Comparism Between Transvaginal Cervical Length Measurement and Digital Examination in Prediction of Imminent preterm Delivery

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ABSTRACT:

BACKGROUND:
Preterm labour is a major cause of perinatal morbidity and mortality, so it is important to predict preterm delivery using the clinical examination of the cervix and uterine contraction frequency. New markers for the prediction of preterm birth have been developed such as transvaginal ultrasound measurement of cervical length as this method is widely available.

OBJECTIVE:
To determine, whether transvaginal cervical length measurement predicts imminent preterm delivery better than digital cervical length measurement in women presented with preterm labour and intact membranes.

PATIENTS AND METHODS:
Two hundred women presented with preterm labour between 24 and 36+6 weeks of gestation were included in this study. All women subjected for digital and transvaginal ultrasound cervical length measurement and the outcome measures were occurrence of preterm delivery within 48 hours and within 7 days.

RESULTS:
Assessment of cervical length measurement using transvaginal ultrasound for the 200 women presented with preterm labour with intact membrane revealed that 8 (4%) delivered within 48 hours and 16 (8%) delivered within 7 days. According to the Bishop score, the test was positive if the Bishop score was ≥8, or 4-7 with cervical length ≤30 mm. The cut-off value for transvaginal ultrasound cervical length considered as 30 mm in the study group.

CONCLUSION:
Transvaginal sonographic measurement of cervical length can predict imminent preterm delivery in women presented with preterm uterine contractions and Bishop score between 4 - 7 compared with digital cervical length measurement.

KEYWORDS: preterm delivery, bishop score , transvaginal ultrasound.

INTRODUCTION:

Preterm labour is defined as the presence of uterine contractions of sufficient frequency and intensity to cause progressive effacement and dilation of the cervix prior to term gestation (between 24 and 37 wk) [1, 2]. Preterm labour precedes almost half of preterm births and preterm birth occurs in approximately 12% of pregnancies and is the leading cause of neonatal mortality worldwide. [1, 3, 4] .Much work has been done to find a diagnostic test that predict accurately if a woman who is at risk of preterm delivery will go on to deliver preterm.[5,6]Predictions of preterm labour can be classified as primary predictors; predictors that can be used directly in unselected population without another screening before, and secondary predictors. [5, 6, 7, 8]

In pregnancy, the uterine cervix serves 2 major functions. First, it maintains its firmness (i.e., physical integrity) during pregnancy as the uterus dramatically enlarges. This physical integrity is critical so that the developing fetus can remain in the uterus until the appropriate time for delivery. Second, in preparation for labour and delivery, the cervix softens and becomes more distensible, a process called cervical ripening. These chemical and physical changes are required for cervical dilatation, labour, and delivery of the fetus. [9]

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Cervical (endocervical) length is the distance between the internal os and the external os as measured with electronic calipers. Cervical length varies by modalities used. It is the longest if obtained transabdominaly and is directly proportional to bladder fullness. [10, 11] Several studies described cervical lengths by transabdominal sonography (mean 32 to 53 mm), transvaginal sonography (mean 32 to 48 mm) and transperineal sonography (mean 29 to 35 mm). There appear to be no clinically significant difference between the mean cervical lengths of primiparous and multiparous women. [10, 12, 13, 14]

AIM OF THE STUDY:

To determine, whether transvaginal cervical length measurement predicts imminent preterm delivery better than digital cervical length measurement in women presented with preterm labour and intact membranes.

PATIENTS AND METHODS:

This prospective study was carried out at the department of obstetrics and gynecology in AL-Kadhymia Teaching Hospital from the beginning of January 2009 to the end of February 2010.

The study was approved by Iraqi Scientific Council of Obstetrics and Gynaecology and patient consent was obtained. The study group included 200 women presented with preterm labour between 24 and 36+6 weeks of gestation.

Preterm labour is defined as delivery of baby before 37 completed weeks of pregnancy. Preterm labour generally diagnosed on the basis of the presence of uncomfortable or painful regular uterine contractions plus progressive changes in the cervix.

