Cukurova Medical Journal
ÇUKUROVA ÜNİVERSİTESİ TIP FAKÜLTESİ

Cukurova Med J 2020;45(4):1634-1643
DOI: 10.17826/cumj.779429

ARAŞTIRMA / RESEARCH

Can uterocervical angle and cervical length determine the success of induction of labor in late-term and post-term nulliparous pregnant women?

Uteroservikal açı ve servikal uzunluk geç term-postterm nullipar gebelerde doğum indüksiyonunun başarısını belirleyebilir mi?

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Cukurova Medical Journal 2020;45(4):1634-1643

Abstract

Purpose: The aim og this study was to evaluate the role of uterocervical angle (UCA) and cervical length (CL) in predicting the success of induction of labor before induction was performed in late term and post-term pregnancies.

Materials and Methods: This retrospective study was carried out between January 2018 and April 2020, in Medipol University based on the data about 260 late-term and post-term nulliparous pregnant women who underwent induction of labor. UCA and CL values in pregnant women were assessed just before the induction was performed. Our study population was assigned into two groups: successful IoL group (group1) and failed (group 2) IoL group. The primary outcome of the study is the effectiveness of UCA and CL in predicting successful induction of labor (latent phase duration ≤720 min).

Results: While the mean UCA was 102.17 ± 4.26 degree in the successful labor induction group, it was 94.25 ± 7.141 degree in the unsuccessful group. While the mean CL was 27.85 ± 3.5 mm in the successful labor induction group, it was found as 31.73 ± 2.71 mm in the unsuccessful group. There was a statistically significant difference between the groups in terms of mean values for the CL and UCA. Both the UCA and the CLsignificantly predicted the duration of the prolonged latent phase.

Conclusions: This study indicated that both the UCA and CL measurements had a significant predictive value in predicting successful induction of labor and normal birth in late term and post-term nulliparous pregnant women.

Keywords:. Cervical length, induction of labor, transvaginal ultrasound, uterocervical angle.

Öz

Amaç: Bu çalışmada, geç ve post term gebeliklerde indüksiyon yapılmadan önce doğum indüksiyonunun başarısını öngörmede uteroservikal açının (USA) ve servikal uzunluğun (SU) rolünün araştırılması amaçlanmıştır.

Gereç ve Yöntem: Bu retrospektif çalışma Ocak 2018-Nisan 2020 tarihleri arasında Medipol Üniversitesi Nisa Hastanesinde doğum indüksiyonu uygulanmış 260 nullipar geçterm ve postterm gebeye ait bilgiler kullanılarak yapılmıştır. Gebelerde indüksiyondan hemen önce uteroservikal açı ve servikal uzunluk değerleri değerlendirilmiştir. Çalışma populasyonumuz, başarılı (grup 1) ve başarısız (grup 2) doğum indüksiyonuna göre 2 grup olarak gruplandırılmıştır Birincil sonuç, doğum indüksiyonuna başarısını öngörmekteki etkinliktir. (latent faz ≤720 dk.).

Bulgular: Başarılı doğum induksiyon grubunda uteroservikal açı ortalaması 102,17 ± 4,26 derece iken başarısız grupta 94,25 ± 7,141 derece olarak saptanmıştır. Başarılı doğum induksiyon grubunda ortalama servikal uzunluk 27,85 ± 3,5 mm iken başarısız grupta 31,73 ± 2,71 mm olarak saptanmıştır. Gruplara göre serviks uzunluk ortalamaları ve uteroservikal açı ortalaması arasında istatistiksel olarak anlamlı bir farklılık saptanmıştır. USA ve SU) uzamış latent faz süresi önemli ölçüde belirleyicidir.

Sonuç: Bu çalışma, geç term ve postterm nullipar gebelerde hem uteroservikal açı hem de servikal uzunluk ölçümlerinin; başarılı doğum indüksiyonu ve normal doğumu tahmin etmede anlamlı belirleyiciliğe sahip olduğunu göstermiştir.

