CERVICAL SHORTENING MEASUREMENT FOR PREDICTION OF SUCCESSFUL LABOR INDUCTION

BAŞARILI DOĞUM İNDÜKSİYONUNU BELİRLEMEDE SERVİKAL KISALMANIN ÖLÇÜMÜ

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Öz

Amaç: Bu çalışmada asıl amacımız doğumun başlangıcında ve indüksiyon sırasında periyodik servikal uzunluk ölçümünün doğum indüksiyon sonuçlarını öngörmedeki etkinliğini belirlemeyi hedefledik. Gereç ve Yöntem: Çalışma Bursa Yüksek İtisas Eğitim ve Araştırma Hastanesi Kadın Hastalıkları ve Doğum Kliniğinde 2013 yılı ağustos ile aralık ayları arasında gerçekleştirilmiştir. Dinoproston doğum indüksiyonu için kulllanılmıştır. 137 hasta vajinal doğum grubunu, 64 gebe kadın ise sezaryen doğum grubunu olşturmuştur. Bulgular: Çalışma popülasyonunda indüksiyonun başlangıcında servikal durum değerlendirilmiş(n=201) ve ortalama servikal efasman % 26.5 ± 17.9 ve ortalama servikal dilatasyon 1.5 ± 3.6 cm olarak bulunmuştur. Ortalama Bishop skoru 2.9 ± 2.5 olarak hesaplanmıştır. İndüksiyonun başlagıcından 4. Saatine(I), indüksiyonun 4. Saatinden 8. Saatine(II) ve indüksiyonun başlangıcından 8. Saatine(III) kadar olan gruplarda servikal kısalma vajinal doğum gerçekleşen grupta hüksek derecede anlamalı bulundu.(I: 26.8 ± 19.5 karşın 16.9 ± 15.1, II: 31.4 ± 23.9 karşın 19.2 ± 18.5 ve III: 44.2 ± 24.1 karşın 30.5 ± 21.2). Tartışma: Çalışmamızda servikal uzunluğun başlangıçtaki değeri ile aktif faz dönemindeki uzunluğu arasında anlamlı korelasyon belirledik. Benzer olarak, 4. Ve 8 saat servikal uzunluk ölçümleri arasında aktif faz döneminde anlamlı korelasyon belirledik. Bishop skoru ve aktif faz dönemi arasında negative korelasyon mevcuttu. Sonuç olarak servikal uzunluk ölçümünün karşılaştırmalı analizi doğum sırasında indüksiyon başarısını belirlemede yardımcı olabilir ve yeni bir teknik olarak uygulanabilir.

Anahtar Kelimeler

Dinoproston; Servikal Uzunluk; İndüksiyon

Abstract

Aim: In this study, main goal is to evaluate the efficiency of periodical cervical length measurements, at the beginning and during the induction, in predicting the outcome of labor induction. Material and Method: This prospective study was performed in Bursa Yuksek Ihtisas Research and Training Hospital Gynecology and Obstetrics clinic between August and December 2013. Dinoprostone was used for inducing labors. 137 cases in vaginal delivery group, 64 pregnant women in cesarean delivery group. Results: In study population, cervical conditions at the initiation of induction was evaluated (n=201) and mean cervical effacement was 26.5 ± 17.9 percent and mean cervical dilatation was 1.5 ± 3.6 cm. Average Bishop score was 2.9 ± 2.5. Cervical shortening from beginning to 4th hour of induction, 4th hour to 8th hour of induction and from beginning to 8th hour of induction were significantly higher in vaginal delivery group 26.8 ± 19.5 to 16.9 ± 15.1, 31.4 ± 23.9 to 19.2 ± 18.5 and 44.2 ± 24.1 to 30.5 ± 21.2 respectively. Discussion: We determined a significant correlation between cervical length at the start with the duration of active phase. Similarly, 4-hour and 8-hour cervical length measurements significantly correlated with the duration of active phase. Bishop score and the duration of active phase had a negative correlation. Finally comparative analysis of cervical length measurements may be useful to predict the success of induction during labor and contribute the precision of current techniques.

