Cervical Length Assessment by Ultrasound in Prolonged Pregnancy as a Predictor of Spontaneous Onset of Labor and Successful Vaginal Delivery in Comparison with Bishop Score

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Abstract

Objective: To examine the value of cervical length measurement with Bishop score in a prolonged pregnancy to predict spontaneous onset of labor within the subsequent 7 days and the rate of successful vaginal delivery.

Patients and Methods: It is a prospective cohort study done at Kasr El-Aini Hospital over a period from February 2012 to October 2014. This study included 200 pregnant patients from 41 weeks to 42 weeks of gestation. These patients are not in labor, with single vertex fetal presentation, without previous uterine scar; without previous operations on the cervix (e.g. cervical amputation); and with absence of any obstetric or medical complications with pregnancy (e.g. Diabetes). All patients were subjected to history taking, abdominal and vaginal examination including Bishop Score. The cervical length measurement by Trans-vaginal ultrasound was recorded in all patients. Spontaneous onset of labor pains is awaited for patients who have completed 41 weeks till 41 weeks + 6 days. The number of cases who delivered vaginally and the number of cases who delivered by Cesarean Section due to failure of progress or fetal distress were recorded. Labor induction was done for patients who completed 42 weeks of gestation according to standard Kasr El-Aini guidelines of induction. The number of cases who were delivered vaginally and cases who delivered by Cesarean Section due to failure of progress or fetal distress were recorded.

Results: In our study, according to the Bishop score, it is inversely related to the number of cases showing spontaneous onset of labor pains and the number of cases that delivered vaginally and the number of cases who delivered by Cesarean Section due to failure of progress or fetal distress were recorded. Labor induction was done for patients who completed 42 weeks of gestation according to standard Kasr El-Aini guidelines of induction. The number of cases who were delivered vaginally and cases who delivered by Cesarean Section due to failure of progress or fetal distress were recorded.

Conclusion: Prediction of spontaneous onset of labor and successful vaginal delivery can be done when cervical length measurement by trans-vaginal ultrasound combined with Bishop score.

Key Words: Trans-vaginal ultrasound – Cervical length – Bishop score – Vaginal delivery – Prolonged pregnancy.

Introduction

THE incidence of prolonged pregnancy is 2.5-12% of pregnancies [1]. The pathogenesis of the prolonged pregnancies explained by many theories [2]. Prolonged pregnancy causes an anxiety among pregnant women [3]. Prolonged pregnancy is associated with higher rate of macrosomia (birth weight >4kg), birth injury, meconium aspiration syndrome [4]. In the management of prolonged pregnancies without specific medical induction of labor, a policy of delaying induction up to 42 weeks reduces the rate of induction because about 80% of women have spontaneous onset of labor [5].

Induction of labor at 42 weeks is associated with less intrapartum fetal compromise and meconium stained liquor [6]. To date, Bishop score is a complicated subjective scoring system with assignable score values from 0-13 [7]. Trans-vaginal ultrasonographic measurement of cervical length can be used as a predictor of labor course and outcome of delivery [8]. In prediction of successful labor induction, trans-vaginal sonographic assessment of cervical length is better than conventional Bishop score [9].

The aim of the study was to evaluate the usefulness of transvaginal sonographic assessment of cervical length in the prediction of spontaneous onset of labor and prediction of successful vaginal delivery in correlation with Bishop score in cases of prolonged pregnancy.
Patients and Methods

This was a prospective cohort study that was approved by Ethical Committee and taking patient consent. It was carried out from February 2012 to October 2014 at the Department of Obstetrics and Gynecology, Faculty of Medicine, Cairo University. The study includes 200 pregnant cases who completed 41 weeks gestation and expectantly managed up to 41 weeks + 6 days. Termination of pregnancy via induction of labor was done for cases who completed 42 weeks gestation after giving a written consent.

The inclusion criteria included a singleton pregnancy with a gestational age correctly dated by either a 1st trimester measurement of crown rump length or a 2nd trimestric ultrasound examination (before 20 weeks) with no gross fetal anomalies, found with a cephalic and vertex presentation. All patients were not in labor and with a reactive fetus. Exclusion criteria included presence of any contraindication to vaginal delivery or any obstetric complications (e.g. placenta previa) or any medical complications with pregnancy (e.g. hypertension or diabetes), previous Cesarean Section or any uterine scar and previous operations on the cervix.

All patients were subjected to full history taking, abdominal examination (for assessment of gestational age by fundal level, fetal back position), and vaginal examination (to exclude cephalopelvic disproportion, confirm fetal presentation and fetal position), digital examination and scoring of the cervix was done using the Bishop score.

