CORRELATION BETWEEN CERVICAL LENGTH WITH SUCCESSFUL LABOR INDUCTION

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Abstract

Objective : *To determine the correlation between cervical length on transvaginal ultrasound assessment with successful labor induction.*
Method : *This was an observational study with crosssectional approach to 39 consecutive women who undergoing induction of labor in the Department of Obstetrics and Gynecology, Prof. dr. R.D. Kandou Manado general hospital. Cervical length was measured by transvaginal ultrasound prior to induction of labor. Labor induction were success if vaginal delivery occured within 24 hours after induction of labor began.*
Results:*Induction of labor succeed in 34 subjects (87.18%) with a mean of cervical length 2,60 ± 0,43 cm and failed in 5 subjects (12.82%) with a mean of cervical length of 3,54 ± 0,77 cm (p = 0.006). The optimal cut off point for predicting the success of labor induction was 2,895 cm. Cervical length ≤ 2,895 cm had a sensitivity of 79,41% and a specificity of 80,00%, positive predictive value of 93,10%, negative predictive value of 36,63% andaccuracy of 79,49%.*
Conclusion: *There was a significant correlation between cervical length with the successful induction of labor, cervical length ≤ 2.895 cm can be used to predict the success of labor induction.*

Keywords: *Induction of Labor, Cevical Length, Transvaginal Ultrasound.*

Abstrak

Tujuan: Untuk mengetahui korelasi antara panjang serviks pada penilaian USG transvaginal dengan induksi persalinan sukses.
Metode: Penelitian ini merupakan penelitian observasional dengan pendekatan crosssectional ke 39 wanita berturut-turut yang menjalani induksi persalinan di Departemen Obstetri dan Ginekologi, Prof. dr. R.D. Kandou Manado rumah sakit umum. Panjang serviks diukur dengan USG transvaginal sebelum induksi persalinan. Induksi persalinan yang sukses jika persalinan pervaginam terjadi dalam waktu 24 jam setelah induksi persalinan dimulai.
Hasil: Induksi persalinan berhasil 34 subyek (87,18%) dengan rata-rata panjang serviks 2,60 + 0,43 cm dan gagal dalam 5 mata pelajaran (12,82%) dengan rata-rata panjang serviks dari 3,54 + 0,77 cm (p = 0,006). Optimal memotong titik untuk memprediksi keberhasilan induksi persalinan itu 2.895 cm. Panjang serviks ≤ 2.895 cm memiliki sensitivitas 79,41% dan spesifisitas 80,00%, nilai prediksi positif 93,10%, nilai prediksi negatif 36,63% andaccuracy dari sebesar 79,49%.
Kesimpulan: Ada hubungan yang signifikan antara panjang serviks dengan induksi sukses kerja, panjang serviks ≤ 2,895 cm dapat digunakan untuk memprediksi keberhasilan induksi persalinan.

Kata Kunci: Induksi Tenaga Kerja, Panjang Cevical, transvaginal USG.

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INTRODUCTION

Induction of labor is one of the most procedure done in obstetric care. Royal College of Obstetricians and Gynaecologists noted induction of labor as a general procedure, where approximately 20% of pregnant women undergoing labor induction due to various reasons.[1] A secondary analysis of the randomized multicenter study for three years in the United States reported that induction of labor counts25,2% of the total labors, where vaginal delivery occurs in 63.2% of the total of labor induction.[2]

Generally, induction of labor is an indication if the option to continue the pregnancy for spontaneous labor at greater risk. In addition, the advantages of induction of labor should be greater than the potential risk to the mother and fetus as a result of this procedure.[3,4]Because of the increased risk of caesarean section in the induction of labor, it is necessary to assess the possible risk of caesarean section individually in women undergoing labor induction.[5]

The standard method for predicting probability of vaginal delivery in the induction of labor is based on preinduction cervical favorability using the Bishop score.[5,6,7] However Bishop score is a subjective tool. A systematic review concluded that Bishop score had a poor predictive value for outcome of pregnancy induction at term pregnancy.[7] Although Bishop score is still considered as a useful tool for predicting vaginal delivery in induction of labor, its accuracy is a concern because of cervical length can not be measured accurately with internal vaginal examination, while the other parameters included in the score which are the consistency and position of the cervix are very subjective and havelimited accuracy.[8]