Anahtar kelimeler: Servikal uzunluk, doğum indüksiyonu, transvaginal ultrason, uteroservikal açı

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Geliş tarihi/Received: 13.08.2020 Kabul tarihi/Accepted: 03.10.2020 Çevrimiçi yayın/Published online: 30.12.2020

INTRODUCTION

The normal gestation period in humans ranges between 37 and 42 weeks. While the gestation that continues after the 42nd gestational week (294 days) is called post-term pregnancy, gestation ranging between 41 0/7 weeks and 41 6/7 weeks is called late term pregnancy. Although there may be differences between societies, the rate of post-term pregnancies varies between 5% and 15% .[1] With the correct determination of the gestational age, this rate decreases to 5%. Since late-term and post-term pregnancies are associated with an increased risk of perinatal morbidity and mortality, correct timing is very important in the induction of labor. According to available epidemiological evidence, induction of labor can be considered between the 41 0/7 weeks of gestation and 42 0/7 weeks of gestation, but induction of labor is strongly recommended after the 42 0/7 weeks of gestation and up to 42 6/7 weeks of gestation[1].

Induction of labor (IoL) is a common practice and is performed in approximately 20-30% of births[2]. Several risk factors such as low Bishop scores (BS <6), nulliparity, gestational age > 41 weeks, fetal macrosomia and maternal obesity lead to the failed IoL. The level of cervical maturation before the IoL is the most important factor for a successful birth[3,4,5].

Bishop score is the cervical scoring method used to determine the success of the birth process. The Bishop score addresses the condition, adequacy, and position of the cervix enlargement and thinning. Evaluation of the cervix prior to the induction with transvaginal ultrasonography (TVUSG) can be preferred to the traditional Bishop score, because it is pratical and easy to learn[6]. In addition, the initial changes in the cervix, cervical length and cervical angle which cannot be detected during manual examination can be evaluated with TVUSG.

The UCA is defined as the angle between the endocervical canal and the anterior uterine wall. The force exerted by the uterus on the cervix changes according to the degree of UCA. While the force applied by the uterus to the cervix cannot open the narrow angle endocervical canal, it can easily open the wide angle endocervical canal. Studies in the literature report that as the UCA increases so does the risk of preterm labor .[7,8,9] In addition, the rate of normal births is higher in term pregnancies with large UCA[10,11].

The review of the literature revealed that the effectiveness of the UCA and cervical length on the IoL in late term and post-term pregnancies was not investigated. Therefore, we aimed to determine the effectiveness of uterocervical angle (UCA) and cervical length (CL) in predicting successful IoL in late term and post-term pregnancies in which normal delivery rates are low.

MATERIALS AND METHODS

This project was carried out as a retrospective study at Medipol University Nisa Hospital between January 2018 and April 2020 using the digital database of Gynecology and Obstetrics clinic of the same hospital. Ethics committee approval and hospital institution approval were obtained prior to the study (date: April 16, 2020 and reference number: 10840098-604.01.01-E.14177).

Sample

Between January 2018 and April 2020, 700 pregnant women received induction of labor. Of these pregnant women, 260 pregnant women consisted of patients with late term and postterm periods. Before the induction of labor; in order to investigate the role of UCA and CL, measured as a routine hospital protocol, in predicting successful IoL in late term and post-term pregnancies, the data available in the patient files were screened, and 260 patients were included in the study. Two groups: group 1 (with normal latent phase duration: ≤720 minutes) and group 2 (with extended latent phase duration :>720 minutes) were included in the study.

Inclusion criteria were being a primipara, having a gestational age of 41 0/7 weeks to 42 6/7 weeks, the fetus in the vertex position, singleton pregnancy, labor not initiating spontaneously, unfavorable cervix (Bishop score: <6). Exclusion criteria: were previous uterine and cervical surgery, cephalopelvic disproportion, fetal congenital abnormalities and contraindications to vaginal delivery (e.g., ablation placenta, placenta previa).

Procedure

Both Bishop score and transvaginal ultrasound examination data about women who met the inclusion criteria were obtained from the hospital database. Before the IoL, all the examinations were carried out by one obstetrician (Derya Kanza Gül).

Cervical length was defined as a single straight line from the internal os to the external os. The UCA was defined as the angle between the anterior uterine wall and the endocervical canal. The ultasound measurements were performed two times, and the mean values obtained from these two measurements were included in the analysis. Ultrasonographic markers were performed using an 9.5 MHz transvaginal transducer.

