Research Article

Transvaginal cervical length and Bishop score value in predicting successful labor induction with an emphasis on the parity

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ABSTRACT

This study was conducted to explore the value of transvaginal ultrasosnography of cervical length measurement, in addition to gestational age, maternal age, parity, Bishop's Score in predicting the method of delivery in pregnancies in which labor is induced with oxytocin at or beyond the 37th gestational week. A total of 148 pregnancies at 40 ± 3 weeks gestation were included. After labor was induced, 88 women delivered vaginally and 60 underwent cesarean section. These groups were compared with respect to possible predictive parameters of delivery out come. Mean prediction cervical length was 24.5±7.9 mm. 108 were primipara and 40 were multipara. The relationship between gestational age, age of women and parity with the model of delivery were evaluated. The first of the two variables were not significant. Primipara (n=57) and multi para (n=31) delivered by vaginally and they were undergone by cesarean 51.9 respectively, the rate of cesarean in the primipara was more than multipara (P=0.007). Sensitivity, specificity, positive, predictive value and negative predictive value of the length of cervix 71.6%, 45%, 65%, 51% and Bishop's score were 53.4%, 66.7%, 72%, 49.4% respectively. Analyses of the Roc curve for cervical length and Bishop's score indicated there is not only significant differences in predicting of model of delivery (P=0.81)In the study the only variable was parity that could predict the success of labor induction but not the age of pregnancy, the age of women, cervical length measurement and Bishop's score.

Key words: Bishop's score, Cervical length, Labor induction, Parity
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INTRODUCTION

In general, about 20 percent of pregnant women are requiring induction of labor to terminate pregnancy (1). Induction of labor usually associated with an increased risk of cesarean delivery, especially when the cervix is not ready for induction(2). Since 1964, Bishop score has been successfully used as the standard, is the current method to assess cervical ripening for induction of labor(3). Bishop's score based on dilation, effacement and position of the cervix is graded to predict the success of labor induction(4). However, Bishop's score is not an accurate method for the evaluation of the cervical status and also especially when the Bishop's score is low, decision-making authority for determining of the sort of pregnancy termination is difficult (5). A number of studies have reported that cervical length measured by transvaginal ultrasonography (TVS) compared with Bishop's score is better able to predict pregnancy termination(6), (7). Some studies also have claimed that TVS is less painful than digital assessment for Bishop score(8), (9). However, this finding has not been reported by all investigators(10). Instance, a recent meta-analysis concluded that TVS has not been observed to be reliable to Bishop's scoreand calls for further research (11).

Some emergent and acute situations such as severe preeclampsia, eclampsia, and thick meconium that may threaten the life of both mother and her fetus necessitate immediate termination of pregnancy. Therefore, the need for induction of labor has been abundant and numerous (12). Therefore a procedure that improves the Bishop score can diminish the risk of cesarean section and maybe the length of labor. So, a reliable and good comfortable tool of pre-induction evaluation than the Bishop's score or even associated with it would be a valuable method in the evaluation and guidance of women candidate for labor induction. On other hand it is seems that this method will be reduced from the amount of time patients and hospital costs and as well as unwelcome financial costs imposed on community health system and also many cases of non-delivery due to unfavorable cervical (13). The present study aimed to compare the efficiency of TVS and the Bishop scoring system to predict the types of pregnancy termination procedureswith an emphasis on the parity.

MATERIALS AND METHODS

Study design:
This is a prospective study that has been carried out through the period from June 2009 to April 2010 at the Fertility, Infertility and Perinatology Research Center in Ahvaz. Pre-induction cervical measurement was carried out in 148 pregnant women who came for delivery at the obstetrics and gynecology ward of Imam Khomeini teaching hospitals in Ahvaz. This study was targeted singleton pregnancy with live fetus, breech presentation, gestational age of 40±3 weeks, non-rupture of the chorioamniotic membrane, non-bleeding vagina, and no history of uterine surgery. The Ethics Committee of Ahvaz Jundishapur University of Medical Sciences approved this study and also all women filled and signed their informed consent form.

Transvaginal sonografy procedure (TVS):
The pregnant women underwent TVSin order to accurately measure cervix size. During this procedure the transvaginal probe was placed into the anterior fornix of the vagina about three cm proximal to the cervix to care to avoid exerting excessive pressure on the cervix which may cause cervical deformation of its location or structure. Then the inside of the cervix canal was observed with special attention to its shape and also obtained a sagittal sign for sonographic prediction of the cervix length with the echogenic endocervical mucosa imaged along the distance of the cervix canal. The length between the internal and external os was measured along the endocervical canal. An experienced co-worker, who was not aware of the TVS findings, evaluated vaginal to score the Bishop's score.

