

Comparison between Sonopartogram and Conventional Partogram in Monitoring Progress of Labor

Thesis

*Submitted for Partial Fulfillment of Master Degree
in Obstetrics & Gynecology*

By

Osama Abdelkhalek Mohamed Mahmoud Marwan

M.B.B.Ch (2012)-Zagazig University Resident of Obstetrics &
Gynecology in Ahmed Maher Teaching hospital

Supervised by

Prof. Ihab Foad Serag Eldin Allam

*Professor of Obstetrics and Gynecology
Faculty of Medicine - Ain Shams University*

Dr. Sherif Ahmed Abdelhamed Ashoush

*Assist. Professor of Obstetrics & Gynecology
Faculty of Medicine - Ain Shams University*

Dr. Mohamed Samir Eid Sweed

*Assist. Professor of Obstetrics & Gynecology
Faculty of Medicine - Ain Shams University*

**Faculty of Medicine
Ain Shams University
2017**

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سببنا انك لا تعلم لنا
إلا ما علمتنا إنك أنت
العليم العظيم

صدق الله العظيم

سورة البقرة الآية: ٢٢



Acknowledgement

First and foremost, I feel always indebted to **Allah**, the Most Beneficent and Merciful. I can do nothing without Him.

*I would like to express my deep thanks and appreciation to **Dr. Ihab Foaad Serag Eldin Allam**, Professor of Obstetrics and Gyencology, Faculty of Medicine – Ain Shams University, for his outstanding help, valuable instructions constant support and close supervision through revising each part of the thesis. I really have the honor to complete this work under his great supervision.*

*My deep gratitude goes to **Dr. Sherif Ahmed Abdlhamed Ashoush**, Assistant Professor of Obstetrics and Gyencology, Faculty of Medicine – Ain Shams University, for his great support, tireless guidance and meticulous supervision throughout this work.*

*Also I would like to express a lot of thanks and appreciation to **Dr. Mohamed Samir Eid Sweed**, Assistant Professor of Obstetrics and Gyencology, Faculty of Medicine – Ain Shams University, for the efforts and time he has devoted to accomplish this work..*

***Finally**, I wish to express all my feelings of love and appreciation to **my lovely family, specially my Parents**, who give me never ending support, understanding, love and care throughout my graduate study.*

 **Osama Abdelkhalek Marwan**

List of Contents

<i>Subject</i>	<i>Page No.</i>
List of Abbreviations.....	i
List of Tables	ii
List of Figures	iii
Protocol of Thesis	iv
Introduction	1
Aim of the Work.....	4
Review of Literature	
The Stages and Physiology of Normal Labour.....	5
Vaginal Examinations in Pregnancy.....	15
Ultrasound.....	21
Patients and Methods.....	35
Results.....	49
Discussion	64
Summary & Conclusion	71
Recommendations	73
References	74
Arabic Summary	—

List of Abbreviations

<i>Abbr.</i>	<i>Full-term</i>
DGC	: Depth gain compensation
GA	: Gestational age
GCP	: Good Clinical Practice
HPerD	: Head-perineum distance
HPrD	: Head progression distance
HSD	: Head-symphysis distance
NICE	: Health and Clinical Excellence
SD	: Standard deviation
TGC	: Time gain compensation
TPU	: Transperineal ultrasound
VE	: Digital vaginal examination
WHO	: Health Organization
2D-US	: Two dimensional ultrasound
3D-US	: Three dimensional ultrasound

List of Tables

<i>Table No.</i>	<i>Title</i>	<i>Page No.</i>
Table (1):	Characteristics of the study population	49
Table (2):	Relation between the fetal head station by VE and fetal head-perineum distance by US	50
Table (3):	Correlation between the fetal head station by VE and fetal head-perineum distance by US	52
Table (4):	Correlation between the cervical dilatation by VE and by US	54
Table (5):	Bland-Altman analysis for agreement between VE and US as regards assessment of cervical dilatation	56
Table (6):	Bland-Altman analysis for agreement between VE and US as regards assessment of the degree of head rotation in hours on the face-clock.....	58
Table (7):	Agreement between VE and US as regards assessment of head position on face-clock.....	60
Table (8):	Accuracy of US for detection of caput and its agreement with VE (gold-standard) as regards assessment of caput.....	61
Table (9):	Comparison between VE and US according to satisfied.	63

List of Figures

<i>Figure No.</i>	<i>Title</i>	<i>Page No.</i>
Figure (1):	Per vaginal examination.....	15
Figure (2):	Types of transducers/probes	27
Figure (3):	Trans-perineal US.....	30
Figure (4):	Head station by VE	31
Figure (5):	CT image showing symphysis pubis and ischial spine.....	32
Figure (6):	Head symphysis distance.....	34
Figure (7):	Head perineum distance	34
Figure (8):	Cervical dilatation	39
Figure (9):	Cervical dilatation.....	39
Figure (10):	Fetal head perineum distance	40
Figure (11):	Fetal head position.....	41
Figure (12):	Fetal head caput.....	41
Figure (13):	A sample sonopartogram showing fetal head descent, cervical dilatation and head rotation	43
Figure (14):	Box plot showing the relation between the fetal head station by VE and fetal head-perineum distance by US.....	51
Figure (15):	Scatter plot showing the correlation between fetal head station by VE and fetal head-perineum distance	53
Figure (16):	Scatter plot showing the correlation between the cervical dilatation by VE and by US	55
Figure (17):	Bland-Altman plot for agreement between VE and US as regards assessment of cervical dilatation.....	57

