The Role of the Bishop Score For Successful Labor Induction

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Abstract

Objective: To demonstrate the role of Bishop Scoring System in the prediction of a successfully induction for vaginal delivery.

Methods: 799 pregnant women were undergone for birth induction in our hospital between December 2002 – January 2005. All patients were investigated for detailed obstetric history and obstetric ultrasonography and gynaecologic examination for Bishop score was performed. Delivery induction was performed with either Misoprostol (Prostaglandin E1 – PGE1, 25 mcg or 50 mcg) vaginally or 1% oxytocin infusion. For the statistic analyses of Bishop score and other parameters, Logistics Regression Analysis and Receiver Operating Characteristic (ROC) have been used. Statistically significance was accepted as $p<0.05$.

Results: 34.9% (n=275) of our patients delivered abdominally (sectio cesarean) and 65.1% (n=520) delivered vaginally. Bishop Score >4, cervical dilatation >0 cm were accepted as the cut off values for delivery. For a successful vaginal delivery Bishop Score ($p<0.05$), cervical dilatation ($p<0.05$), cervical consistency ($p=0.020$) were found statistical significant. The other parameters of Bishop Scores were not statistically significant.

Conclusion: Multiple regression analysis proves that multiparity is the most powerful factor for a successful vaginal delivery.

Keywords: Bishop score, birth induction, successful vaginal birth.

Bishop skorunun başarılı doğum indüksiyonunun öngörülmesindeki değeri

Amaç: Bishop skorlama sisteminin başarılı vaginal doğum indüksiyonunu öngörmedeki değerini araştırmaktır.

Yöntem: Aralık 2002-Ocak 2005 tarihleri arasında tıbbi nedenlerle doğum indüksiyonu yapılan 799 gebe çalışma kapsamına alındı. Tüm gebelerden ayrıntılı anamnez alındı, rutin ultrasonografileri yapıldı ve vajinal muayene ile Bishop skorları saptandı. Doğum indüksiyonu için Misoprostol (Prostaglandin E1-PGE1)'ün 25 ve 50 mcg'lık intravajinal dozları ve %1 Oksitosin infüzyonu kullanıldı. Çalışma verileri değerlendirilirken Bishop skoru ve diğer parametrelerin öngörüsünün saptanması için Lojistik Regresyon analizleri ve Receiver Operating Characteristics (ROC) eğrileri kullanıldı.İstatistiksel anlamlılık sınırı $p<0.05$ olarak kabul edildi.

Bulgular: Çalışma grubumuzdaki olguların %34.9'unun (n=279) abdominal, %65.1'inin (n=520) vaginal yoldan doğumu gerçekleştirdi. Bishop skoru için >4, servikal açıklık için >0 cm olması, doğum şekli öngörüsünde eşik değer olarak olarak alındı. Yaptığımız çalışmada Bishop skoru ($p<0.05$), servikal açıklık ($p<0.05$) ve servikal kıvam ($p=0.02$) başarılı vajinal doğumun öngörüsü için istatistiksel olarak anlamlı bulundu. Bishop skorunun diğer parametreleri ile başarılı vajinal doğum arasında anlamlı ilişki saptanmadı.

Sonuç: Yaptığımız çoklu regresyon analizleri vajinal doğumun en güçlü belirleyicisinin multiparite ($p=0.000$) olduğunu göstermiştir.

Anahtar Sözcükler: Bishop skoru, doğum indüksiyonu, başarılı vajinal doğum.

Introduction

Stimulation of uterus contractions by any mechanical process or by means of pharmacological agents without waiting for spontaneous delivery activity is called birth induction. For a succesful vaginal birth, cervix should soften, be obliterated and opened. When the cervix is not suitable, it is generally difficult to stimulate the delivery and this takes a long time,and the rate of interfered birth and cesarean section increas-

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es. This increases the mortality and morbidity for mother and infant. Standard birth stimulation method is amniotomy and intravenous oxytocin infusion. Many methods have been tried for stimulation of delivery activity and shortening the delivery time. Today, use of misoprostol (PGE1) and dinoprostone (PGE2) in cervical maturation and the stimulation of delivery has come on the agenda. Some conditions related to cervix and fetal head should be appropriate for a succesful birth induction. For this reason, some scoring systems have been put forth. The most widely used of them is Bishop scoring system. In this study, the role of Bishop scoring system in the prediction of a succesful vaginal delivery is evaluated.

