

The Accuracy of Fetal Head to Perineum Distance and Cervical Length in Predicting the Outcomes of Labor Induction

Thesis

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*✍️ **Nada Hassan***

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List of Abbreviations

Abb.	Full term
AROM-ARM	Artificial rupture of the membranes
AUC	Area under curve
BMI	Body mass index
CI	Confidence interval
CL	Cervical length
CRF	Case record form
CS	Caesarean section
CTG	Cardiotocography
DA	Diagnostic accuracy
EASI	Extra-amniotic saline infusion
FDA	Food and drug administration
FHPD	Fetal head to perineum distance
GA	Gestational age
HPV	Human papilloma virus
IL	Interleukin
iNOS	induced Nitric oxide synthase
IOL	Induction of labor
IUGR	Intrauterine growth restriction
IV	Intravenous
LMP	Last menstrual period
LR	likelihood ratio
MRI	Magnetic resonance imaging
NO	Nitric oxide

Abb.	Full term
NOS	Nitric oxide synthase
NPV	Negative Predictive value
PCA	Posterior cervical angle
PG	Prostaglandin
PPV	Positive Predictive value
PROM	Premature rupture of the membranes
PTB	Preterm birth
RCOG	Royal College of Obstetrics and Gynecology
ROC curve	A receiver Operating characteristic curve
SD	Standard deviation
SE	Standard error
TVUS	Transvaginal ultrasound
US	Ultrasound
VAS	Visual analogue scale
VD	Vaginal delivery
YI	Youden's index

The Accuracy of Fetal Head to Perineum Distance and Cervical Length in Predicting the Outcomes of Labor Induction

Abstract

Background: Induction of labor is defined as the process of artificially stimulating the uterus to start labor. It is usually performed by administering oxytocin or prostaglandins to the pregnant woman or by manually rupturing the amniotic membranes.

Objective: The aim of the study is to assess the accuracy of fetal head to perineum distance and cervical length in predicting the outcomes of labor induction.

Patients and Methods: This is a prospective, observational study aimed to assess the accuracy of fetal-head to perineum distance and cervical length measurement in predicting the outcomes of labor induction. The study was performed at Ain Shams University Maternity Hospital from December 2017 to July 2018, 112 pregnant women who met inclusion criteria and admitted for labor induction at term (between 37-41 weeks).

Results: In predicting the outcomes of labor either vaginal delivery or CS, Bishop score had low diagnostic performance while cervical length, FHPD and posterior cervical angle had moderate diagnostic performance. The mean for pain perception among women who had vaginal examination was 3.6 ± 0.9 (range: 2.0-5.0) which is significantly higher than that among women who had perineal ultrasound 1.0 ± 0.6 (range: 0.0-2.0).

Conclusion: It can be concluded that, based on this study, the FHPD, CL and posterior cervical angle are useful in predicting the outcome of labor induction in comparison to Bishop score. Ultrasound examination is better tolerated by women than pelvic examination.

Keywords: Fetal Head to Perineum Distance, Cervical Length in Predicting, Outcomes of Labor Induction



PROTOCOL OF A THESIS FOR PARTIAL FULFILMENT OF MASTER DEGREE IN OBSTETRICS AND GYNECOLOGY

Title of the Protocol:

**THE ACCURACY OF FETAL HEAD TO
PERINEUM DISTANCE AND CERVICAL
LENGTH IN PREDICTING THE OUTCOMES OF
LABOR INDUCTION**

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1. INTRODUCTION/ REVIEW

Induction of labor is defined as the process of artificially stimulating the uterus to start labor. It is usually performed by administering oxytocin or prostaglandins to the pregnant woman or by manually rupturing the amniotic membranes. Over the past several decades, the incidence of labor induction for shortening the duration of pregnancy has continued to rise (*Caughey et al., 2009*).

Over the years, various professional societies have recommended the use of induction of labor in circumstances in which the risks of waiting for the onset of spontaneous labor are judged by clinicians to be greater than the risks associated with shortening the duration of pregnancy by induction. These circumstances generally include gestational age of 41 completed weeks or more, prelabour rupture of amniotic membranes, hypertensive disorders, maternal medical complications, fetal death, fetal growth restriction, chorioamnionitis, multiple pregnancy, vaginal bleeding and other complications (*Mozurkewich et al., 2009*).

The goal of labor induction is to achieve a successful vaginal delivery. Before induction, there are several clinical elements that need to be considered to estimate the success of induction and minimize the risk of Caesarean Section. Factors that have been shown to influence success rates of induction include the Bishop score, parity, Body Mass Index, maternal age and estimated fetal weight (*Crane, 2006*).

