

Ultrasonographic Measurement of Cervical Length as A Predictor of Successful Induction of Labor

(A prospective study)

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List of Abbreviations

AF	:	Amniotic fluid.
AFI	:	Amniotic fluid index.
AUC	:	Area under curve.
BMI	:	Body mass index.
BPP	:	Biophysical profile.
CRF	:	Corticotropin-releasing factor.
CS	:	Cesarean section.
CTG	:	Cardiotocography.
DHEA-S	:	Dehydroepiandrosterone sulfate.
EASI	:	Extra amniotic saline infusion.
EDD	:	Expected date of delivery.
FHR	:	Fetal heart rate.
FN	:	False negative
FP	:	False positive.
GAGs	:	Glucosaminoglycans
GBS	:	Group B Beta-hemolytic Streptococci.
IGFBP-1	:	Insulin-Like Growth Factor Binding Protein-1.
IOL	:	Induction of labor.
IUFD	:	Intra uterine fetal death
LMP	:	Last menstrual period.

List of Abbreviations (Cont.)

NICHD	: National institute of child health and development.
NPV	: negative predictivity value.
PGE2	: Prostaglandin E2.
PGF2	: Prostaglandin F2.
PPV	: Positive predictivity value.
PROM	: Premature rupture of membrane.
ROC	: Receiver-operating characteristic.
SMFM	: Society of Maternal-Fetal Medecine
TN	: True negative
TP	: True positive
TVUS	: Transvaginal ultrasonography.
US	: Ultrasonography.
VD	: Vaginal delivery.
WHO	: World Health Organization.

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Introduction

Induction of labor refers to iatrogenic stimulation of uterine contractions to accomplish delivery prior to the onset of spontaneous labor (**Martin et al. 2011**).

It is performed in about 20% of all pregnancies. According to the studies, the rate varies from 9.5 to 33.7 percent of all pregnancies annually (**Tendore 2003**).

Successful induction is reported to be related to cervical characteristics, or 'ripeness' (**Pandis et al., 2001 and Vrouenraets et al., 2005**).

One of the most common indications for labor induction is post term pregnancy, induction for such an indication has been shown to reduce the likelihood of perinatal death (**Crowley 2000 and Hannah et al; 1992**).

Other indications for induction include antepartum rupture of membranes or other situations that require termination of conservative management of high risk pregnancies. Potential fetal compromise such as significant fetal growth restriction, non-reassuring fetal surveillance, maternal medical conditions like diabetes, renal disease, significant pulmonary disease, chronic or gestational hypertension, antiphospholipid syndrome, suspected or proven chorioamnionitis, abruptio placentae, and intrauterine fetal death (**Tan, Hannah 2000**).

The need for cesarean delivery is believed to increase in association with the increase in induction of labour for both nulliparous and parous women (**Yeast, Jones, Poskin 1999**).

Cesarean delivery not only carries operative risks in the index pregnancy, but also increases risks for future pregnancies (**Kwee et al.,2007**).

The continuous rise in rates of cesarean section gives cause for concern to both obstetricians and policy makers (**Gibbons et al.,2012**).

Recent randomized comparisons have shown that the effect of induction of labor on the risk for cesarean section is limited (**Boers et al.,2010**).

Over the past decade, pre-induction cervical length, as determined by transvaginal sonography, has been proposed as a predictor for cervical ripeness. Initial changes at the internal os of the cervix can be observed by transvaginal sonography, even in the absence of cervical dilatation. It has been suggested that measurement of cervical length before induction of labor can be used to assess the success of induction of labor (**Verhoeven et al.,2013**).

Transvaginal ultrasound allows visualization of the cervix beyond a closed external os and measures the cervical length accurately, without much inter-observers' variation, especially in cases of parts of the cervix that couldn't be felt by digital examination (**Chandra, et al., 2001**).

It may accurately reflects the cervical anatomy and it is considered a less painful examination compared to the digital examination (**Lazanakis, Marsh, Brockbank 2002**).

Gomez et al. concluded that the cervical length measured by TVUS was a better predictor of successful

induction than the modified Bishop's score (**Gomez et al. 2007**).

To date, the Bishop score remains the standard method for predicting the duration and safety of induced labor (**Bishop 1964**). However, a recent systematic review showed that the Bishop score was a poor predictor of the outcome of labor in women scheduled for induction (**Kolkman et al., 2013**).

Aim of the Work

To detect the accuracy of pre-induction ultrasonographic cervical length measurement in the prediction of successful vaginal delivery within 24 hours of induction of labor.

Chapter 1

Postterm pregnancy

Definitions:

Postterm pregnancy refers to a pregnancy that has reached or extended beyond 42, 0/7 weeks of gestation from the last menstrual period (LMP), whereas a late-term pregnancy is defined as one that has reached between 41 0/7 weeks and 41, 6/7 weeks of gestation (**Spong CY., 2013**).

Recommended Classification of Deliveries

From 37 Weeks of Gestation

Early term: 37, 0/7 weeks through 38 6/7 weeks

Full term: 39, 0/7 weeks through 40 6/7 weeks

Late term: 41, 0/7 weeks through 41 6/7 weeks

Postterm: 42, 0/7 weeks and beyond

(Spong CY, 2013)

Gestation in singleton pregnancies lasts an average of 40 weeks (280 days) from the first day of the last menstrual period to the estimated date of delivery.

In the past, the period from 3 weeks before until 2 weeks after the estimated date of delivery was considered “term” (**WHO, 2013**) with the expectation that neonatal outcomes from deliveries in this interval were uniform and good. Increasingly, however, research has identified that neonatal outcomes, especially respiratory morbidity, vary depending on the timing of delivery even within this 5-week gestational age range. The frequency of adverse neonatal

outcomes is lowest among uncomplicated pregnancies delivered between 39 0/7 weeks of gestation and 40 6/7 weeks of gestation (*Tita AT et al;2009, Reddy UM et al; 2011*).

For this reason, quality improvement projects have focused, for example, on eliminating nonmedically indicated deliveries at less than 39 0/7 weeks of gestation (*ACOG, 2013*).

The terms prolonged pregnancy, postdates and postdatism are synonymously used to describe the same condition (i.e > 40 weeks) . The terms postdate and prolonged pregnancy are ill-defined and best avoided (*ACOG, 2004*).

Epidemiology:

"The incidence of postterm pregnancy is about 7% of all pregnancies (*Martin et al., 2007*). The prevalence varies depending on population characteristics and local management practices. Population characteristics that affect the prevalence include: the percentage of primigravidas in the studied population, the prevalence of obesity, a prior postterm pregnancy as well as genetic predisposition. The proportion of women with pregnancy complications and the frequency of spontaneous preterm labor also influence the rate of postterm pregnancy. The link between ethnicity and overall duration of pregnancy is not well established .(*Collins et al., 2001; Caughey et al., 2009*).

Local management practices such as scheduled induction of labor, differences in the use of early ultrasound (US) for pregnancy dating, and elective Cesarean section (CS) rates will affect the overall prevalence of postterm pregnancy. In the United States for example, the increase in