Ultrasound examination was done for all included patients by a single operator and by using Voluson Ultrasound machine equipped with a 3.3 MHz convex trans-abdominal probe and 7.5MHz vaginal probe. Trans-abdominal ultrasound was done for fetal biometry for calculation of the fetal weight using the Hadlock formula, determination of placental position, fetal presentation, and measurement of the vertical distance of the deepest pool of the amniotic fluid. Trans-vaginal ultrasound was done for assessment of cervical length but the following steps should be done first as follows: Patient was asked to empty the bladder, the probe was slided into the vagina only a few centimeters and then rocked in the antero-posterior direction to visualize the cervix, checking for the anterior and posterior lips and the line of the internal cervical canal in the midline sagittal plane. The probe was then slowly withdrawn back a little with the lightest touch to avoid compression artifacts. Measurement was made from internal to external os along the endo-cervical canal. Any membrane protrusion more than 5mm down the canal or funneling was recorded.

Pregnant patients who completed 41 weeks or up to 41 weeks + 6 days were managed expectantly and were assessed for spontaneous onset of labor pains and the number of cases who delivered vaginally and the number of cases who delivered by Cesarean section due to failure of progress of labor or due to fetal distress will be recorded.

On the other hand, pregnant patients who completed 42 weeks gestation will undergo induction of labor according to the standard Kasr El-Aini guidelines for induction of labor, we started induction by prostaglandin E1 using an initial dose of 50 micrograms (2 vaginal tablets of Vagiprost®, 25 microgram each tablet, manufactured by AD-WIA CO S.A.E Egypt). Six hours later, reassessment of the cervix was done unless the clinical condition necessitated earlier assessment. A second dose, third and fourth dose of 25 micrograms were given in cases of unfavorable cervix with failed ripening; each 6 hours apart. If no cervical ripening after the 4th dose of prostaglandins, the patient was delivered by Cesarean section.

In cases that achieved cervical ripening with prostaglandins, oxytocin infusion was started using 5 units in 500ml of normal saline or ringer’s solution, 6 hours following the last dose of prostaglandins, starting with a rate of 10-15 drops/minute. Infusion was increased at intervals of 30 minutes until there were 3 good contractions in 10 minutes, each lasting 45-60 seconds.

During the period of induction, the fetus monitored continuously by electronic fetal heart rate monitoring (cardiotocography). Also, maternal monitoring was done including blood pressure measurements every 2 hours with frequent clinical evaluation. When a non reassuring Fetal Heart Rate (FHR) was detected, closer monitoring of FHR was performed with some conservative measures in the form of stoppage of oxytocin infusion, change in maternal position to the left lateral position and oxygen administration.

Cesarean section was done in case of persistent non-reassuring FHR even after performing the previous measures. Deliveries were performed in the operating theatre, an anesthetist and a pediatrician were attending. Women's characteristics of age, parity, BMI, cervical length and Bishop score were recorded.
All collected data were statistically described in terms of mean ± Standard Deviation (± SD), or number of cases and percentages when appropriate. Comparison of numerical variables between the study groups was done using student t-test for independent samples. For comparing categorical data, Chi square (χ^2) test was performed. Exact test was used instead when the expected frequency is less than 5. p-value less than 0.05 considered statistically significant. p-value less than 0.001 considered highly significant. All statistically calculations were done using computer programs SPSS (Statistical Package For the Social Science; SPSS Inc., Chicago, IL, USA) Version is for Microsoft Windows.

Results

The cohort of enrolled women was divided into 2 groups as follows:

Group (A): Those who were managed expectantly from completed 41 weeks till 41 weeks + 6 days, they will be assessed for spontaneous onset of labor, and the number of cases who delivered vaginally and the number of cases who delivered by Cesarean section (due to failure of progress or fetal distress). Group (B): Those who are completed 42 weeks then underwent induction of labor, the number of cases who delivered vaginally and the number of cases who delivered by Cesarean section (due to failure of progress or fetal distress).

Table (1) illustrates the maternal demographic data among both groups and (Table 2) illustrates the maternal clinical data among both groups.

The total number of cases included in this study is 200 pregnant women who were more than 41 weeks gestation. In the present study, 165 women (82.5%) developed spontaneous onset of labor, 140 cases (84.8%) were delivered vaginally, 78 were multiparous (55.7%) and 62 were nulliparous (44.29%). The average cervical length was 19.3mm ±3.05, the average Bishop score was 6.05±0.70. But 25 out of 165 (15.2%) women were delivered by Cesarean section (14 of them due to failure of progress while 11 cases due to fetal distress), 3 cases were nulliparous (12%) and, 22 cases of them were multiparous (88%). The average cervical length was 31.32mm±2.54, the average Bishop score was 4.12±0.78 and the average BMI was 27.36±1.73.