The IoL was started by placing a vaginal prostaglandin E2 (PGE2) in the posterior fornix of vagina. This procedure was continued until BISHOP score> 7 or for up to 24 hours. Fetal heart was monitored 1 hour after dinoprostone insertion and then every 4 hours. vaginal dinoprostone removed in case of fetal distress, uterine tachystole, or successful cervical maturation. Participants who successfully responded to the IoL and the labor was supported with oxytocin when it was necessary. The decision to administer oxytocin was made based on the types of the uterine contractions. The oxytocin was given intravenously as a diluted solution. The starting dose was 5 mU / min. It was then increased to 40 mU / min every 20 minutes. This study population was assigned into two groups: successful IoL group and failed IoL group. Induction of labor was considered successful if the duration of the latent phase was <720 min [12] and if the cervical dilatation was 4 cm at the end of the latent phase. [13]Data on the socio-demographic and obstetric characteristics (gestational age, pre- and post-induction Bishop scores) of the participants, CL, UCA and newborn were analyzed. The primary outcome was to determine the degree of UCA, and CL in patients with successful or unsuccessful induction of labor.

Statistical analysis

The data were analyzed using the IBM SPSS V23. Kolmogorov Smirnov test was used to find out whether the variables were distributed normally. The Chi-square test, the two independent samples t-test, Mann-Whitney U test, the paired sample t test, ROC analysis was used for data. p values <0.05 were considered statistically significant

RESULTS

Our study population was studied in two groups: group 1 (with normal latent phase duration: ≤720 minutes) and group 2 (with extended latent phase duration :>720 minutes). There were no statistically differences between the groups in terms of mean age, height averages, BMI, educational status, distribution of income status, baby's weight, baby's height, infant head circumference, and gestational age (p>0.050) (Table 1). However, there were statistically significant differences between the two groups in terms of mean values for the CL, UCA, and pre-induction Bishop score (p<0.001).

Table 1. Comparison of the demographic characteristics and quantitative variables according to the duration of the latent phase

	Group 1 ≤720min (n=200)	**Group 2 >720min (n=60)**	**Total (n=260)**	**p**
Age (year) Mean ± SS Mean. (Min– Max.)	 31.69 ± 5.4 32 (23 - 41)	 32.63 ± 5.74 34 (23 - 41)	 31.9 ± 5.49 32 (23 - 41)	 0.241*
Height(cm) Mean ± SS Mean. (Min– Max.)	 162.05 ± 4.79 160 (152 - 175)	 162.55 ± 5.05 162 (155 - 172)	 162.16 ± 4.84 160 (152 - 175)	 0.480*
Weight (kg) Mean ± SS Mean. (Min– Max.)	 76.82 ± 10.12 75.5 (65 - 105)	 76.93 ± 10.82 75 (65 - 105)	 76.84 ± 10.27 75 (65 - 105)	 0.938*
BMI(bodymassındex) Mean ± SS Mean. (Min– Max.)	29.25 ± 3.64 28.34 (23.53-41.02)	29.14 ± 4.06 27.59 (23.53-41.02)	29.22 ± 3.73 28.04 (23.53-41.02)	 0.834*
Education status Not literate Primary school High school *Unıversity	n % 4 (2) 61 (30.5) 96 (48) 39 (19.5)	n % (0) 21 (35) 28 (46.7) 11 (18.3)	n % 4 (1.5) 82 (31.5) 124 (47.7) 50 (19.2)	 0.672**