Induction of labor:
 Induction of labor was performed according to the approved protocol and also standard practice in this hospital. The Bishop's score index of 4 was chosen for this study.

Statistical analysis:
All analyses were carried out with the SPSS 15 and Epi info statistical software. All data are expressed as the mean ± SEM. The pregnant women were alienated by gravity into nulliparous and multiparous. Student t test and chi-square were used statistical. Receiver–operating characteristics (ROC) curves were employed to evaluate the capability of sonographic cervical distance, Bishop's score and cervical distance by vaginal inspection to predict pregnancy termination. For all other outcomes, a nominal p-value of $p<0.05$ was considered significant

RESULTS

Maternal demographic characteristics assessment:
A total of 148 pregnant women were randomized and available for investigation. The demographic characteristics are shown in Table 1. None of the women refused to participate in the study. The mean ages of all of the patients was 25.5 ± 4.4 years with a range of 16 to 36 years. The median duration of pregnancy was 40.1 ± 1.4 weeks with a variety of 37 to 42 weeks. The median length of the cervix of pregnant women was 24.5 ± 7.9 mm with a variety of 13.3 to 45.3 mm. From of 148 pregnant women who had indication of pregnancy termination, 108 (73%) were nulliparous and 40(27%) were multiparous pregnant women. Eighty eight (59.5%) patients were undergoing vaginal delivery and other cases (40.5%) were underwent cesarean section. The most common causes of cesarean section was lack of progress in labor (dystocia)(68.3%) and other causes were decolman (16.7%) and distress fetus (15%).
 In case of parity, from 108 nulliparous cases, 52.8% underwent vaginal birth and 47.2% were undergoing cesarean delivery. However, from 40 multiparous pregnant women, 77.5% had vaginal birth and 22.5% had cesarean birth. Therefore the relation between gravity and the types of pregnancy termination procedures was significant. Indeed,

the mean rate of cesarean in nulliparous pregnant women more pronounce than multiparous ones (P=0.007). The mean ages of vaginal and cesarean delivery subjects were 25.9 ± 4.5 and 25 ± 4.2 years, respectively.

Transvaginalsonography procedure (TVS) assessment:
Sonographic measurement of cervical length (CL) was successfully carried out in all 148 pregnancies. We recorded no complications or difficulties in the performance of the hysteroscopy (none of the women had abdominal pain and we had no problems in insertion the TVS probe into the cervical canal). The median cervical distance was 18 (range, 5–39) mm and 16 (range, 1–40) mm, in nulliparous and multiparous cases respectively (*P* <0.05).

Roc curve methodology, according to sonographically measured cervical length, Bishop's score and cervical length by vaginal examination were constructed for each predictor (Figures 1) and sonographic cervical length was found to be the best discriminator on the basis of area under the curve (areas 82%, 72% and 63%, respectively). Using the optimum cut-off of 20 mm a sensitivity of 82.4% and a specificity of 69.4 % were obtained for nulliparous pregnant women. Using the optimum cut-off of 30 mm a sensitivity of 77.8% and a specificity of 65.5% were obtained for multiparous pregnant women.

The percentage of those delivering according to parity and sonographic cervical length is shown in Figure 5. The percentage for nulliparous women with a cervical length of 20 mm was about 74.1% and for those with a cervix >20 mm it was about 10%. In fact, the median cervical distance of 20 could be predicted pregnancy termination correctly in 80 nulliparous cases. while the Bishop's score index was predicted pregnancy termination correctly in 58.8% of nulliparous cases and this was significantly showed that the sonographic cervical length index is more reliable in the nulliparous cases compared to Bishop's score index(P=0.016).

 The respective percentage for multiparous women with a cervical length of 30 mm was about 65.5% and for those with a cervix >30 mm it was about 10%. In fact, the median cervical distance of 30 could be predicted pregnancy termination correctly in 65.5% 0f multiparous cases. While the Bishop's score index was predicted pregnancy termination in 58.8% multiparous cases. It seems that the sonographic cervical length index is not pronounced confidence in the multiparous cases compared to Bishop's score index (P=0.6). Overall, Sonographically measured cervical length was observed to describe a superior proportion of the total variation compared to Bishop's score.

DISCUSSION

The present study showed that the best sonographic cervical length index in the nulliparous pregnant women is 20 mm and at this point the sensitivity and specificity were a bit more than 82 and 69 percent respectively that are compatible with previous reports (14), (15), (16),(17), (18), (19). Tan *et al*.,(20) also reported that the best sonographic cervical length index in the nulliparous women is of 20 mm. However, the sensitivity and especially specificity points (79% and 48% respectively) were different from observation of the current study. In addition, the present research declared that the distance cervix of 20 mm in the nulliparous pregnant cases in comparison with Bishop's score of 4 has better reliability and validity to predict the types of pregnancy termination procedures. We have also demonstrated that sonographically measured cervical length is better than the Bishop's score or cervical length (CL) by vaginal examination in predicting the outcome of induction.