Methods

799 pregnant women were taken in the study for whom birth induction was planned for medical reasons in Bakırköy Maternity Hospital Gynaecological and Pediatric Diseases Training Hospital Perinatology Service between December 2002–January 2005. All pregnant women were evaluated in terms of age, number of pregnancy and birth, pregnancy week, background and family history. Alive single pregnancies that were at and above 28 weeks and that had life expectancy and head presentation were evaluated within the scope of the study. The pregnancies that were detected to have cesarean section or uterus operation history, dead fetus, more than 4000 gr approximate fetus weight, head-pelvis discord, presentation anomaly were not included in the study. The cases that were determined to have risk factors (time prescription, oligohydramnios, hypertensive pregnancy, diabetes, intrauterine growth retardation, early membrane rupture, fetal anomaly that accords with life and the birth of which is planned in elective conditions) were included in the induction protocol. Detailed medical histories of all pregnant women who were included in the study were taken, rutin ultrasonographies were completed and Bishop scores were determined by vaginal examination. Vaginal examination was made at lithotomy position on the gynaecological Table. Cervical aperture (cm), obliteration (%), consistency (hard,medium, soft), position (retropose, middle, centralized), arriving part (-3,+3) parameters were evaluated and Bishop score was calculated out of 10. Cervix changes were evaluated beginning from the start of induction at 6-hour intervals and when necessary by vaginal examination. 2 different induction protocols were applied to the cases taken into the study upon the approvals of patients and Ethical Committee. 1st Protocol:It was applied to the pregnant women who entertained risk factor between December 2002-January 2004.In this protocol, 200 mg-misoprostol tablet was equally divided and 25 mcg-intravaginal misoprostol (PGE1) and additional method when necessary (intravaginal 50 mcg-misoprostol (PGE1), amniotomy, %1-oxytocin infusion) was applied. 2nd Protocol:Between January 2004-January 2005, intravaginal doses of Prostaglandin E1 (PGE1)-Misoprostol, 25 mcg on odd days and 50mcg on even days,and 1% Oxytocin infusion (5 Ü oxytocin into 500 cc 5% dextrose solution) was used. The same protocol was applied in the following days when the delivery was not realized in 24 hours by the protocol used. PGE1 was placed in posterior fornix at the beginning of induction and at 6-hour intervals in starting dose and by vaginal touch. Oxytocin starting dose was 1 ml/min, and it was used by increasing 1 ml/min every 30 minutes until active phase started. The induction of pregnant women who reached active phase by misoprostol was continued by oxytocin. In the cases that had 2cm and above cervical dilatation or that had more than 5 contractions in 20 minutes, misoprostol was not used. The cases for which induction was started were observerd for fetal heart rate and uterus contractions every 2 hours,and by vaginal examination at least every 6 hours and when necessary. The cases that came in active phase (>4cm) were observed in

delivery room. Delivery date, hour, cesarean section reasons, infant weights, induction-delivery intervals (time) of the ended deliveries were recorded. In the induction protocol applications made at two different time, objective criteria were considered while evaluating the patients. SPSS (Statistical Package for Social Sceinces) for Windows 10.0 program was used for the statistics of the data. Logistic Regression analyses and Receiver Operating Characteristics (ROC) curves were used for determining the Bishop score and the prediction of other parameters while evaluating the study data. Statistical significance was accepted as $p<0.05$.

Table 1. Factors in Indication.