Income status	n %	n %	n %	0.06**
Revenue lower than expense	29 (14.5)	2 (3.3)	31 (11.9)	
Income and expense	140 (70)	47 (78.3)	187 (71.9)	
Income more than expense	31 (15.5)	11 (18.3)	42 (16.2)	
Baby birth Weight(gram)				0.799***
Mean ± SS	3322.15 ± 538.94	3366.5 ± 317.41	3332.38 ± 496.46	
Mean. (Min– Max.)	3355 (295 - 4500)	3400 (2750 - 4000)	3400 (295 - 4500)	
Baby birth Height (cm)				0.473*
Mean ± SS	49.4 ± 1.16	49.52 ± 1.13	49.42 ± 1.15	
Mean. (Min– Max.)	49 (48 - 53)	50 (48 - 52)	49 (48 - 53)	
Infant head circumferernce (cm)	3			0.161***
Mean ± SS	4.48 ± 0.5	34.58 ± 0.5	34.5 ± 0.5	
Mean. (Min– Max.)	34 (34 - 35)	35 (34 - 35)	35 (34 - 35)	
Gestational age (days)				1.000*
Mean ± SS	284.2 ± 3.58	284.2 ± 3.6	284.2 ± 3.58	
Mean. (Min– Max.)	283 (280 - 294)	283 (280 - 294)	283 (280 - 294)	
Cervical length				
Mean ± SS	27.85 ± 3.5	31.73 ± 2.71	28,75 ± 3.71	**<0.001***
Mean. (Min– Max.)	28 (20 - 38)	30 (26 - 38)	30 (20 - 38)	
Uterocervical angle				
Mean ± SS	102.17 ± 4.26	494.25 ± 7.14	100.34 ± 6.06	**<0.001***
Mean. (Min– Max.)	102 (92 - 112)	96 (75 - 110)	100 (75 - 112)	
Duration of latent phase (min)				**<0.001***
Mean ± SS	412 ± 138.5	1174 ± 297.04	587.85 ± 371.9	
Mean. (Min– Max.)	400 (150 - 700)	1200 (750 - 1600)	450 (150 - 1600)	
Before induction Bishop score				**<0.001***
Mean ± SS	3,16 ± 0,5	2,2 ± 0,4	2,93 ± 0,63	
Mean. (Min– Max.)	3 (2 - 4)	2 (2 - 3)	3 (2 - 4)	
After induction Bishop score				0.962*
Mean ± SS	5.33 ± 0.47	5.33 ± 0.48	5.33 ± 0.47	
Mean. (Min– Max.)	5 (5 - 6)	5 (5 - 6)	5 (5 - 6)	

*t: independent samples T-Test, ** χ^2: Chi-square test statistics, ***U: Mann-Whitney U test statics

Both anterior UCA (AUC= 0.835, p<.001) and the CL (AUC=0.801 (p<0.001).) predicted prolonged latent phase (Figures 1 and 2). When the cutoff point was 98.5 for the uterocervical angle, the sensitivity and the specificity rates were 75% was 73.5% respectively. When the cutoff point was 29.5 for the cervical length, the sensitivity and the specificity rates were 91.7% and 57% respectively.

The participants were assigned into two subgroups according to these cutoff points. Some demographic and clinical characteristics of the groups with and without high degrees of UCA are given in table 2. Given cutoff points for the UCA, statistically differences were determined between the groups in terms of the mean head circumference values of the babies, cervical length, pre-induction Bishop score, duration of the latent phase and normal birth rates. However, there were no statistically significant differences between the distributions of the other variables according to the cutoff points of the cervical length (p>0.050).

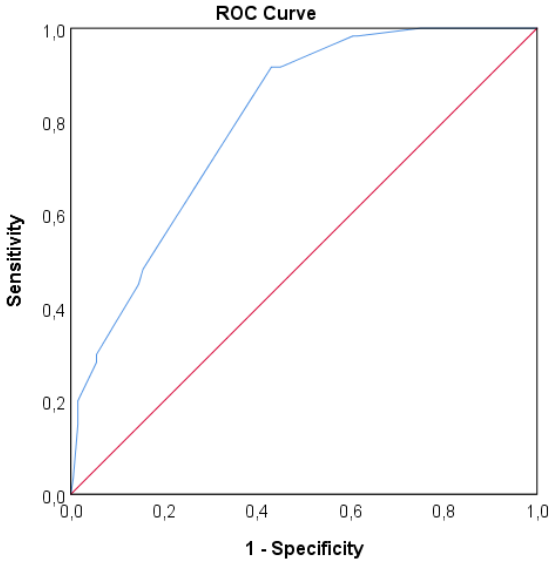

Figure 1. ROC curve for the cervical length when the duration of the latent phase was ≤720 minutes