The findings of the this study also is shown ,by using the optimum cut-off of 30 mm, a sensitivity of 82.4% and a specificity of 69.4 % were obtained for nulliparous pregnant women. Nevertheless, the current research declared that the optimum cut-off of 30 mm distance cervix in the nulliparous pregnant cases in comparison with Bishop's score of 4 is not more reliable to predict the types of pregnancy termination procedures. It seems thatthis outcome obtained due to restriction on the number of multiparous cases and therefore further research is necessary on this issue.

Contrary to the present study's findings, Beartris Bueno *et al*., (21), of course without determination of the sensitivity and specificity value, reported that the best sonographic cervical length index in the nulliparous and multiparous pregnant women are 16.5 and 27 mm respectively.

The current study's findings also showed that the rates of correct prediction for types of pregnancy termination procedures nulliparous (CL= 20 mm) and multiparous pregnant women (CL=30) were 82 and 79.4 percent respectively. While these rates in report of Beartris Bueno *et al*.,(21) for nulliparous (16.5) and multiparous

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cases (CL=27) were 91.6 and 100 percent. It seems that the main reason of the difference in the success or failure of induction of Beartris Bueno *et al.*,(22) is lowered of aforesaid index study than the current research.

Consequently, Gravity offered notable individual role, besides to pre-induction cervical distance, in the prediction of the result of labor (23), (24). TVS measurement of cervical distance can be reached effortlessly and with less anxiety to the pregnant women than a vaginal examination to score Bishop's score (25), (26), (27). Pre-induction CL provides a useful prediction of the likelihood of vaginal delivery within of pre-induction and of the induction-to-delivery interval (27), (28), (29).

CONCLUSION

The optimum cut-off of 20 mm distance cervix in the nulliparous pregnant cases is most reliable to predict the types of pregnancy termination procedures.

Acknowledgment

REFERENCES

[1] Bueno B, San-Frutos L, Salazar F, Pérez-Medina T, Engels V, Archilla B, et al. Variables that predict the success of labor induction. *Acta obstetricia et gynecologica Scandinavica.* **2005**;84(11):1093-7.
[2] Faltin-Traub EF, Boulvain M, Faltin DL, Extermann P, Irion O. Reliability of the Bishop score before labour induction at term. *European Journal of Obstetrics & Gynecology and Reproductive Biology.* **2004**;112(2):178-81.
[3] Hoffmann MK, Sciscione AC. Elective Induction With Cervical Ripening Increases the Risk of Cesarean Delivery in Multiparous Women. *Obstetrics & Gynecology.* **2003**;101(4):7S.
[4] Bartha J, Romero-Carmona R, Martínez-del-Fresno P, Comino-Delgado R. Bishop score and transvaginal ultrasound for preinduction cervical assessment: a randomized clinical trial. *Ultrasound in obstetrics & gynecology.* **2005**;25(2):155-9.
[5] Kenneth O, Cunningham FG, FNorman G. Williams Obstetrics & Gynecology. Mc Graw Hill; **2001**.
[6] Rozenberg P, Chevret S, Chastang C, Ville Y. Comparison of digital and ultrasonographic examination of the cervix in predicting time interval from induction to delivery in women with a low Bishop score. BJOG: An *International Journal of Obstetrics & Gynaecology.* **2005**;112(2):192-6.
[7] Laencina AMG, Sánchez FG, Gimenez JH, Martínez MS, Martínez JAV, Vizcaíno VM. Comparison of ultrasonographic cervical length and the Bishop score in predicting successful labor induction. *Acta obstetricia et gynecologica Scandinavica.* **2007**;86(7):799-804.
[8] Daskalakis G, Thomakos N, Hatziioannou L, Mesogitis S, Papantoniou N, Antsaklis A. Sonographic cervical length measurement before labor induction in term nulliparous women. *Fetal diagnosis and therapy.* **2006**;21(1):34-8.
[9] Callen PW. Ultrasonography in obstetrics and gynecology: Elsevier Health Sciences; **2011**.
[10] Yanik A, Gülümser Ç, Tosun M. Ultrasonographic measurement of cervical length in predicting mode of delivery after oxytocin induction. *Advances in therapy.* **2007**;24(4):748-56.
[11] Tan P, Vallikkannu N, Suguna S, Quek K, Hassan J. Transvaginal sonographic measurement of cervical length vs. Bishop score in labor induction at term: tolerability and prediction of Cesarean delivery. *Ultrasound in obstetrics & gynecology.* **2007**;29(5):568-73.
[12] Smith KtM, Hoffman MK, Sciscione A. Elective Induction of Labor in Nulliparous Women Increases the Risk of Cesarean Delivery. *Obstetrics & Gynecology.* **2003**;101(4):45S.
[13] Gómez-Laencina AM, García CP, Asensio LV, Ponce JAG, Martínez MS, Martínez-Vizcaíno V. Sonographic cervical length as a predictor of type of delivery after induced labor. *Archives of gynecology and obstetrics*. **2012**;285(6):1523-8.
[14] Jo YS, Jang DG, Kim N, Kim SJ, Lee G. Comparison of cervical parameters by three-dimensional ultrasound according to parity and previous delivery mode. *Int J Med Sci.* **2011**;8:673-8.
[15] Taylor BK. Sonographic assessment of cervical length and the risk of preterm birth. *Journal of Obstetric, Gynecologic, & Neonatal Nursing.* **2011**;40(5):617-31.
[16] Park K, Kim S, Lee S, Jeong E, Jung H, Oh K. Comparison between sonographic cervical length and Bishop score in preinduction cervical assessment: a randomized trial. *Ultrasound in Obstetrics & Gynecology.* **2011**;38(2):198-204.