Gestational age was calculated from a known last menstrual period or early ultrasound (first trimester).

All women included in the study were admitted to the hospital for assessment and further management. The women excluded from this study include those presented with intrauterine growth restriction, multiple pregnancy, preterm premature rupture of membranes, cervical dilatation > 3 cm, antepartum haemorrhage and medically indicated preterm delivery.

After admission all patients were subjected for uterine contraction assessment, digital cervical examination, and transvaginal sonographic measurement of cervical length.

After cervical digital examination, the different variables of the Bishop score were recorded and the score was recorded for every patient.

Transvaginal ultrasound examination of the cervix was performed by the same senior and cervical length was measured in the saggital plane using a Siemens Versa ultrasound machine with a 5 MHz transvaginal transducer.

Further management was decided by senior obstetrician on call. Delivery within 48 hours and 7 days following admission were chosen as primary outcome measures for the study.

Regarding statistical analysis we use receiver-operating characteristics (ROC) curves to obtain the cut-off points for the Bishop score and cervical length in our study. Areas under the ROC curves were calculated by ties. The predictive values of the cervical length of women with preterm labour and intact membranes were calculated and analyses of the results were done.

RESULTS:

During the period of the study, a total of 200 women were included. Of them, 109 (54.5%) were nulliparous with a mean maternal age in years was 32.76±4.87. The mean gestational age at inclusion in weeks was 29.8±4.1 ranging between 24 and 36+6 weeks of gestation as shown in table 1.

Table 1: General characteristics of the study group (n=200).

Characteristic		Mean + SD or n (%)
Maternal age (years)		32.67+4.87
Nuliparous		109
Multiparous	Delivery < 37	27
	Delivery > 37	64
Gestational age at inclusion (weeks)		29.8+4.1
24-28		59(29.5)
>28-32		56(28.0)
>32-37		85(42.5)

Figure (1) shows the pregnancy outcomes, i.e.; time of delivery for women included in the study from inclusion. The number of cases of preterm delivery before 37 weeks gestation is 50 (25%), while it is 8 cases (4%) and 16 cases (8%) that delivered within 2 and 7 days respectively.
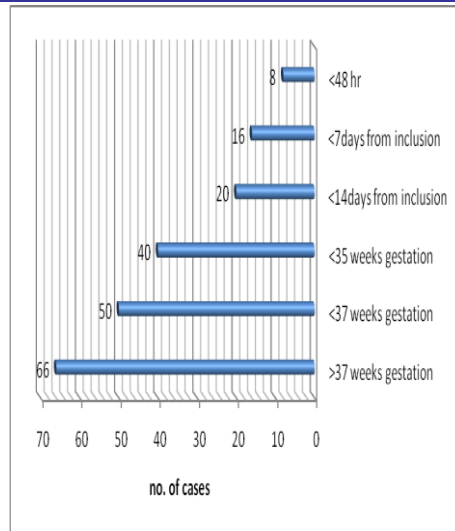
Figure 1: Pregnancy outcome (time when delivery occurred after admission) of the study group (n=200)

Figure (2) show the ROC curves for Bishop score and sonographic cervical length for prediction of spontaneous preterm delivery within 48 hours were significantly above the 45° diagonal line of unity.

Areas under the Bishop score and sonographic cervical length ROC curves did not differ significantly for delivery within 48 hours (0.749 vs. 0.707, p=0.853) as shown in figure 2.
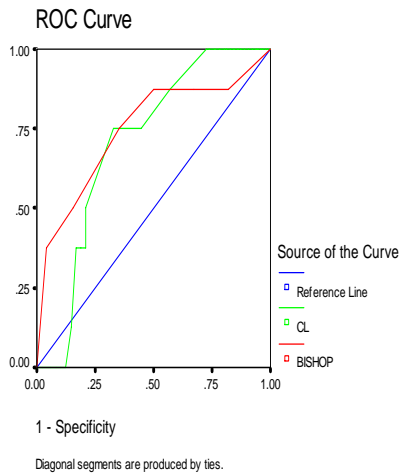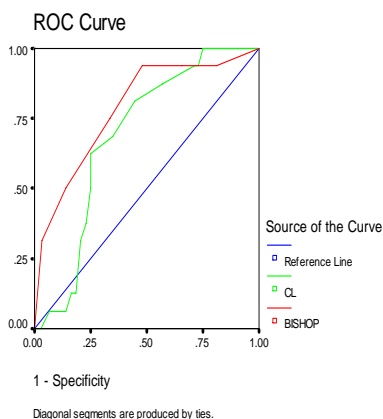