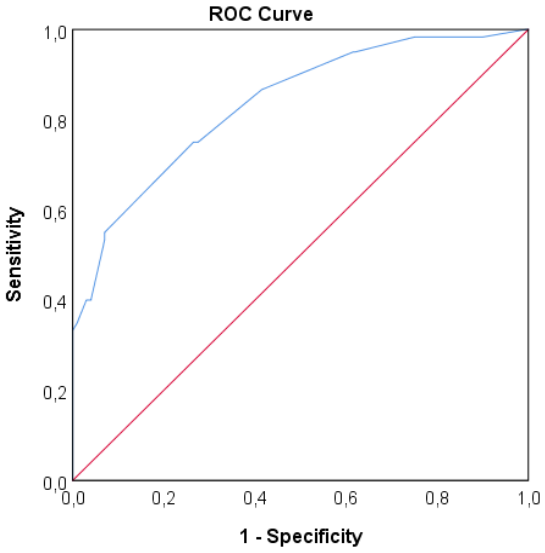

Figure 2. ROC curve for the Uterocervical angle when the duration of the latent phase was ≤720 minutes

Table 2. Comparison of the variables according to the cutoff point for the uterocervical angle

Variable	UCA>98,5 (n=162)	UCA <98,5 (n=98)	Total	p
Age (year) Mean ± SS Mean. (Min– Max.)	 31.98 ± 5.27 32 (23 - 41)	 31.79 ± 5.86 32 (23 - 41)	 31.9 ± 5.49 32 (23 - 41)	0.793*
Height(cm) Mean ± SS Mean. (Min– Max.)	 161.77 ± 4.77 160 (152 - 175)	 162.81 ± 4.91 163 (152 - 175)	 162.16 ± 4.84 160 (152 - 175)	0.095*
Weight (kg) Mean ± SS Mean. (Min– Max.)	 76.92 ± 10.57 75.5 (65 - 105)	 76.71 ± 9.8 75 (65 - 105)	 76.84 ± 10.27 75 (65 - 105)	0.876*
BMI(bodymassındex) Mean ± SS Mean. (Min– Max.)	29.38 ± 3.75 28.4(23.53– 41.02)	 28.97 ± 3.7 27,55 (23.5- 41.02)	29.2 ± 3.73 28,04 (23.53 41.02)	0.386*
Baby birth Weight(gram) Mean ± SS Mean. (Min– Max.)	 3300.59 ± 514.71 3400 (2950 -4500)	 3384.95 ± 462.49 3400 (2950 - 4500)	 3332.38 ± 496.46 3400 (2950 - 4500)	0,187*
Baby birth Height (cm) Mean ± SS Mean. (Min– Max.)	 49.35 ± 1.13 49 (48 - 53)	 49.55 ± 1.18 50 (48 - 53)	 49.42 ± 1.15 49 (48 - 53)	0.163*
Infant head circumferernce (cm) Mean ± SS Mean. (Min– Max.)	 34.44 ± 0.5 34 (34 - 35)	 34.6 ± 0.49 35 (34 - 35)	 34.5 ± 0.5 35 (34 - 35)	**0.014***
Gestational age (days) Mean ± SS	 284.4 ± 3.68	 283.88 ± 3.4	 284.2 ± 3.58	0.276**