[17] Greco E, Gupta R, Syngelaki A, Poon LC, Nicolaides KH. First-trimester screening for spontaneous preterm delivery with maternal characteristics and cervical length. *Fetal diagnosis and therapy.* **2012**;31(3):154-61.

[18] Bertossa P, Mikic AN, Stupar ZT, Milatovic S, Boulvain M, Irion O, et al. Validity of clinical and ultrasound variables to predict the risk of cesarean delivery after induction of labor. *Obstetrics & Gynecology.* **2012**;120(1):53-9.

[19] Grotegut CA, Dulitzki M, Gaughan JP, Achiron R, Schiff E, Geifman-Holtzman O. Transvaginal ultrasound of cervical length and its correlation to digital cervical examination, time to spontaneous labor and mode of delivery. *Archives of gynecology and obstetrics.* **2011**;284(4):855-9.

[20] Dilek TUK, Doruk A, Gozukara I, Durukan H, Dilek S. Effect of cervical length on second trimester pregnancy termination. *Journal of Obstetrics and Gynaecology Research.* **2011**;37(6):505-10.

[21] Torricelli M, Novembri R, Voltolini C, Conti N, Biliotti G, Piccolini E, et al. Biochemical and biophysical predictors of the response to the induction of labor in nulliparous postterm pregnancy. *American journal of obstetrics and gynecology.* **2011**;204(1):39. e1-. e6.

[22] Cheung CW, Leung TY, Sahota DS, Chan OK, Chan LW, Fung TY, et al. Outcome of induction of labour using maternal characteristics, ultrasound assessment and biochemical state of the cervix. *The Journal of Maternal-Fetal & Neonatal Medicine.* **2010**;23(12):1406-12.

[23] Verhoeven CJ, Oudenaarden A, Hermus MA, Porath MM, Oei SG, Mol BWJ. Validation of models that predict Cesarean section after induction of labor. *Ultrasound in Obstetrics & Gynecology.* **2009**;34(3):316-21.

[24] Tan P, Vallikkannu N, Suguna S, Quek K, Hassan J. Transvaginal sonography of cervical length and Bishop score as predictors of successful induction of term labor: the effect of parity. *Clinical and experimental obstetrics & gynecology.* **2008**;36(1):35-9.

[25] Chao A-S, Chao A, Hsieh PC-C. Ultrasound assessment of cervical length in pregnancy. T*aiwanese Journal of Obstetrics and Gynecology.* **2008**;47(3):291-5.

[26] Rao A, Celik E, Poggi S, Poon L, Nicolaides K. Cervical length and maternal factors in expectantly managed prolonged pregnancy: prediction of onset of labor and mode of delivery. *Ultrasound in Obstetrics & Gynecology.* **2008**;32(5):646-51.

[27] Meijer-Hoogeveen M, Van Holsbeke C, Van Der Tweel I, Stoutenbeek P, Visser G. Sonographic longitudinal cervical length measurements in nulliparous women at term: prediction of spontaneous onset of labor. *Ultrasound in Obstetrics & Gynecology.* **2008**;32(5):652-6.

[28] Keepanasseril A, Suri V, Bagga R, Aggarwal N. Pre-induction sonographic assessment of the cervix in the prediction of successful induction of labour in nulliparous women. *Australian and New Zealand Journal of Obstetrics and Gynaecology.* **2007**;47(5):389-93.

[29] Park KH. Transvaginal ultrasonographic cervical measurement in predicting failed labor induction and cesarean delivery for failure to progress in nulliparous women. *Journal of Korean medical science.* **2007**;22(4):722-7.