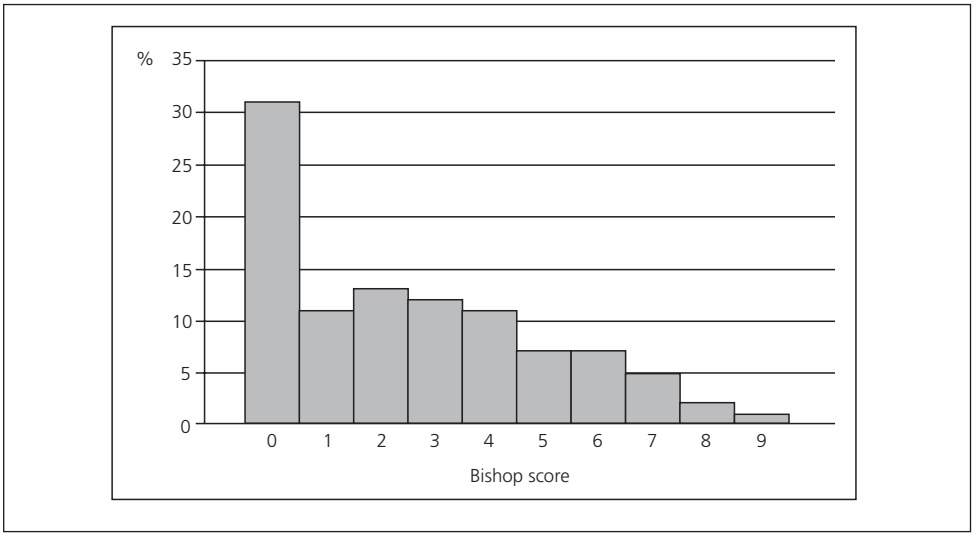
Indication of risk factor	n	%
Oligohydramnios	366	45.8
Postterm pregnancy	299	37.4
Severe pre-eclampsia	95	11.9
Mild preeclampsia	93	11.6
Chronic hypertension	30	3.8
Intrauterine growth retardation (IUGG)	30	3.8
Gestational hypertension	23	2.9
HELLP syndrome	19	2.4
Diabetes	16	2
Premature rupture of membranes (EMR)	16	2
Eclampsia	14	1.8
Fetal anomaly	11	1.4
Total (n)	1012	126.8

Results

When the cases taken in induction protocol were analysed for indications,the results in Table 1 were received. Total patient number's (n) being in excess is the result of some patients' having more than one risk factor for induction. Some patients carried more than one indication in terms of induction. This was caused not by expecting the formation of more than one risk factor for indication, but by patient's having more than one risk factor at that moment. Age,pregnancy week, approximate fetal weight (gr) and amniotic fluid index (cm) of the cases were evaluated in terms of the smallest, biggest and median values. Median age was evaluated as 26 (17-45), pregnancy week was evaluated as 40.3 (28-43), approximate fetal weight was evaluated as 3000 (800-4000), amniotic fluid index was evaluated as 7 (0-35). The smallest and the largest parity value was between 0 and 7 in terms of parity features. Parity of 64v of the cases was 0, the parity number was 1 in 18% of the cases, and it was 2 in %10, and in the remaining cases the number of parity was 3 and over 3 at the decreasing rates. Distribution of 799 cases whose Bishop score was determined by vaginal examination and induction protocol started and the delivery was realized is shown in table 2 in terms of Bishop score features. Bishop score distribution rates were shown as percent in Graphic 1. 34.9% of the patients (n=279) delivered abdominally (sectio cesarean).Among the ones who delivered abdominally, 73.5% (n=205) delivered with fetal distress indication, 10.8% (n=30) delivered with unsuccessful induction indication, 6.1% delivered with head-pelvis disorder indication, 6.8% (n=19) delivered with non-progressive labour indication, 0.7% (n=2) delivered

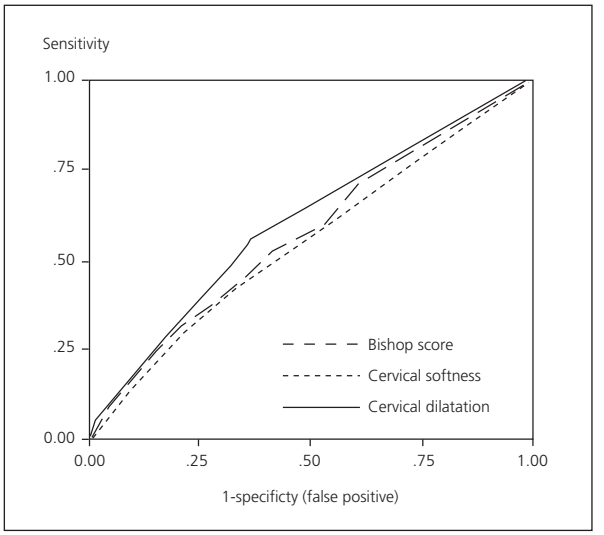
Table 2. Distribution of cases according to Biskop score.