Mean. (Min– Max.)	283 (280 - 294)	283 (280 - 294)	283 (280 - 294)	
Cervical length Mean ± SS Mean. (Min– Max.)	 27.17 ± 3.24 28 (20 - 36)	 31.36 ± 2.89 30 (24 - 38)	 28.75 ± 3.71 30 (20 - 38)	**<0.001***
Uterocervical angle Mean ± SS Mean. (Min– Max.)	 103.78 ± 3.35 102 (99 - 112)	 94.64 ± 5.18 98 (75 - 98)	 100.34 ± 6.06 100 (75 - 112)	**<0.001****
Duration of latent phase (min) Mean ± SS Mean. (Min– Max.)	 486.11 ± 277.51 400 (150 - 1600)	 756.02 ± 442.28 600 (200 - 1600)	 587.85 ± 371.9 450 (150 - 1600)	**<0.001***
Duration of active phase (min) Mean ± SS Mean. (Min– Max.)	 4.63 ± 0.93 4 (3 - 7)	 4.68 ± 0.92 5 (3 - 7)	 4.65 ± 0.92 4 (3 - 7)	0.754*
Induction time between birth Mean ± SS Mean. (Min– Max.)	 15.52 ± 2.58 15 (11 - 20)	 15.32 ± 2.68 15 (10 - 20)	 15.47 ± 2.6 15 (10 - 20)	0.639*
before induction Bishop score Mean ± SS Mean. (Min– Max.)	3.04 ± 0.53 3 (2 - 4)	2.77 ± 0.73 3 (2 - 4)	2.93 ± 0.63 3 (2 - 4)	**0.002***
After induction Bishop score Mean ± SS Mean. (Min– Max.)	5.34 ± 0.48 5 (5 - 6)	5.32 ± 0.47 5 (5 - 6)	5.33 ± 0.47 5 (5 - 6)	0.702*
Normal Delivery Yes n (%)	147 (90.7)	53 (54.1)	200 (76.9)	**<0.001*****
Normal Delivery No n (%)	15 (9.3)	45 (45.9)	60 (23.1)	

*t: independent samples T-Test, **U: Mann-Whitney U test statics, *** χ^2: Chi-square test statistics

The participating pregnant women were assigned to another two subgroups in terms of their cervical lengths: women with and without a short cervical length. Given cutoff points for the cervical length statistically significant differences were determined between the two groups in terms of the mean head circumference values of the babies, cervical length, uterocervical angle, pre-induction Bishop score, duration of the latent phase and normal birth rates. However, there were no statistically significant differences between the distributions of the other variables according to the cutoff points of the cervical length (p>0.050). (Table 3.)

Table 3. Comparison of the variables according to the cutoff point for the cervical length

Variable	CL<29.5mm (n=119)	CL>29.5mm (n=141)	Total	p
Age (year) Mean ± SS Mean. (Min– Max.)	 31.87 ± 5.32 32 (23 - 41)	 31.94 ± 5.64 33 (23 - 41)	 31.9 ± 5.49 32 (23 - 41)	0.918*
Height(cm) Mean ± SS Mean. (Min– Max.)	 161.95 ± 4.72 160 (152 - 175)	 162.34 ± 4.96 162 (152 - 175)	 162.16 ± 4.84 160 (152 - 175)	0.518*
Weight (kg) Mean ± SS Mean. (Min– Max.)	 77,76 ± 11,07 77 (65 - 105)	 76,06 ± 9,51 75 (65 - 105)	 76,84 ± 10,27 75 (65 - 105)	0,184*
BMI(bodymassındex) Mean ± SS	29.65 ± 4.04 28.4 (23.53- 41.02)	28.86 ± 3.42 27.55 (23.53-41.02)	29.22 ± 3.73 28.04 (23.53-41.02)	0.091*