Figure 2: comparison of ROC curves for bishop score and sonographic cervical length in prediction of preterm delivery within 48 hours (p= 0.853).

For spontaneous preterm delivery within 7 days, the ROC curves for Bishop score and for sonographic cervical length were significantly above the 45° diagonal line of unity. Areas under

the Bishop score and sonographic cervical length ROC curves did not differ significantly for delivery within 7 days (0.786 vs. 0.690, p=0.705). This is shown in **figure 3.**

Figure 3: Comparison of ROC curves for bishop score and sonographic cervical length in prediction of preterm delivery within 7 days (p= 0.705).

Table 2 shows that out of 200 patients included in this study, 8 patients delivered within 48 hours and 16 patients delivered within 7 days.

It also shows a high sensitivity and negative predictive value for a Bishop score ≥ 4 for predicting imminent spontaneous preterm delivery (87.5% and 98.46%) respectively for delivery within 48 hours.

In addition, we can notice a high specificity of a Bishop score ≥ 8 (95.83%) for delivery within 48 hours. The same thing is applicable regarding delivery within 7 days (93.75%, 98.79% and 97.82%) respectively.

Table 2: Predictive values for imminent spontaneous preterm delivery of Bishop score in women with preterm labour and intact membranes (n=200).

Predictor	Sensitivity %(95%CI)	Specificity %(95%CI)	PPV %(95%CI)	NPV %(95%CI)
Delivery within 48 hr. (n=8)				
Bishop score (4-7)	87.5 (72-95)	33.33 (12-45)	5.18 (3-11)	98.46 (95-100)
Bishop score ≥8	37.5 (13-66)	95.83 (81-100)	27.27(12-67)	97.35 (93-100)
Delivery within 7days(n=16)				
Bishop score (4-7)	93.75 (85-99)	44.56 (23-78)	12.82 (4-17)	98.79 (97-100)
Bishop score ≥8	31.25 (18-45)	97.82 (87-99)	55.56 (34-87)	94.24 (92-99)

Table 3 shows a high sensitivity and NPV for a sonographic cervical length of ≤ 30 mm in women with a Bishop score of 4-7 for delivery within 48 hours which were 80% and 96.87% respectively and for delivery within 7 days the sensitivity and NPV were 88.88% and 96.29% respectively.

Table 3: Predictive values for imminent spontaneous preterm delivery of sonographic cervical length in women with preterm labour and intact membranes and with a bishop score between (4-7 bishop) (n=102).

Predictor	Sensitivity %(95%CI)	Specificity %(95%CI)	PPV %(95%CI)	NPV %(95%CI)
Delivery within 48 hr. (n=8)				
Cervical length ≤20 mm	60 (34-88)	63.19 (34-77)	7.89 (2-19)	96.87 (95-100)
Cervical length ≤25 mm	80 (45-99)	45.36 (34-58)	7.01 (3-17)	97.77(95-100)
Cervical length ≤30 mm	80 (55-92)	26.8 (13-67)	5.33(2-18)	96.29 (90-98)
Delivery within 7days(n=16)				
Cervical length ≤20 mm	44.44 (23-67)	64.51 (45-89)	10.81 (4-28)	92.3 (87-99)
Cervical length ≤25 mm	77.77 (60-89)	47.31 (23-66)	12.5 (7-18)	95.56 (90-99)
Cervical length ≤30 mm	88.88 (50-96)	27.95 (13-56)	10.66 (3-26)	96.29(95-100)

DISCUSSION:

Preterm labour is the major cause of perinatal death, constituting a severe worldwide health problem. So, it is important to determine the predictive factor of preterm labour.