In recent years, methods which play role in the management of patients at risk for preterm labor proposes to predict the outcomes of induction of labor, includes the assessment of the cervix using transvaginal ultrasound (USG) for measuring cervical length and morphological characteristics of the os internum.[8,9]

Shortening of the cervix, as can be seen on transvaginal ultrasound is considered to represent the process of effacement of the cervix. Theoretically transvaginal ultrasound examination may represent a more accurate assessment than internal vaginal examination because supravaginal part of the cervix is about 50% of cervical length, and varies greatly between individuals. This is a difficult part to evaluate at the time of internal vaginal examination. In addition, the depletion is highly subjective and varies between examiners, in addition it's difficult to assess in closed cervix. While the examination of the cervix by transvaginal ultrasound is quantitative, more objective and interexaminer variation was minimal.[6] Vayssière et al concluded that measurement of cervical length by transvaginal ultrasound is a technique that can be learned quickly and easily used by inexperienced examiner.[10]

METHOD

This was an observational study with cross sectional approach. Women undergoing induction of labor in obstetrics and gynecology department of Prof. dr. R.D. Kandou Manado general hospital, included in the study. Inclusion criterias were term, singletonfetal pregnancy, life and head presentation.

Indications of labor induction includes : pregnancy ≥ 41 weeks of gestational age,severe preeclampsia/ superimposed preeclampsia, oligohydramnios and prolonged latent phase. Pregnancy with premature rupture of membranes and the presence of vaginal bleeding were excluded. Caesarean section for fetal distress indication are also excluded. A total of 39 women were included in the study by signing the informed consent.

Measurement of cervical length by transvaginal ultrasound performed prior to induction of labor. Measurements were made and three best images that meets the criteria were taken and the shortest length of cervix used as a measure of cervical length. Induction of labor is done by oxytocin drips. Successful criteria determined by the occurrence of vaginal delivery within 24 hours after induction of labor began.

Some characteristic data were collected includes : maternal age, occupation, BMI, parity, gestational age, birth weight and Bishop score.Cervical length on successful and failed labor induction were examined by MannWhitney Test. To determine the cut off point cervical length was analyzed by ROC curve.

Table 1. Characteristics of Study Subjects

Characteristics (N=39)	Successful of labor induction				Total	
	Success (n=34)		No (n =5)			
Age						
< 20 years	9	(100,00 %)	0		9	(23,08 %)
20 - 24 years	9	(81,82 %)	2	(18,18 %)	11	(28,21 %)
25 - 29 years	9	(90,00 %)	1	(10,00 %)	10	(25,64 %)
30 - 35 years	7	(77,78 %)	2	(22,22 %)	9	(23,08 %)
Occupation :						
Housewife	30	(90,91 %)	3	(9,09 %)	33	(84,62 %)
Government employee	1	(50,00 %)	1	(50,00 %)	2	(5,13 %)
Private employee	3	(75,00 %)	1	(25,00 %)	4	(10,26 %)
BMI						
< 18,5	1	(100,00 %)	0		1	(2,56 %)
18,5 - 24,9	14	(100,00 %)	0		14	(35,90 %)
25 - 25,9	14	(82,35 %)	3	(17,65 %)	17	(43,59 %)
> 30	5	(71,43 %)	2	(28,57 %)	7	(17,95 %)
Parity :						
Nuliparaous	18	(85,71 %)	3	(14,29 %)	21	(53,85 %)
Multyparaous	16	(88,89 %)	2	(11,11 %)	18	(46,15 %)
Gestational age						
37 – <40 weeks	4	(80,00 %)	1	(20,00 %)	5	(12,82 %)
≥ 40 – < 41 weeks	5	(100,00 %)	0		5	(12,82 %)
≥41 – < 42 weeks	25	(86,21 %)	4	(13,79 %)	29	(74,36 %)
Bischop score						
< 5	29	(85,29 %)	5	(14,71 %)	34	(87,18 %)
≥ 5	5	(100,00 %)	0		5	(12,82 %)
Birth weight						
2500 - <3000 gr	14	(93,33 %)	1	(6,67 %)	15	(38,46 %)
3000 - <3500 gr	11	(91,67 %)	1	(8,33 %)	12	(30,77 %)
≥ 3500 gr	9	(75,00 %)	3	(25,00 %)	12	(30,77 %)