Mean. (Min– Max.)				
Baby birth Weight(gram) Mean ± SS Mean. (Min– Max.)	3328.32 ± 510.04 3400 (295 -4500)	3335.82 ± 486.5 3400 (295 - 4500)	3332.38 ± 496.46 3400 (295 – 4500)	0.898**
Baby birth Height (cm) Mean ± SS Mean. (Min– Max.)	49.34 ± 1.19 49 (48 - 53)	49.49 ± 1.11 50 (48 - 53)	49.42 ± 1.15 49 (48 - 53)	0.219**
Infant head circumferernce (cm) Mean ± SS Mean. (Min– Max.)	34.44 ± 0.5 34 (34 - 35)	34.56 ± 0.5 35 (34 - 35)	34.5 ± 0.5 35 (34 - 35)	**0.048***
Gestational age (days) Mean ± SS Mean. (Min– Max.)	284.21 ± 3.6 283 (280 - 294)	284.19 ± 3.58 283 (280 - 294)	284.2 ± 3.58 283 (280 - 294)	0.967*
Cervical length Mean ± SS Mean. (Min– Max.)	25.53 ± 2.4 26 (20 - 29)	31.46 ± 2.1 30 (30 - 38)	28.75 ± 3.71 30 (20 - 38)	**<0.001****
Uterocervical angle Mean ± SS Mean. (Min– Max.)	104.19 ± 3.85 104 (96 - 112)	97.09 ± 5.67 98 (75 - 110)	100.34 ± 6.06 100 (75 - 112)	**<0.001***
Duration of latent phase (min) Mean ± SS Mean. (Min– Max.)	449.92 ± 198.91 400 (150 - 1450)	704.26 ± 438.98 500 (150 - 1600)	587.85 ± 371.9 450 (150 - 1600)	**<0.001***
Duration of active phase (min) Mean ± SS Mean. (Min– Max.)	4.68 ± 0.93 4 (3 - 7)	4.59 ± 0.91 4 (3 - 7)	4.64 ± 0.92 4 (3 - 7)	0.491*
Induction time between birth Mean ± SS Mean. (Min– Max.)	15.21 ± 2.32 15 (10 - 20)	15.64 ± 2.53 15 (12 - 20)	15.47 ± 2.6 15 (10 - 20)	0.411*
before induction Bishop score Mean ± SS Mean. (Min– Max.)	3.08 ± 0.5 3 (2 - 4)	2.81 ± 0.7 3 (2 - 4)	2.93 ± 0.63 3 (2 - 4)	**<0.001***
After induction Bishop score Mean ± SS Mean. (Min– Max.)	5.29 ± 0.46 5 (5 - 6)	5.36 ± 0.48 5 (5 - 6)	5.33 ± 0.47 5 (5 - 6)	0.248*
Normal Delivery Yes n (%)	114 (95.8%)	86 (61%)	200 (76.9%)	**<0.001*****
Normal Delivery No n (%)	5 (4.2%)	55 (39%)	60 (23.1%)	

*t: independent samples T-Test, **U: Mann-Whitney U test statics; *** χ^2: Chi-square test statistics

DISCUSSION

This study detected that the UCA and CL values had a predictive value in predicting successful induction of labor and normal birth rates.

The level of cervical ripening prior to IoL is the most important factor for a successful labor. Previous studies have shown a close relationship between the features of the uterine cervix and the onset of spontaneous labor. [14]

The cervix is supported by the pelvic ligaments and is made up of collagen fibers. The cervix is exposed to changes under pressure created by the surrounding pelvic organs, and growing uterus or fetus. Therefore, the uterocervical angle is important for the correct progression of labor. Ultrasound is an important for measuring a large number of obstetric and ultrasonographic parameters.[15,16,17]

Previous studies have emphasized that cervical length is an important indicator in normal delivery and successful induction of labor in term pregnancies.[18,19] In patients whose cutoff value of the cervical length is <27mm, high sensitivity and specificity were detected for the success of IoL[10,16,20] In this study, when the cutoff value for the cervical length was 29.5 in late and post-term pregnant women, the area under the curve (AUC) was 0.801 (p<0.001). When the cutoff value was 29.5, the sensitivity and specificity levels to predict the success of IOL were 91.7% and 57% respectively. Similarly, in studies in which the probability of normal delivery and cesarean delivery was assessed in late term pregnant women (week 41), maternal factors such as nulliparity, advanced maternal age and obesity and ultrasonographic cervical length were evaluated, and the cervical length was found to be effective in predicting normal birth.[21,22] Strobel et al. investigated the success of the induction of labor in prolonged pregnancies and found that the Bishop score and ultrasonographic cervical length were effective in determining the mode of delivery and the time to delivery.[19]

In recent years, the anterior UCA has come to the fore as a new ultrasound marker in the determine of premature delivery.[8,23] A wide UCA creates a bigger linear protrusion for the uterine content and causes the fetal head to exert more pressure on the cervix. In a narrow UCA, the uterus exerts less force on the cervix and delays the discharge of uterine contents. Dziadosz et al. compared the predictive performance of UCA and CL in guessing preterm deliveries and found that UCA was more effective.[8] In another study, cervical length and utero-cervical angle were evaluated to distinguish between real and pseudo labors and it was found that in the "real birth" group, the cervical length was shorter and the uterocervical angle was wider. The optimal threshold value for the UCA was found to be 123 (RR 6.7, sensitivity 50%, specificity 83%, PPV 10%, and NPV 96%).[24] In addition, the UCA parameter was found valuable in predicting successful second trimester terminations, and in pregnant women with a wider angle, a higher rate of pregnancy termination was determined.[25] In this study the cut-off value for the uterocervical angle was 98.5 degree. We think that this difference between the cut-off values is caused by the pressure of the baby growing in the last trimester on the cervix uterus.