Cervical dilatation	<1cm	423 (53%)
	1-2 cm	342 (43%)
	3-4 cm	34 (4%)
Cervical rippening	<%40	604 (76%)
	40-50%	152 (19%)
	60-80%	43 (5%)
Cervical softness	Hard	337 (42%)
	Medium	215 (27%)
	Soft	247 (31%)
Cervical position	Retropoze	395 (49%)
	Medium	217 (27%)
	Santralize	187 (23%)
Station of head	-5, -3	755 (94%)
	-2	34 (4%)
	-1, 0	10 (1%)

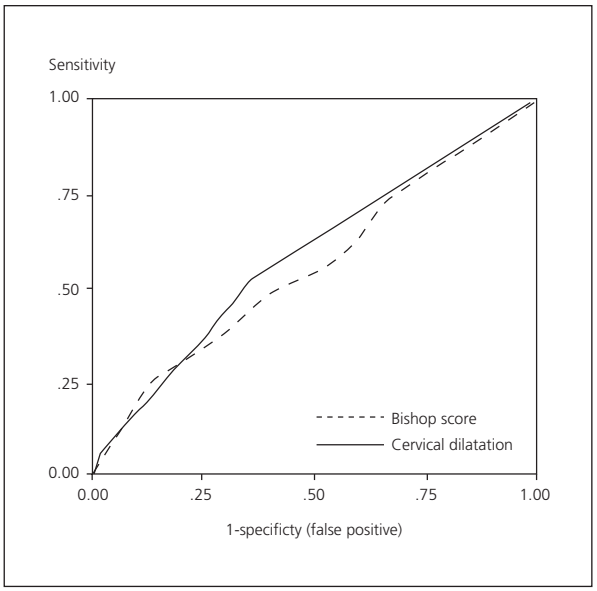


Graphic 1. Distribution of the cases according to modified Bishop score.

with large infant indication (the cases that received this indication after driven to labour after induction), 1.8% (n=5) delivered with bad maternal general state indication, 0.4% (n=1) delivered with cordon prolapsus indication. When the cases taken in induction were evaluated in terms of active phase success, 22.5% (n=180) of 799 patients could not pass to active phase,and 77.5% (n=619) successfully passed to active phase. 51.6% (n=412) of the patients could not delivered vaginally within the first 24 hours after the induction, 48.4% (n=387) delivered vaginally within the first 24 hours after the induction. 65.1% (n=520) delivered vaginally, 34.9% (n=279) delivered abdominally. 77.5% of the cases progressed to active phase with induction, 48.4% of the cases delivered vaginally within 24 hours. The effect of Bishop score and its components on a successful vaginal birth before the induction was searched.Successful vaginal delivery defines the vaginal deliveries within the first 24 hours after the induction. With ROC curves (Graphic 2), the precision of cervix aperture to predict a successful vaginal delivery within the first 24 hours after the induction was determined as 74%, and specifity was determined as 36% (If cervical aperture is >0). The precision of Bishop score to predict a successful vaginal delivery after the induction was determined as 56%, and specifity was determined as 62%. (If Bishop score is >4). According to this precision and specifity rates,it was found that cervical aperture ($p<0.05$), cervical consistence ($p<0.05$) and Bishop score ($p<0.05$) is statistically significant ($p<0.05$) in the prediction of delivery (Table 3). The effect of Bishop score and its components on a successful vaginal



Graphic 2. ROC curve for successful vaginal delivery.



