International Journal of Gynecology and Obstetrics (2008) **101**, 133–136

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CLINICAL ARTICLE

Comparison of clinical estimation of fetal weight at the beginning and end of labor

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Received 16 October 2007; received in revised form 15 November 2007; accepted 15 November 2007

KEYWORDS
Estimated fetal weight;
Labor;
Operative delivery

Abstract

Objective: To compare the accuracy of clinically estimated fetal weight (EFW) obtained at the beginning and end of labor. *Methods:* The clinical EFWs obtained by obstetricians at the beginning (initial EFW) and end (repeat EFW) of labor were compared to determine the accuracy of the estimates in 138 women with term pregnancies. *Results:* The initial clinical EFW was changed by obstetricians in 65% of patients over the course of their labor. There was a 66% chance that the repeat EFW was more accurate than the initial EFW ($P=0.003$). This increased to 78% when the difference between the initial and repeat EFW was more than 300 g ($P=0.04$). Duration and speed of labor, and change in fetal station were not correlated with a lower, higher, or more accurate EFW. *Conclusion:* The improved accuracy of a clinical EFW obtained at the end of labor is important for management decisions, such as whether to attempt operative vaginal delivery.

1. Introduction

Obstetricians routinely record estimated fetal weight (EFW) at the beginning of labor, either by physical examination of the maternal abdomen (clinical EFW), with ultrasound measurements of fetal size (ultrasound EFW), or an estimate of fetal weight self-reported by a multiparous patient (patient EFW). Multiple studies have shown similar accuracy among these various EFW modalities [1–4], and many obstetricians rely on a clinical EFW as opposed to an ultrasound or maternal EFW when estimating the weight of the fetus.

During labor the EFW may play an important role in management, and in particular the decision to attempt an operative vaginal delivery [5,6]. However, these clinical decisions are made at the end of labor. For obstetricians who rely on a clinical EFW (as opposed to an ultrasound or patient EFW), changes in fetal position or station, or decreased amniotic fluid volume following rupture of membranes could result in a different EFW than the estimate obtained at the beginning of labor. In addition, knowledge of the labor curve itself could influence the obstetrician's perception of the clinical EFW, either knowingly or unknowingly. For example, a protracted labor may lead the obstetrician to believe that the fetal weight is greater than the weight initially estimated. It

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0020-7292/$ - see front matter
doi:10.1016/j.ijgo.2007.11.011

Table 1 Labor characteristics of the study participants

Characteristics	$n=138$
Gestational age, weeks/days	39±8 days
Cervical dilation at entry, cm	3.0±1.7
Fetal station at entry, cm (−5 to +5)	−2.5±1
Membrane status at entry, %	
Intact	67
Ruptured	33
Examiner training level, %	
Resident	15
Attending	85
Mean time to repeat EFW, hours	7.1±4.5
Mean birth weight, g	3383±495

Abbreviation: EFW, estimated fetal weight.
Values are given as mean±SD unless otherwise indicated.

is unknown, however, if a clinical EFW performed at the end of labor is more or less accurate than an estimate performed before or at the beginning of labor. Any change in estimate of fetal weight could cause uncertainty about whether to rely on the initial or repeat EFW when making management decisions, such as whether to attempt an operative delivery. The objective of the present study was to compare clinical EFWs performed at the beginning of labor (initial EFW) with clinical EFWs performed at the end of labor (repeat EFW) in term pregnancies to determine the accuracy of the estimates.

2. Methods

A prospective study of 138 pregnant women at term was conducted at one academic hospital's labor floor over a 3-month period, beginning in March 2007. Obstetricians were asked to estimate fetal weight when their patients were admitted to the labor floor and again when they were fully dilated, or just before cesarean delivery if the indication was arrest of labor. All EFWs were ascertained by physical examination (clinical EFW). Eligible patients were women presenting with spontaneous labor, ruptured membranes, or for induction of labor at or beyond 37 weeks of gestation. Exclusion criteria were patients with a recent ultrasound EFW, multiple pregnancy, scheduled cesarean delivery, or a contraindication to labor (i.e., malpresentation, placenta previa, prior classical cesarean delivery, active herpes infection). The study received Institutional Review Board exemption.

It was an intention of the study not to blind the obstetricians to their patients' labor pattern, which would result in the introduction of this bias into their clinical assessment of the EFW at the end of labor. However, it was our intention to study how this bias of the labor pattern would influence the repeat EFW, and blinding the obstetricians would not allow us to test our hypothesis. We also wanted to study the accuracy of a repeat EFW in a typical clinical setting where the labor pattern may influence the perception of the EFW, and to achieve this we specifically required that obstetricians knew the pattern of labor in their patients. The same obstetrician was required to perform both clinical EFWs; if the covering obstetrician switched during labor then the patient was excluded. The management of labor was at the discretion of the covering obstetrician.

In addition to recording the EFW the participating obstetricians were asked to record the date and time, cervical dilation, fetal station (−5 to +5), and membrane status (intact or ruptured) at the time of each EFW.

Because the first and second EFWs were performed by the same obstetrician on the same patient we compared the accuracy of the 2 EFWs using a paired *t* test and the Wilcoxon signed rank test. The Fisher exact test was also used when appropriate. Statistical analysis was done using SPSS version 12.0 (SPSS, Chicago, IL, USA). Based on prior data we assumed that there would be an absolute percentage error of approximately 8%±6% in the initial EFW [4]. The absolute percentage error is defined as the absolute value of the difference between the birth weight and the EFW divided by the birth weight. A sample size of approximately 128 patients was needed to demonstrate a 1.5% difference (increased accuracy from 8% to 6.5% or decreased accuracy from 8% to 9.5%) and power of 80% with a 2-tailed alpha error of 0.05.

3. Results

The labor characteristics of the 138 women included in the study are shown in Table 1. Most obstetricians (85%) were

Table 2 Accuracy of repeat estimated fetal weight (EFW) compared with initial clinical EFW

	Initial clinical EFW	Repeat clinical EFW	*P* value
All patients ($n=138$)			
Mean absolute error, g [a]	308±249	269±219	0.005
Mean absolute percentage error [b]	9.2±7.7	8±6.6	0.005
Patients in whom the clinical EFW was changed ($n=90$)			
Mean absolute error, g [a]	339±270	279±232	0.005
Mean absolute percentage error [b]	10.2±8.4	8.3±7.0	0.005
More accurate EFW, %	34	66	0.003
Patients in whom the clinical EFW was changed by >300 g ($n=18$)			
Mean absolute error, g [a]	483±317	315±258	0.04
Mean absolute percentage error [b]	14.3±9.8	9.4±7.7	0.05
More accurate EFW, %	22	78	0.04

Abbreviation: EFW, estimated fetal weight. Values are given as mean±SD unless otherwise indicated.
[a] Absolute error: Absolute value of birth weight minus EFW.
[b] Absolute percentage error: Absolute value of birth weight minus EFW divided by birth weight.