There are studies showing that cervical length, posterior cervical angle, and anterior uterocervical angle evaluations are better than traditional Bishop scores in predicting the successful induction of labor in term nulliparous women as they are in second trimester terminations and preterm deliveries.[10,11,16,26]

In their study conducted to evaluate 150 nulliparous term pregnant women, Dağdeviren et al. determined that the median UCA was wider in patients who gave birth vaginally after a successful induction of labor than was that in those who gave birth by cesarean section. (The UCA was 107.97 ± 19.61 in the successful induction group and 104.25 ± 18.37 in the failed group). They also detected a negative correlation between CL and UCA before induction in the participants who gave birth vaginally after successful induction (rho = 0.21, p=0.03) .[11] In this study, the mean UCA value was 102.17 ± 4.26 in the successful induction of labor group and 94.25 ± 7.141 in the failed group. In their study conducted to evaluate 109 nulliparous term pregnant women, Eser et al. detected that both anterior utero-cervical angle (AUCA=0.802, p<.001) and cervical length (AUCA = 0.679, p<.05) were good determinants in predicting the success of induction of labor. They achieved the optimal cutoff value when the anterior utero-cervical angle was 97 degrees (sensitivity: 64%, specificity: 91%).[10] In this study in which late term and post-term 260 nulliparous pregnant women were evaluated, the rates of normal births and success of induction of labor were lower. When the cut-off value for the uterocervical angle was 98.5, the area under the curve (AUC) was 0.835. This value obtained is statistically significant (p<0.001). When the cut-off value was 98.5, the sensitivity and specificity were 75% and 73.5% respectively.

To our current knowledge, this study is the first study in which the role of UCA and CL measured in prenatal period in predicting the success of IoL in late term and post-term pregnancies. The primary limitation of our study is that the CL and the UCA were measured before the uterine contractions occurred. However, the CL and UCA are variable anatomical structures that can change with uterine contractions. Unfortunately, due to the functioning

of the hospital, we were not able to reevaluate the UCA and CL after the onset of the active phase of labor. The second limitation was that it was designed as a retrospective study. In retrospective studies, the data obtained from the heterogeneous data sources is limited; therefore, it is recommended that prospective studies with large populations should conducted.

In conclusıon this study demonstrated that both the UCA and CL measurements had a significant predictive value in the prediction of successful induction of labor and normal birth rates in late term and post-term nulliparous pregnant women.

Yazar Katkıları: Çalışma konsepti/Tasarımı: DKG; Veri toplama: DKG; Veri analizi ve yorumlama: DKG; Yazı taslağı: DKG; İçeriğin eleştirel incelenmesi: DKG; Son onay ve sorumluluk: DKG; Teknik ve malzeme desteği: DKG; Süpervizyon: DKG; Fon sağlama (mevcut ise): yok.
Etik Onay: Bu çalışma için Medipol Üniversitesi Tıp Fakültesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu'ndan etik onay alınmıştır. (16.04.2020 tarihi ve 10840098-604.01.01-E.14177 numarası ile).
Hakem Değerlendirmesi: Dış bağımsız.
Çıkar Çatışması: Yazarlar çıkar çatışması beyan etmemişlerdir.
Finansal Destek: Yazarlar finansal destek beyan etmemişlerdir.
Author Contributions: Concept/Design : DKG; Data acquisition: DKG; Data analysis and interpretation: DKG; Drafting manuscript: DKG; Critical revision of manuscript: DKG; Final approval and accountability: DKG; Technical or material support: DKG; Supervision: DKG; Securing funding (if available): n/a.
Ethical Approval: Ethical approval was obtained from Medipol University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee for this study. (With the date 16.04.2020 and the number 10840098-604.01.01-E.14177).
Peer-review: Externally peer-reviewed.
Conflict of Interest: Authors declared no conflict of interest.
Financial Disclosure: Authors declared no financial support

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