Graphic 3. ROC curve for prediction of vaginal delivery.

birth before the induction was searched.With ROC curves (Graphic 3), the precision of cervical aperture to predict vaginal delivery was determined as 53%, and specifity was determined as 63%. (If cervical aperture is >0). The precision of Bishop score to predict vaginal delivery after the induction was determined as 25%, and specifity was determined as 85% (If Bishop score is >0). According to the obtained p values, cervical aperture and Bishop score were determined as the most significant parameters for vaginal delivery prediction (p<0.05). It was determined that other parameters in Bishop score were not statistically significant in the prediction of vaginal delivery (p>0.05) (Table 4). Logistic regression analyses were made to all parameters in terms of prediction of delivery type. p<0.05 values were accepted as significant, 0.1?p?0.05 values were accepted as significant at limit, p>0.1 values were accepted as non-significant. It was seen that the prediction of 88.1% of successful vaginal deliveries and 31.9% of the cesarean section deliveries is possible with multiple Logistic regression analyses that used all relevant parameters (oligohydramnios, time prescription, acute preeclampsia, mild preeclampsia,chronical hypertension, gestation hypertension, hellp syndrome, eclampsia, intra uterine growth retardation, diabetis, early membrane rupture, fetal anomaly that accords with life, nulliparity, multiparity, amniotic fluid amount, age of the mother) (Table 5). In the pattern created with multiple Logistic regression analysis; multiparity (previos vaginal delivery, p=0.000) was determined as the most signifi-

Table 3. ROC curve for Bishop score for vaginal delivery prediction.

	Odds ratio (%95 confidence interval)	p
Cervical dilatation	0.601 (.562 - .640)	.000
Cervical rippening	0.534 (.494 - .574)	.096
Cervical softness	0.547 (.508 - .587)	.020
Cervical position	0.529 (.489 - .569)	.154
Station of head	0.519 (.479 - .559)	.352
Bishop score	0.571 (.532 - .611)	.000

Table 4. ROC curve for Bishop score for vaginal delivery prediction.

	Odds ratio (%95 confidence interval)	p
Cervical dilatation	0.586 (.545 - .627)	.000
Cervical rippening	0.529 (.488 - .571)	.166
Cervical softness	0.537 (.496 - .579)	.079
Cervical position	0.525 (.484 - .567)	.231
Station of head	0.506 (.464 - .548)	.767
Bishop score	0.557 (.516 - .598)	.557

Table 5. Logistic regression for method of delivery.

Shape of the observed birth	Estimated delivery type		
	Type of delivery		Percent correct
	Cesarean n=151	vaginal delivery n=648	
Cesarean n=279	89	190	31.9
vaginal delivery n=520	62	458	88.1

cant parameter statistically in the prediction of successful vaginal delivery. Eclampsia risk factor (p=0.017) and Age (p=0.021) were determined as the other significant parameters. Again in multiple logistic regression analyses, cervical obliteration (p=0.05) and Cervical dilatation (p=0.84) that are the components of Bishop score were determined as the parameters that have weak prediction performance. It was seen that cervical consistence (p=0.160), cervical position (p=0.289), fetal head level (p=0.205), total Bishop score (p=0.570) and other parameters were in the background.

