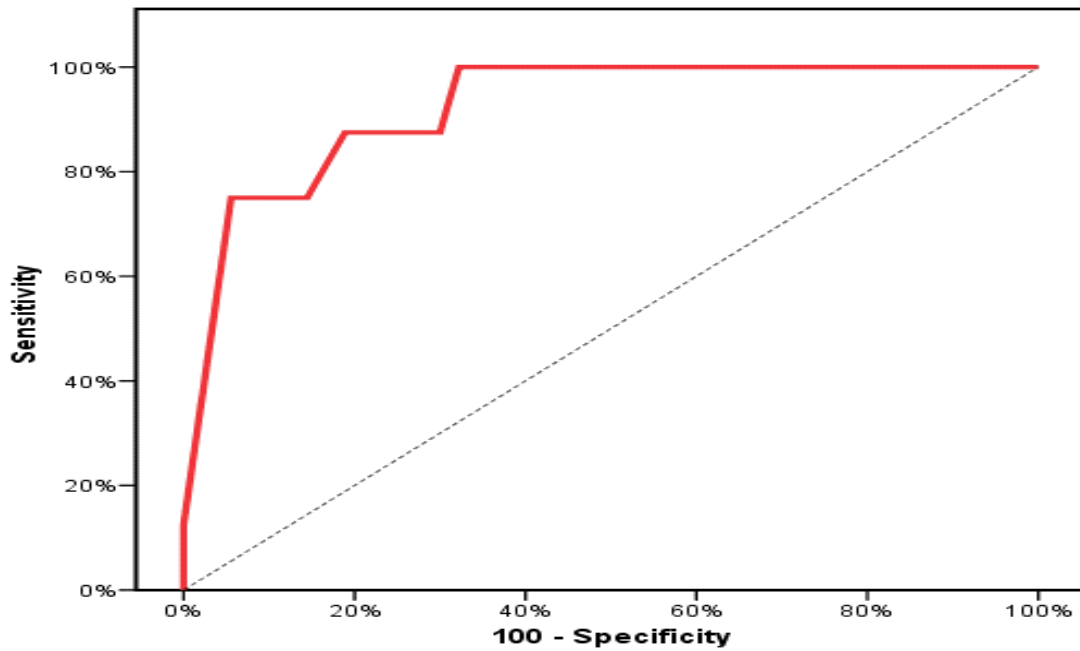


Figure (1): ROC curve for HPD on admission to prognoses AOL (n = 8) from NVD (n = 90).

Table (5): Side effects in studied groups.

| HPD | AUC | p | 95% C. I | Cut off | Sensitivity | Specificity | PPV | NPV |
|--------------|-------|---------|-------------|---------|-------------|-------------|------|------|
| 2 hrs. later | 0.926 | <0.001* | 0.918 – 1.0 | >44 | 87.50 | 84.52 | 35.0 | 98.6 |

AUC: Area Under a Curve, p value: Probability value, CI: Confidence Intervals, NPV: Negative predictive value, PPV: Positive predictive value, *: Statistically significant at $p \leq 0.05$

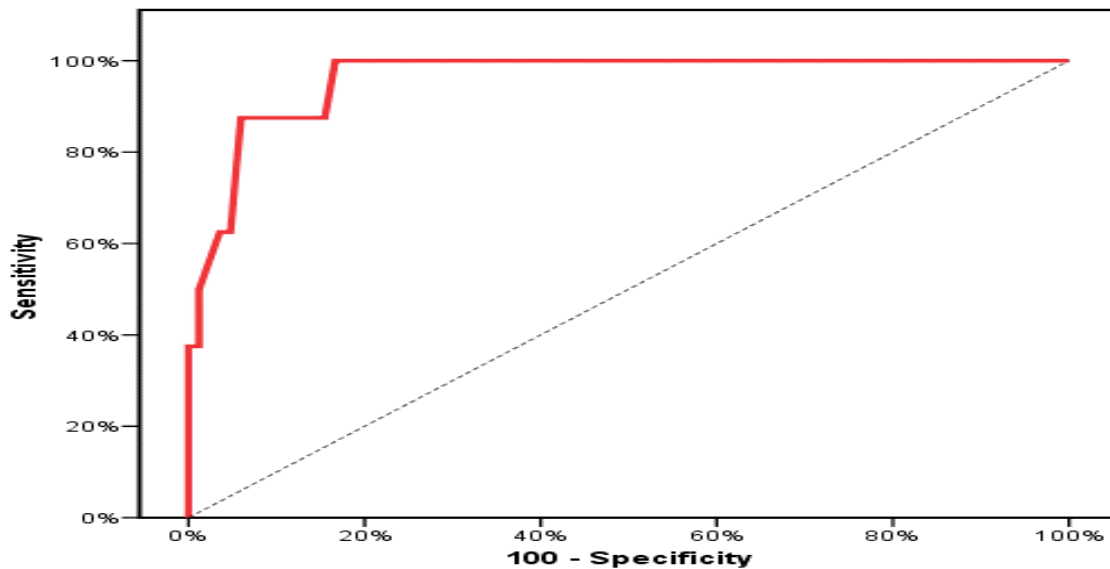


Figure (2): ROC curve for HPD2hrs Later to prognoses AOL (n = 8) from NVD (n = 84).