Keywords

Dinoprostone; Cervical Length; Induction

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Introduction

Induction of labor is the artificial stimulation of uterine contractions before its spontaneous onset for the purpose of vaginal delivery. Vaginal delivery is the main goal of the labor induction. 20 percent of pregnancies needs to induction of labor because of various obstetric and non-obstetric reasons [1]. The rate of labor induction is increasing in modern obstetrics [2].

Labor induction performed by medical reason is associated with increased rates of cesarean section, mainly in nulliparous patients [3]. Bishop score has been widely used for to determine the success of labor induction. But the subjective nature and limitations of this scoring system can reduce the predictive power for the success of labor induction [4,5].

Studies have demonstrated the benefits of transvaginal ultrasonographic evaluation of the cervix to predict the success of labor induction over the clinical examination [6-8]. Because transvaginal ultrasonography provides better measurement of the cervix.

Many studies evaluated only the cervical length at the time of induction, but not the dynamic changes of the cervix during labor. The present study aimed to measure the dynamic changes of the cervix during labor for the prediction of success of labor induction. In addition, the present study also determined the cut-off values of cervical shortening at 4th and 8th hour of induction of labor.

Material and Method

This is a prospective observational study. From August 2013 to December 2013, 201 women were prospectively recruited for the study at Bursa Yuksek Ihtisas Research and Training Hospital, Department of Gynecology and Obstetrics. Study was approved by the Institutional Ethics Committee. All patients gave written consent to participate inthe present study.

During the study period, 6441 women delivered at our center and 1281 (19.8%) consecutive women underwent labor induction. 1080 of these women were excluded because they did not meet the inclusion criteria (n = 827) or they declined to participate (n = 253). 201 patients included in the study.

The inclusion criteria were as follows: singleton pregnancy; alive fetus; cephalic presentation; gestational age between 37 and 41 weeks (determined by the date of the last period and confirmed by first-/second-trimester ultrasound); absence of premature rupture of the membranes; normal fetal well-being on cardiotography (before and during labor); absence of contractions and/or onset of labor; absence of previous uterine scars (cesarean, metroplasty, myomectomy). For all participants, data on age, gravidity, parity, gestational week at delivery, systemic disorders, body mass index (BMI) at the time of delivery and indications for induction were recorded.

The patients first underwent a standard complete evaluation. Bishop score assessed by an expert obstetrician who were blinded to the results of the ultrasound. All women underwent cervical assessment by transvaginal ultrasound by one of the authors (EA) using an ESAOTE My Lab Six (ESAOTE, Genoa, Italy) equipped witha 5 MHz transvaginal probe. First the patient empty her bladder. An endovaginal probe was placed in the anterior vaginal fornix. Ultrasound measurement of cervical length was made in the sagittal plane along the length of the endocervical canal with simultaneous visualization of theinternal and external cervical os.

For those with Bishop score 6 or more (favorable cervix for labor induction) for labor induction, intravenous oxytocin (5 IU of oxytocin diluted in 500 mL of ringer lactate solution, starting with 2 mIU/min) was used to obtain labor's active phase according our routinely clinical protocol. Oxytocin dose was regularly increased every 15 minutes by 2 mU/min until 3-5 contractions per 10 minutes were achieved. Maximum dosage was 32mU/min.

If the Bishop score less than 6 (unfavorable cervix for labor induction) preinduction cervical ripening was performed using 10 mg of controlled-release dinoprostone inserted as a single dose(Propess 10 mg, Controlled Therapeutics, East Kilbride, Scotland) until the Bishop score became 6 or more. Then dinoprostone vaginal insert removed and complementary oxytocin was used when adequate. If the Bishop score remained unfavorable after 24 hours of dinoprostone insertion then vaginal insert removed and patient underwent cesarean section.

Continuous electronic fetal heart rate monitoring was employed to all patients. Artificial amniotomy was performed when a cervical dilatation of 5–7 cm was achieved. Artificial amniotomy was not performed until the cervix was dilated to at least 5 cm and the vertex was engaged.

For the purpose of the study, we defined an induction a ssuccessful only if vaginal delivery was achieved. Ultrasound measurement of cervical shortening was calculated at 4th and 8th hours of induction.