Table 2. Correlation between servical length with successful of labor induction

Variable	Successful of labor induction		*p value*
	Success n=34	**No n=5**	
Mean of cervical length (cm)	2,60 ± 0,43	3,54 ± 0,77	*p=0,006*
Range of min-max (cm)	1,61 – 3,32	2,72 – 4,45	

Tabel 3. Sensitivity, specificity, *positive predictive value*, *negative predictive value* and accuracy based on *cut off point*

Cervical length (cm)	Successful of induction		SSV (%)	SPF (%)	+PV (%)	-PV (%)	Akurasi (%)
	Success	No					
≤ 2,895	27 (69,23 %)	1 (2,56 %)	79,41	80,00	96,43	36,63	79,49
> 2,895	7 (17,95 %)	4 (10,26 %)					

Results

A total of 39 pregnant women undergoing induction of labor in the Department of Obstetrics and Gynecology, Prof. dr. R.D. Manado Kandou general hospital included in this study. Induction of labor succeed in 34 subjects, ie those who gave birth within 24 hours after induction of labor begin (87.18%), 5 other subjects (12.82%) experienced caesarean section for indicationof failed of oxytocin drips.

Characteristics of the study subjects are shown in Table 1, in which the largest percentage of successful induction of labor at each characteristic are in the age group of <20 years, housewives, BMI for <18,5 and 18,5 – 24,9, multiparity, gestasional age ≥ 40 - <41 weeks, Bishop score ≥ 5 and birth weight 2500 - <3000 gr.

Table 2 shows a comparison between cervical length of successful and unsuccessful group. The mean cervical length on successful group of labor induction is 2,60 ± 0,43 cm and on unsuccessful group is 3,54 ± 0,77 cm, with the MannWhitney statistical test, $p = 0.006$.

Cervical length were then analyzed by ROC curve (receiveroperator characteristics) to obtain the best combination of sensitivity and specificity of diagnostic tests to determine whether cervical length can be used to predict the success of labor induction. Analysis of the ROC curve obtained coordinates of the curve that gives the best sensitivity and specificity values (cutoff point) is a cervical length for 2.895 cm. Table 3 shows the sensitivity, specificity, positive predictive value, negative predictive value and accuracy based on the cutoff point of 2.895 cm.

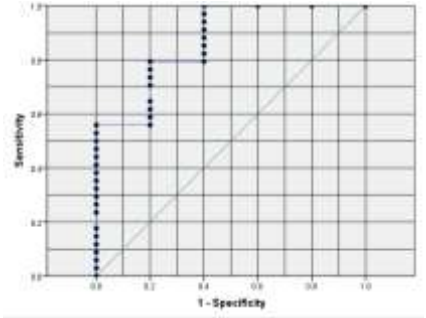

Figure 1. ROC Curve

DISCUSSION

The primary outcomes which clinically important to measure the effectiveness and complications of labor induction, are :[1,11]

- Vaginal delivery is achieved or not achieved within 24 hours
- Uterine hyperstimulation by fetal heart rate changes
- Cesarean section
- Serious of neonatal morbidity or perinatal death (eg seizures, asphyxia, neonatal encephalopathy, disability in childhood)
- Serious maternal morbidity or death (eg rupture of uterine, the need for intensive care, septicemia)

There is no definition of failed induction of labor is widely accepted.[2] A number of factors have been proposed as the endpoint of a failure of induction of labor, includes : delivery by Caesarean section after induction of labor, not achieving vaginal delivery at a specified time (usually 12 or 24 hours), the active phase of labor is not achieved within a certain time, or failure to achieve of active phase of labor.[12]

Because of the increased risk of caesarean section in the induction of labor, it is necessary to assess the possible risk of caesarean section individually in women undergoing labor induction.[5] There wereseveral factors of maternal and fetal as well as screening test had been proposed for predicting the success of labor induction, includes :

1. Maternal factors: parity, height, weight, body mass index (BMI), age, Bishop score and its components
2. Fetus factors : fetal weight and gestational age
3. Cervical assessment by transvaginal ultrasound
4. Biochemical Marker: fetal fibronectin (fFN), insulin like growth factor binding protein-1 (IGFBP-1)

A number of studies have evaluated the accuracy of transvaginal ultrasound to predict the successful of induction of labor. In this study, the mean cervical length on successful labor induction is 2,60 $\pm$ 0,43 cm and on unsuccessful labor is 3,54 $\pm$ 0,77 cm *(p = 0.006)*, indicating that there is a significant difference between the length of the cervix in the successful of labor and unsuccessful (table 2).