The ultrasound probe is supposedly capable of assessing structures that the examining finger cannot, specifically, the supraforniceal portion of the cervix and the internal os. Even if this assumption is true, it does not follow that more information necessarily equals better care.

Furthermore, in contrast to the claimed advantages of ultrasonography, digital examination provides superior information about consistency, station, and the shape of the lower uterine segment, so several studies have been published regarding the effectiveness of clinical evaluation and ultrasound (U/S) guidance in the prediction of preterm labour all over the world.

In this study, both sonographic cervical length and the Bishop score were found to predict imminent preterm delivery, this is obtained by the comparison of the areas under ROC curves for both sonographic cervical length and the Bishop score while Jean-Luc V et al [15] published that prediction of preterm delivery was not improved by ultrasonograhy compared to digital examination and ultrasonography is less relevant in identifying patients anticipated to deliver prematurely.

On the contrary, other studies as Carlos Novaes et al[16], Kagan KO et al[17], Tsoi E et al[18], Guzman ER et al[19], Carbonne B[20] and Berghella V et al[21] ; stated that ultrasonographic cervical length is the best for predicting preterm delivery.

Kagan KO et al [17] have demonstrated the high incidence of preterm birth in patients whose ultrasonographic findings had demonstrated significant shortening of uterine cervix .While Carlos Novaes et al [16] found that in most of cases preterm labour can be predicted by cervical ultrasonography.

On the contrary, other study as Gomez R et al [22]; indicated that there is no significant association between preterm delivery and either cervical dilatation or effacement.

Using of 48 hours and 7 days following inclusion for prediction of preterm delivery in this study, this is based on the fact that the protective measures for the fetus, such as corticosteroid and tocolytic therapy, should be taken within 48 hours and up to 7 days of the diagnosis of preterm labour. This is agreed by Calros N et al [16] and Montenegro CAB et al. [23]Since corticosteroid treatment has been proven to be effective for only the first week, delivery within 2 and 7 days following inclusion are more clinically relevant primary outcome measures than is delivery by a particular gestational age.

While Carlos N et al [16], Kagan KO et al [17], Tsoi E et al [18]; and Gomez R et al [22]; used delivery within 7 days as a target and point primary outcome.

In the same way other investigators as Jean-Luc V et al[15], Crane JM et al[17]; used a specific

gestational age for predicting preterm delivery when they considered delivery before 35-37 weeks gestational age as primary outcome.

This may simply affect the effectiveness of digital cervical examination as a result of an unspecified period between the examination and delivery which may be a long one.

In this study, transvaginal ultrasound measurement of cervical length predicts imminent spontaneous preterm delivery better than digital cervical length measurement in women with preterm labour and intact membrane. This is more or less similar to what has been done in the Ohio State [24].

Iams JD [24] suggested measuring cervical length in patients with preterm labour only if the cervix is less than 80% effaced and ruling out preterm labour in cases with a cervical length ≥30 mm, since the diagnosis is very unlikely in this case. Our study, confirmed the strategy proposed by Iams *JD* [24]; transvaginal cervical length can be measured only in women with preterm labour and intact membrane.

Indeed, when, transvaginal cervical length measurement was performed in patients with a Bishop score between 4 and 7, the negative predictive values of this test with a 30-mm cervical length cut-off for a delivery within 48 hours and 7 days were excellent. Thus transvaginal ultrasound cervical length measurement used selectively in daily clinical practice could provide the clinician with a test on which may be based a decision not to treat.

Furthermore, increasing the specificity of transvaginal ultrasound cervical length for predicting preterm birth within 7 days, when measured in women with preterm labour and intact membrane, means that the number of false positives, for which unnecessary therapeutic measures could have been prevented.

CONCLUSION:

Transvaginal sonographic measurement of cervical length can predict imminent preterm delivery in women presented with preterm uterine contractions and Bishop score between 4 and 7 compared with digital measurement. Transvaginal sonographic measurement of cervical length preferred to be done after Bishop score for better prediction of imminent preterm delivery.

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