4. Discussion

Cervical dilatation and fetal head descent are used to assess labor progress. Head descent can be identified through an abdominal examination [9] or by vaginal examination as head station in reference to the ischial spines is regarded the gold standard for head descent assessment. The results of these clinical procedures have been proven to be subjective, with large differences in outcomes across examiners [10].

Ultrasonography in the labor ward has become more accessible. Several research on using the ultrasonography in the labor ward have been published in the previous two decades. A number of metrics for monitoring labor progress were presented in these studies. [6]

In this study, the fetal head station evaluated by vaginal examination was shown to correlate to HPD. Station (-2) was located at a distance of more than 50 mm. Station (-1) was located between (about 40-50 mm). Station (0) was found to be between (30-40 mm) in the majority of the cases, whereas Station (+1) was positioned at an HPD of less than 30 mm.

Torkildsen et al. [3] looked at HPD in primiparous women with a prolonged first stage of labor and found that the vast majority of cases (93%) had vaginal delivery at a distance of less than 40 mm. 67 percent of cases were delivered vaginally when the distance was between 40 and 50 mm. Only 18% of women delivered vaginally when the distance was more than 50 mm.

Many additional studies from across the world employed HPD to predict vaginal delivery following induction of labor, and they all agreed that it has a strong predictive value equivalent to the bishop score. The incidence of vaginal birth rose as the transperineal fetal head–perineum distance decreased. For greatest prediction of vaginal delivery, Eggebo et al. [11] selected a cut-off value of 55 mm (sensitivity 97 percent, specificity 88.1 percent).

Before induction of labor, Ali et al., from India, tested HPD. They discovered that when HPD was less than 40 mm, all of the patients were delivered vaginally, and when HPD was greater than 61 mm, all of the cases were delivered through caesarean section. With a cut-off value of 55 mm, it was discovered that only 7.1 percent of HPD below 55 mm required caesarean birth, whereas 95 percent of HPD > 55 mm required caesarean section. When compared to Bishop's score and cervical length, HPD was more predictable in every way.

Saroyo et al., [13] from Indonesia offered a 43.5 cm HPD cut-off with 98 percent sensitivity and 80 percent specificity for predicting vaginal delivery, whereas Ali et al., [12] from Egypt used a 48 mm HPD cut-off. This gap might be explained by the ethnic variety of the inhabitants of the three nations (Egypt, India and Indonesia).

The use of HPD to predict the mode of delivery has some limitations because there are many factors other than the position of the head that can affect the mode of delivery, such as the position of the head, the condition of the cervix, the efficiency of uterine contractions, and the condition of the fetus [14].

Another group of HPD studies looked into using it to identify head engagement by determining a cut-off HPD value below which the head is considered engaged. This diagnosis is essential before trying an operable vaginal delivery. [15]

The HPD was judged to be 30- 40 mm 95 times, 40-50 mm 7 times, and 30 mm 18 times when the clinical diagnostic of engagement (station zero) was acquired in this study. Desurmont et al. [15] used a 57-mm cutoff threshold for engagement, which had 75.0 percent sensitivity, 75.9% specificity, 50.3 percent positive predictive value, and 90.3 percent negative predictive value. Maticot-Baptista et al. [16] used a 60 mm engagement cutoff point at HPD, whereas Dimassi et al. [17] used a 55 mm engagement cutoff point.

Residents and obstetricians, according to Barber et al., [18], made 88 percent and 67

percent of errors when misdiagnosing a station as midpelvic rather than high-pelvic. As labor progresses, there was a decrease in the agreement degree. This misunderstanding can have serious implications for the management of laboring patients. [19].

The Digital Vaginal Examination remains the gold standard procedure in evaluation of head engagement, and none of the studies that used HPD to diagnose engagement have claimed that it can replace DVE. If the diagnosis of engagement is disputed, the findings of DVE and HPD should be combined to prevent operative vaginal delivery failure, according to Desurmont et al., [15].

5. Conclusion

Intrapartum transperineal ultrasonography assessment of head perineum distance is reliable in assessing labor progress. It's easy to perform and has the extra benefit of data storage.

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