The Bishop score was developed in 1964 as a predictor of success for an elective induction. The initial scoring system used 5 determinants (dilatation, effacement, station, position, and consistency) that attributed a value of 0 to 2 or 3 points each (for a maximum score of 13). Bishop showed that women with a score of > 9 were equally likely to deliver vaginally whether induced or allowed to labor spontaneously (*Bishop, 1964*). In 1966, Burnett modified the scoring scheme (still in use and still known as the Bishop score) so that each variable was assigned a maximum value of 2 points (for a maximum score of 10) (*Burnett, 1966*). A favourable preinduction Bishop score of > 6 is predictive of a successful vaginal delivery.

Assessment of cervical status is fundamental for the clinician to estimate the likelihood of a successful vaginal delivery. Of the Bishop score criteria for predicting successful induction, the most important is cervical dilatation, followed by effacement, station, and position, with the least important being consistency (*Laughon et al., 2011*).



Transvaginal ultrasonography is a well-known objective technique for assessing the entire length of the cervix and the morphological characteristics of the internal os even when the external os is closed (*Jackson et al., 1992*).

Several studies have compared the ability of the Bishop score to predict successful labor induction with ultrasound assessment of the cervix with conflicting results. Peregrine et al. reported cervical length > 1 cm to be a predictor for Caesarean Section with induction of labor (*Peregrine et al., 2006*). In contrast, Hatfield et al. found that cervical length was not predictive of successful labor induction (*Hatfield et al., 2007*). Rozenberg et al. reported that the Bishop score was a better predictor of time interval from induction to delivery (*Rozenberg et al., 2005*).

In this study, the aim is the analysis of the validity of the ultrasound in the prediction of the outcomes of labor induction, its usefulness in our daily practice and the convenience to participated cases.

2. AIM/ OBJECTIVES

The aim of the study is to assess the accuracy of fetal head to perineum distance and cervical length in predicting the outcomes of labor induction.

Research question:

In induction of labor, is the use of fetal head to perineum distance and cervical length useful in the prediction of the outcomes?

Research hypothesis:

The use of fetal head to perineum distance and cervical length can predict the outcome of induction of labor.

Null hypothesis:

The use of fetal head to perineum distance and cervical length cannot predict the outcome of induction of labor.



3. METHODOLOGY: Patients and Methods

Study design:

A prospective, observational study.

Study setting:

The study will be conducted at the labor ward at Ain Shams University Maternity Hospital and will include 112 pregnant women according to sample size calculation.

The sample size:

The required sample size has been calculated using the Power Analysis and Sample Size (PASS©) software version 11.0.10 (NCSS©, LLC, Kaysville, Utah).

The primary outcome measure is the accuracy of fetal head to perineum distance (FHPD) as measured with transperineal US and cervical length (CL) as measured with endovaginal US in predicting the outcomes of labor induction.

A previous study reported that the receiver-operating characteristic (ROC) curve for prediction of cesarean delivery using the FHPD, CL, or Bishop score had an area under the curve (AUC) of 0.734, 0.663, or 0.678, respectively. In that study, 30.5% of the women delivered by CS while 69.5% delivered through the vaginal route with a CS: VD ratio of 1: 2.28 (**Alvarez-Colomo & Gobernado-Tejedor, 2016**).

So, it is estimated that a total sample size of 112 patients is expected to yield 34 women who would deliver by CS (positive group) and 78 delivering vaginally (negative group). This sample size would achieve a power of 81% (type II error, 0.19) to detect a difference of 0.163 between the area under the ROC curve associated with the CL (AUC1) and a null AUC (AUC0) of 0.5 using a two-sided z-test at a significance level of 0.05.

This sample size would have 98% power (type II error, 0.02) to detect a difference of 0.234 between the area under the ROC curve associated with the FHPD (AUC1) and a null AUC (AUC0) of 0.5, and 87% power (type II error, 0.13) to detect a difference of 0.178 between the area under the ROC curve associated with the Bishop score (AUC1) and a null AUC (AUC0) of 0.5 using a two-sided z-test at the same significance level of 0.05.

Inclusion criteria:

- Maternal age (20-35) years old.
- Body Mass Index (18- 30).
- Term singleton pregnancy with gestational age (37 – 41) weeks.
- Living fetus with vertex presentation.
- Reactive CTG.
- Intact amniotic membranes.
- Indication for medical induction of labor as (pre-eclampsia, diabetes, fetal Intrauterine Growth Restriction and oligohydroamnios).

Exclusion criteria:

- Extremes of reproductive age (less than 20 years old or more than 35 years old).
- Body Mass Index (<18 - >30).
- Multiple pregnancies.
- Rupture of membranes.
- Intrauterine fetal death.
- Contraindication for vaginal delivery like macrosomia (more than 4 KG), malpresentations, placenta previa, cord prolapse, vasa previa, uterine fibroids and active genital herpes.
- Polyhydramnios.
- Any sign of fetal distress as abnormal CTG or low biophysical profile.
- History of scarred uterus.
- Contraindication for the use of prostaglandines like history of asthma, epilepsy or increased intra-ocular pressure.

Ethics:

- The study will be approved from the ethical committee of the department of the Obstetrics and Gynaecology, Faculty of medicine, Ain Shams University.