Studies of correlation between cervical length with the success of labor induction reported different results. Paterson Brown et al reported the results of the study of 50 patients showed that cervical length was not associated with the success of labor induction.[13] Boozarjomehri et al reported a cervical length correlated with the duration of the latent phase of labor, although there was no significant correlation between intervals of induction until parturition by cervical measurement.[14]Watson et al reported a significant association between cervical length with clinical assessment, but not worth predictive for induction of labor.[15] Roman et al reported cervical length ultrasound is not better than the Bishop score to predicting the success of labor.[16] Study was done by Groeneveld et al concluded that cervical length is not a significant independent predictor for vaginal delivery.[17]

Pandis et al reported that cervical length has a better predictive value than the Bishop score for predicting vaginal delivery within 24 hours after induction of labor.[18] GomezLaencina et al reported that cervical length as a predictor of the risk for Caesarean section better than Bishop score.[19] While Uyar et al reported a cervical length as a better predictor than the Bishop score for predicting the success of labor induction.[20] Rane et al reported that in women undergoing induction of labor, cervical length is a significant

independent predictor of induction to delivery interval within 24 hours, the tendency of vaginal delivery and caesarean section within 24 hours.[21] Pitarello et al concluded that the assessment of the cervix by transvaginal ultrasound had a significant association with the incidence of vaginal delivery and vaginal delivery within 24 hours after induction.[22]

Cut off point that gives the best sensitivity and specificity values in this study was 2,895 cm. Some value of cut-off points proposed by Ware et al[6], Pandis et al[18], Gabriel et al [18]for each cervical length <30 mm, <28 mm and <26 mm,respectively, where the cut-off point is associated with a shorter duration of labor and the higher of the incidence of vaginal birth.

A systematic review with meta-analysis by Harfield et al concluded that cervical length can be used to predict the success and failure of induction, but does not predict the mode of delivery. The presence of cervical wedging was useful as a diagnostic test with a likelihood ratio of a positive test result was 2.64 and the likelihood ratio of a negative test result of 0.64.[24] While systematic review with meta-analysis by Verhoeven et al concluded that the length of the cervix and cervical wedging measured by ultrasound has a moderate capacity to predict outcome of parturition after induction of labor.[25]The presence of wedging or funneling found associated with a shorter duration of delivery after induction of labor.[14] Bansiwal et al proposed a cut off value Bishop score of < 6 and wedging on ultrasound examination of< 30% as consideration for choosing induction agents and increase the success of induction.[26]

The existence of a tool to predict the success of induction can be used as consideration for whether or not a pregnancy is in need for immediate termination. For example, in patients with preeclampsia or gestational age of 41 weeks. Patients with unripe cervix or long cervix are in a high risk for induction failure and longer time to achieve spontaneous labor.[25]

Tajik et al in his publication regarding the measurement of cervical length in patients with gestational hypertension and preeclampsia suggests that a longer delivery time can cause patients at higher risk circumstances. Patients with a shorter of cervix associated with a shorter delivery time, whereas women with cervical longer may experience longer delivery time and can be at risk for complications.[27]

In this study, there is a significant association between cervical length with the successful induction of labor, and the cut-off point of 2,895 cm provides good sensitivity and specificity. Cervical length of ≤ 2,895 cm can predict the likelihood of success of labor induction by positive predictive value 96,43% and accuracy 79,49%.

There are several limitations of this study.Other factors that can affect the success of labor induction, for example, the influence of maternal and fetal factors in induction of labor where not analyzed. In addition cervical wedging has not excluded from the study, but its effect is not taken into account statistically. In addition, oxytocin receptors factors that play a role in the success of labor induction was not observed in this research.

CONCLUSION

This study shows there is a significant correlation between cervical length on transvaginal ultrasound assessment with the success of labor induction. Cervical length ≤2.895 can predict the success of labor induction with a sensitivity of 79.41% and a

specificity of 80.00%, positive predictive value was 96.43%, a negative predictive value of 36.36% and accuracy of 79.49%.

Assessment of cervical length by transvaginal ultrasound is a tool that can be used to predict the success of labor inductionand can be performed prior to induction of labor to assist clinical decision for doctors and counseling the patients.

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