Discussion

When risk factors that threaten the life of mother and infant, birth induction is a frequently used birth application without waiting for the spontaneous birth contractions.An immature cervix is an important reason that constrains the induction success of the birth. Induction of birth activity is a long and hard process, and it is important as some negativities may develop for mother and fetus. It is important to predict the vaginal delivery chance of a pregnant woman at the beginning of induction. If the induction monitoring process that may be risky sometimes is mostly concluded with cesarean section, this process may be seen as a waste of time and an unnecessary risk. Therefore,various indicators have been developed in order to set apart the pregnant women who have high chance of vaginal delivery. One of the most studied parameters is Bishop score parameters. Maturing the cervix unnaturally and birth induction is among the most important steps of birth applications. The most widely used birth induction method is oxytocin intravenous infusion method. However, in the cases where the cervix is not maturated,this process has some negativities such as long induction period and high failure rate. Therefore, local effective pharmacological and physical substances have been developed. For this reason, hypertonic solutions (hypertonic saline, urea glucose solution), Rivanol solutions, balloon catheter, cervical expanders that swell by keeping water (laminerya, lamisel, dilopen), antiprogestins and relaxin have been used for years. Recently, however, progesterone antagonists and prostaglandins have been used for this reason. Local drugs that are mostly used today are prostaglandin preparations.[1,2] Unfortunately, there is not a single method suggested although various techniques or drugs have been developed in birth induction. The reason is that every method has its positive and negative factors. In oxytocin use, prolonged induction-birth interval and high failure rate is seen.[3,4] Only foley catheter's being placed affects the cervix mechanically, however, the contractions start late.[5,6] Prostaglandins were given systematically, however, recently they are used locally. Systemic absorption of prostaglandines cause uterus hypertonity, nausea and vomiting. In order to avoid these effects, protaglandins are used as intravaginal, intracervical, extraamniotic, pesser or supozituar gel.[7,8] The application of prostaglandines are not new for birth induction. Calder and Embray defined and used PGE2 first in 1973. The use of misoprostol was applied in 1992 by Morguver and its friends.[9] We used PGE1-Misoprostol in our study as 25 mg and 50 mg doses and intravaginally, and used Oxytocin in its 1% form and as intravenous infusion. Our aim is to evaluate the prediction performance of Bishop score and its parameters in a successful vaginal delivery, induction-birth interval before induction. Successful delivery means vaginal delivery realized within the first 24 hours after the induction. 62.5% (n=499) of our study group had never delivered before, 37.5% (n=300) delivered at least once. 34.9% (n=279) delivered abdominally (cesarean section), 65.1% (n=520) delivered vaginally. The reason of total cesarean section rate's being 5-10% higher than the lit-

erature may arise from perinatology service's being a reference center, some patients' having more than one risk factor at the same time,and pregnant woman population's not having their anatenatal care and controls exactly due to low socio-cultural characteristics. The most important reason of 73.5% (n=205) caserean section with fetal distress indication was thought to be dependent on heavy risk factors of the patients. The most important reason of 10.8% (n=30) caserean section with unsuccessful induction indication was thought to be dependent on non-progressive labour related to abnormal cervix. 22.5% (n=180) of patients could not pass to active phase, and 77.5% (n=619) successfully passed to active phase. 51.6% (n=412) of the patients could not delivered vaginally within the first 24 hours after the induction, 48.4% (n=387) delivered vaginally within the first 24 hours after the induction. 12.4% of cesarean sections were realized after passing to active phase. The most significant parameter in terms of predicting the delivery type (vaginal/cesarean section) was determined as cervical aperture, and it was seen that Bishop score was also significant. In the study that was conducted by Mark and his friends,[10] in 443 cases, it was found out that cervical aperture had a stronger prediction performance than Bishop score and its parameters before the induction, and it was proven that induction method did not affect the success of vaginal delivery. In the study that was conducted by Nancy and his friends,[11] in 365 cases (in nullipar and multipar pregnant women), it was found out that Bishop score is a weak clinic indicator in the prediction of successful vaginal delivery induction regardless of number of birth. In our study, Bishop score, servical aperture and servical consistence was found statistically significant in the prediction of successful vaginal delivery, and cervical aperture was determined as the most significant parameter (p=0,000). No significant relation was determined between other parameters of Bishop score and successful vaginal delivery. Threshold value was taken as greater than 4 for Bishop score and as greater than 0 for cervical aperture in the prediction of birth type. In the study conducted by Nicolaides and his friends,[12] in 2001 in 240 cases between 37-42 weeks in which they used Dinoprostone gel and oxytocin for induction, cervix length and Bishop score was compared. Cesarean section was found as 19.2%, while the rate of vaginal delivery within 24 hours was approximately 60%, 74.3% of vaginal deliveries within 24 hours was multipar, and induction-birth interval was significantly found shorter in multipars. Bishop score was found relevant to successful vaginal delivery and induction-birth interval. Cervix parameter was indicated to have a more powerful prediction performance in terms of these parameters. By using ROC curves,it was reported that 28 mm for cervix length and 3 for Bishop score can be used as threshold value in the prediction of successful birth. In our study, asignificant relation was found between Bishop score and induction-active phase interval, induction-birth interval. A significant relation was found between cervical aperture that is the component of Bishop score and induction-active phase interval, induction-birth interval. Cervical aperture was found as the most significant parameter (p=0,000). No significant relation was determined between other parameters of Bishop score and induction-active phase interval, induction-birth interval. Threshold value was taken as greater than 4 for Bishop score and as greater than 0 for cervical aperture in the prediction of birth type. In the successful study conducted by Paterson-Brown and his friends,[13] in 50 pregnant women, successful vaginal delivery and Bishop score was found clearly in relation, however, its prediction performance was insufficient. Besides, cervical length was shown not have relation with Bishop score and induction-birth interval. In the study conducted by Ellen and his friends,[14]