Data processed by statistics programme for social scientists for Windows 21.0 (SPSS, Chicago, IL, USA). Normal data distributionwas analyzed via the Kolmogorov–Smirnov test. Results were presented as the mean±SD. Demographic characteristics of the patients were analyzed using the t test, x2 test, and the Fisher's exact test, where appropriate. In order to deal with uncertainty in estimation, we generated 95% confidence intervals for posttest probabilities around the point estimate. Overall logistic regression analysis was used to examine the relationship between the degree of cervical length shortening and successful labor induction. Receiver operating characteristic (ROC) curves and area under the curve (AUC) values were used to determine the cut-off values of cervical shortening for successful labor induction. $P<0.05$ was considered statistically significant.

Results

The characteristics of the study group are listed in Table 1(Table 1). Maternal age, gestational age and body mass index did not differ between the vaginal delivery and cesarean section groups. Oligohydroamnios (n:70, 34.8%) was the most common indication for labor induction. Postmaturity (n:67), intra-uterine growth restiriction (n:28), non-reassuring NST (n:21) and hypertension (n:15) were the other indications for induction (Table 2).The method of induction was administration of: both dinoprostone and oxytocin(n=103), oxytocin only (n=98).

One hundred thirty seven (68.2%) women had a vaginal delivery. Cesarean delivery was performed in the other (n:64, 31.8%) women for the following indications: failure to progress (n = 43) and induction failure(n = 21). Mean preinduction cervical length in the vaginal delivery group was 29.6 ± 7.4 mm and in

Table 1. Characteristics of vaginal delivery group and cesarean section group

	Vaginal Delivery n: 137	Cesarean Section n: 64	p Value
Maternal Age	26.5 ± 5.5	27 ± 4.7	0.514
Gestational Age	39.4 ± 1.9	39.5 ± 1.9	0.756
Body Mass Index	28.1 ± 4.2	28.3 ± 4.5	0.723
Nulliparity	42 (65.6%)	74 (54%)	
Bishop Score	3.4 ± 2.5	1.9 ± 2.1	<0.001
Preinduction Cervical Length (mm)	29.6 ± 7.4	31.5 ± 7.4	0.09

#Values given as mean ± SD. Chi-Square test.

Table 2. Indications for labor induction#

Indication	Vaginal delivery (n = 137)	Cesarean (n=64)	p Value
Postmaturity	50 (36.5%)	17 (26.6%)	0.493
Oligohydramnios	46 (33.6%)	24 (37.5%)	0.164
IUGR	16 (11.6%)	12 (18.7%)	0.200
Non-reassuring NST	14 (10.4%)	7 (10.9%)	0.349
Hypertension	11 (7.9%)	4 (6.3%)	0.932

Values are given as n(%). Univariate regresion

the cesarean section group was 31.5 ± 7.4 mm (p:0.09, Table 1). Mean Bishop score in the vaginal delivery group was significantly higher than in the cesarean group (P<0.001).

Cervical shortening from beginning to 4th hour of induction, 4th hour to 8th hour of induction and from beginning to 8th hour of induction were significantly higher in vaginal delivery group 26.8 ± 19.5 to 16.9 ± 15.1, 31.4 ± 23.9 to 19.2 ± 18.5 and 44.2 ± 24.1 to 30.5 ± 21.2 respectively (Table 3). Receiver operating characteristic (ROC) curves analysis showed that optimal cervical shortening cut-off values for successful labor induction were 10 mm (beginning to 4th hour) with 66% sensitivity, 44% specificity(95% CI, AUC: 0.580); 14 mm (4th hour to 8th hour) with 73% sensitivity, 52% specificity(95% CI, AUC: 0.657) and

Table 3. Decrease in cervicallength in vaginal delivery and cesarean section groups#

	Vaginal delivery	Cesarean section	P value
Cervical Shortening – From beginnig to 4th hour	26.8 ± 19.5	16.9 ± 15.1	0.001
Cervical Shortening – From 4th hour to 8th hour	31.4 ± 23.9	19.2 ± 18.5	0.006
Cervical Shortening – From beginning to 8th hour	44.2 ± 24.1	30.5 ± 21.2	0.003

#Values given as mean ± SD. Chi-Square Test.