Figure (18):	Bland-Altman plot for agreement between VE and US as regards assessment of head rotation	59
Figure (19):	Accuracy of US for detection of caput with VE regarded as the gold-standard.	62
Figure (20):	Bar chart between PV and US according to satisfied.	63

ABSTRACT

Background: Progress of labor has been assessed by digital vaginal examination (VE). We introduce the concept of a non-intrusive ultrasound (US)-based assessment of labor progress (the ‘sonopartogram’) and investigate its feasibility for assessing cervical dilatation and fetal head descent and rotation. **Aim of the Work:** To evaluate the accuracy of the transperineal ultrasound in detecting the cervical dilation in relation to VE. **Patients and Methods:** This prospective observational study was carried out in Ain Shams University Maternity Hospital on 40 pregnant women at third trimester planned to undergo digital VE and transperineal 2D-US during the period from December 2016 to May 2017. **Results:** There is very strong correlation between the cervical dilatation by VE and by US. [Pearson’s $r = .8601$, 95% CI = 0.7493 to 0.9240, p-value <.0001, $r^2 = 0.7396$] (Fig. 12). **Conclusion:** The agreement between digital VE and US was good for cervical dilatation, head rotation and caput but less so for head descent. **Recommendations:** Intrapartum translabial ultrasound examination is a useful, an objective tool to assess the progress of labor.

Key words: sonopartogram, partogram, progress of labour, Digital vaginal examination

Introduction

Digital vaginal examination (VE) is used worldwide for the assessment of cervical effacement and dilatation, fetal head descent (station) and fetal head rotation (position) at different stages of labor. However, assessment of cervical dilatation based on digital VE is imprecise (*Buckmann and Libhaber, 2007*) and the direction of error in the assessment is random (*Tuffnell et al., 1989*). Inconsistent findings between the examiners cause distress to women and loss of confidence in their care providers (*Ying and Levy, 2002*).

Digital VE can be uncomfortable for the patient, especially when the examination is repeated or in the absence of adequate regional analgesia, and can have negative psychological sequelae in those who are predisposed (*Murphy et al., 1986; Clement, 1994*).

Repeated VE also increase the risk of ascending vaginal infection; the probability of chorioamnionitis was found to range from 4% for two VE to 10% for 13 VEs (*Westover and Knuppel, 1995*).

It has been reported that repeated VEs significantly shorten the latency period of labor in preterm rupture of membranes (*Lewis et al., 1992*). With this in mind, the World Health Organization (WHO) recommends limiting the number

of digital VE and in the UK, the National Institute for Health and Clinical Excellence (NICE) has recommended further research aimed at reducing the frequency of digital VE in normal labor (*NICE clinical guideline, 2007*).

Traditionally, serial findings from digital VE are recorded prospectively on a partogram, a printed chart through which maternal and fetal observations are monitored and whose format is substantially similar throughout the world (*Lewis et al., 1992*).

Two-dimensional (2D) ultrasound (US) using a transperineal approach has been reported in the context of assessment of fetal head descent by measuring the angle of progression (*Barbera et al., 2009; Kalache et al., 2009*). Or the fetal head–perineum distance (HPD) (*Eggebo et al., 2008; Maticot-Baptista et al., 2009; Rivaux et al., 2012; Torkildsen et al., 2012*).

Furthermore, 2D-US allows assessment of fetal head rotation, and its position during the first and second stages of labor (*Akmal et al., 2002; Ghi et al., 2009; Blasi et al., 2010*) and cervical dilatation (*Hassan et al., 2013*).

US assessment alone might be also desirable in cases in which digital VE is best avoided, namely in cases of threatened preterm labor, prelabor rupture of membranes or placenta previa (*Hassan et al., 2014*).

Aim of the Work

Study objective

Primary objective:

The accuracy of the transperineal ultrasound in detecting the cervical dilation in relation to VE.

Secondary objective:

The fetal head station, fetal head position and detection of caput and moulding. as the conventional partogram

The Stages and Physiology of Normal Labour

Labour is defined as the onset of painful, regular contractions, more than one every ten minute, with progressive cervical effacement and dilatation accompanied by descent of the presenting part (*Hanley et al., 2016*).

Another definition is the process by which the fetus is expelled from the uterus (*WHO, 1994*).

The physiology of labour

The mechanism responsible for initiating human parturition is still unknown (*Berghella et al., 2008*).

Although much is understood about the physiology of labor in humans, the initiating biological event is still unclear (*Hanley et al., 2016*).

It is certainly true however that the uterine body and cervix undergo a number of changes in preparation for labour which start a number of weeks before its onset (*Kauffman et al., 2016*).

The start of labour occurs when those factors which inhibit contractions and maintain a closed cervix diminish and are succeeded by the action of factors which do the opposite,

around 32 wks, oestrogen rises faster than progesterone. (*Kauffman et al., 2016*).

The myometrium:

Myometrial cells contain filaments of actin and myosin, which are the two key proteins for contraction (*Ishii et al., 2008*)

The interaction of myosin and actin brings about contraction, while their separation brings about relaxation, under the influence of intracellular free calcium (*Astle et al., 2005*).

An increase in intracellular free calcium brings about contraction (*Shiina and Ohnuki, 2013*). Prostaglandins and oxytocin increase intracellular free calcium (so they stimulate uterine contraction) (*Grigsby et al., 2006*). Beta- adrenergic compounds and calcium channel blockers decrease intracellular calcium (they inhibit uterine contraction (*Ishii et al., 2008*).

The uterine segments:

During labour, the uterus may be divided into two functional segments (*Berghella et al., 2008*):

1. The upper segment (upper part of the uterus or body of the uterus): (*Berghella et al., 2008*).