in 156 cases that were in 38th pregnancy week, it was shown that high Bishop score was in relation with successful vaginal delivery and induction-birth interval, however, cervical aperture did not have a good prediction performance for successful vaginal delivery. In our study,the precision of cervical aperture in the prediction of vaginal delivery was determined as 53%, and specifity was determined as 63%. The precision of Bishop scorer in the prediction of vaginal delivery after induction was determined as 25%, and specifity was determined as 85%. According to p value obtained, cervical aperture and Bishop score were determined as the most significant parameters for vaginal delivery prediction. It was determined that other parameters in Bishop score were not statistically significant in the prediction of vaginal delivery ($p>0.05$). In the study conducted by Gonen and his friends[15] in 86 cases, it was found out that cervical length and Bishop score had relation with successful induction and induction birth interval;in Logistic regression patterns, however, it was shown that only Bishop score and number of birth had significant relation with successful induction as independent variable. In the study conducted by Chandrs and his friends,[16] in 122 time prescription cases, parity, cervical dilatation,cervical obliteration, induction method and maternal weight were determined as independent predictors for successful vaginal delivery, however, it was reported that other parameters of Bishop score were not good predictors. In the study conducted by Ware and Raynor,[17] in 72 cases,it was found out that both cervical length and Bishop score had relation with successful vaginal delivery and induction-birth interval. In Logistic regression patterns made, however, it was reported that only cervical length and number of birth were parameters that had independent prediction performance. In the study conducted by Deborah and his friends,[18] in 1373 cases; it was shown that multiparity, cervical aperture before induction and pregnancy age were the factors that had independent prediction performance for successful vaginal delivery, and that Bishop score did not have a strong prediction performance in the logistic regression analysis where multiple parameters were used. In the study conducted by Reis and his friends,[19] in 134 cases close to term;it was shown that multiparity and Bishop score had independent prediction performance for successful vaginal delivery, however,transvaginal cervix length and fetal fibronectin were not significant.In the study conducted by Crane and his friends,[20] in 781 cases; logistic regression analysis where multiple parameters are used was used, and it was shown that multiparity, cervical aperture before induction, cervical obliteration, cervical position and pregnancy age were independent predictors for successful vaginal delivery, and that Bishop score did not have a good prediction performance. In our study, in the multiple Logistic regression pattern made, it was determined that the most significant parameter was multiparity in terms of successful induction. After multiparity, eclampsia risk factor and pregnancy age was found in relation with successful vaginal delivery as independent variable. It was considered that maternal negativities that accompany eclamptic pregnant women increased the cesarean section possibility. Eclampsia was found as a significant risk factor in terms of birth type prediction. The relation of cervical aperture and cervical obliteration with successful vaginal delivery was found weak, and no significant relation was determined for Bishop score and other parameters.

Conclucion

Delivery is realized as a result of the chain of events that induce or pressurize each other.In order to understand the birth mechanism in human completely and to comprehend each

step, more study should be made. Prostaglandins have important role in this complex mechanism. In order for the pregnancies that require induction for medical reasons to be concluded with successful vaginal delivery and healthy infants,medical parameters with high prediction performance are required. Together with many study in the literature, in our study,degree of cervical aperture is a stronger clinical indicator than Bishop score and other Bishop score parameters in the prediction of vaginal delivery within 24 hours. Besides,it was found out in our multiple regression analyses that the strongest determiner of vaginal delivery is multiparity. The studies show that stronger scor and parameters that can predict successful vaginal delivery are needed.These parameters should be easy to use,should not annoy the pregnant woman, and should be an objective method, and should not have personal differences.

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