Table 4. Relationship of cervical length and Bishop score with mode of delivery in patients with a Bishop's score 5 or less#

	Vaginal Delivery	Cesarean Section	P value
Cervical Lenght at the beginning (mm)	31.2 ± 6.9	32.1 ± 7.1	0.418
Cervical Shortening – From beginning to 4th hour	25.8 ± 19.7	15.1 ± 12.9	<0.001
CervicalShortening – from 4th hourto 8th hour	30.4 ± 23.6	16.7 ± 15.5	<0.001
Cervical Shortening – From beginning to 8th hour	43.2 ± 27.7	27.7 ± 17.7	<0.001

#Valuesaregiven as mean ± SD. Chi-Square Test.

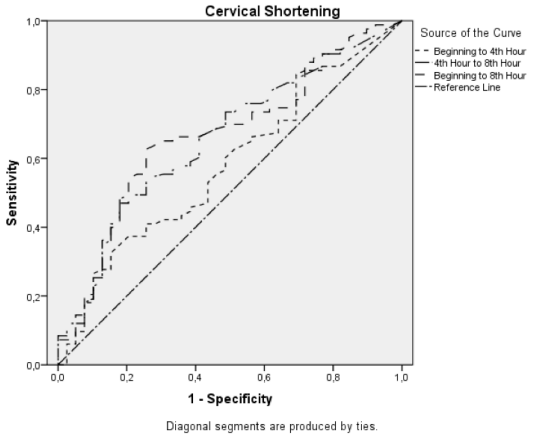

Figure 1. Receiver–operating characteristics curves for cervical length shortening beginning to 4th hour, 4th to 8th hour and beginning to 8th hour in predicting successful labor induction (95% CI, AUC: 0.580, AUC: 0.657 and AUC: 0.667 respectively)

30 mm (beginning to 8th hour) with 66% sensitivity, 62% specificity (95% CI, AUC: 0.667) respectively (Figure 1). When the Bishop's score 5 or less, vaginal delivery group still have significantly higher cervical shortening degree (Table 4).

Discussion

The exact process of cervical ripening is not clearly established [9]. Cervical ripening and cervical shortening are dynamic processes. However, evaluation of the preinduction cervical length and assessment of Bishop score are not enough to predict successful induction of labor, also cervical shortening should be included.

Our results support that cervical shortening and Bishop score may predict vaginal delivery with reasonable accuracy. In vaginal delivery group, preinduction mean cervical length was lower, mean Bishop score and cervical shortening degree was higher compared with cesarean section group. Assessment of cervical shortening at 4th and 8th hour of labor may be useful for predict the success of labor induction with moderate sensitivity and specificity. Our data shows that, cut-off values for 4th and 8th hour cervical shortening were 10 mm and 30 mm respectively. Cervical shortening degree at 4th and 8th hour are useful too even if cervix is unfavorable (bishop score 5 or less).

The performance of the Bishop score has been evaluated in various studies [10-12]. However, Bishop score has limitations [7,11,13]. Bishop Score is more favorable for multiparous women. It demonstrates intra- and inter-observer variability [14]. A potential advantage of transvaginal ultrasound assessment compared with Bishop score is that ultrasound measurement may provide a more objective assessment. Eggebo et al. suggested that TVUS is superior to digital examination in the prediction successful labor induction [15].

This study demonstrated that measurement of cervical length during labor is useful for prediction of successful labor induction, but it can be prompt to fault if:

-Performing measurement of cervical length during uterine contraction by ultrasound

-Insufficient experience of using transvaginal ultrasound prob for measuring cervical length

-performing the measurement with low-quality ultrasound devices.

All these handicaps may cause incorrect results and assumed as drawbacks of our study.

Cervical dilatation and effacement are dynamic processes during labor. Bishop score and preinduction cervical length measurement provides moderate prediction for successful labor induction. Assessment of cervical shortening combined with Bishop score during labor may provide a better prediction.

Authors' contributions:

This work was carried out in collaboration by all authors. Authors EA,TC and EK wrote the first drafts of the manuscript. Author BB,MT managed the literature search. Author EU revised and edited the manuscript. All authors read and approved the final manuscript.

Consent:

The authors declare that 'written informed consent' was obtained from the patient for
publication of this case report with accompanying images.

Ethical approval:

The authors hereby also declare that all examinations and interventions have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards.

Competing interests

The authors declare that they have no competing interests.

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