On the other hand, 35 women (17.5%) of 200 completed 42 weeks gestation and underwent induction of labor using prostaglandins. Cases who were delivered vaginally were 22 cases (62.8%), 14 cases of them were multiparous (63.64%) and 8 cases were nulliparous (36.36%). The average BMI was 23.00±0.72, the average cervical length was 21.14±0.91, and the average Bishop score was 7.73±1.3. 13 cases of 35 (37.2%) were delivered by Cesarean section (8 of them due to failure of progress while 5 cases due to fetal distress). From these 13 cases, 12 of them were multiparous (92.3%) and 1 case was nulliparous (7.70%). The average BMI was 27.46±0.85, the average cervical length was 32.3±1.35, and the average Bishop score was 5.69±11.5.

A positive correlation was found between the cervical length and the rate of Cesraean section (r=0.551). Other variables such as Bishop score and BMI showed negative correlation among this group. A negative correlation was found between cervical length and BMI among the group of patients who delivered vaginally after spontaneous onset of labor and after labor induction. Bishop score, on the other hand, showed positive correlation among those patients.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group (A) n = 165</th>
<th>Group (B) n = 35</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VD (n=140)</td>
<td>CS (n=25)</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>24.29±3.24</td>
<td>26.00±3.16</td>
</tr>
<tr>
<td>BMI</td>
<td>22.94±1.49</td>
<td>27.36±1.73</td>
</tr>
<tr>
<td>Nulliparous women</td>
<td>62 (44.29%)</td>
<td>3 (12%)</td>
</tr>
<tr>
<td>Muliparous women</td>
<td>78 (55.71%)</td>
<td>22 (88%)</td>
</tr>
</tbody>
</table>

CS : Cesarean Section.
BMI : Body Mass Index.
Table (2): Maternal clinical characteristics among both groups.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group (A) n = 165</th>
<th>Group (B) n = 35</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VD (n=140)</td>
<td>CS (n=25)</td>
</tr>
<tr>
<td></td>
<td>Mean SD</td>
<td>Mean SD</td>
</tr>
<tr>
<td>CL by TVS (mm)</td>
<td>19.38 3.05 31.32 2.54 0.001</td>
<td>21.14 0.91 32.3 1.35 0.000</td>
</tr>
<tr>
<td>Bishop score</td>
<td>6.05 0.70 4.12 0.78 0.001</td>
<td>7.73 1.3 5.69 11.5 0.415</td>
</tr>
</tbody>
</table>

CL : Cervical length.
TVS : Trans-Vaginal Ultrasound.

Table (3): Correlation between cervical length, Bishop score and BMI among the different studied groups.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Vaginal delivery after spontaneous onset of labor</th>
<th>Vaginal delivery after induction of labor</th>
<th>Cesarean section group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r     p-value</td>
<td>r     p-value</td>
<td>r     p-value</td>
</tr>
<tr>
<td>Cervical length</td>
<td>-0.718 0.001 **</td>
<td>-0.017</td>
<td>0.807NS</td>
</tr>
<tr>
<td>Bishop score</td>
<td>0.454 0.001 **</td>
<td>0.296</td>
<td>0.001 **</td>
</tr>
<tr>
<td>BMI</td>
<td>-0.639 0.001 **</td>
<td>-0.026</td>
<td>0.718NS</td>
</tr>
</tbody>
</table>

r: Correlation coefficient.
p: Probability.

Discussion

The traditional approach to the management of prolonged pregnancy is to undertake delivery at 41 weeks gestation. In this study, induction of labor can be delayed by 7 days unless there was evidence of specific medical or obstetric indication. The study demonstrated that in cases attending the study, a policy of delaying induction of labor for 7 days, resulted in spontaneous onset of labor and delivery in many cases.

According to parity, spontaneous onset of labor is higher in multiparous than in nulliparous women. The number of vaginal deliveries is higher in those with spontaneous onset than induced labor, in multiparous than nulliparous women. This agrees with the study done by Rao et al., [5] also Rane et al., Ware et al., and Pandis et al., reported in their studies that the chance of vaginal delivery is higher in those with spontaneous than induced onset of labor, in parous than nulliparous women [10-12].

According to the BMI, it is inversely related to the vaginal delivery in the spontaneous onset group. But it is inversely related to the number of Cesarean in the induction group. This agrees with the study done by Sebire et al., that reported the need for induction of labor and risk of Cesarean section increase with maternal BMI [13].

As regards the cervical length, it is inversely related to the vaginal delivery in the spontaneous onset of labor group with statistical difference with the number of cases in the induction group and the number of cases of Cesarean section in the induction group. Vankayalapati et al., Rozenberg et al., measured cervical length at 39 weeks + 4 days to 40 weeks + 3 days in 128 singleton pregnancies and reported an association of cervical length with spontaneous onset of labor within 7 days but not with the risk of Cesarean section [14,15]. Other studies for example Vimeracti et al., examined 120 singleton posterm pregnancies in nulliparous women and reported that cervical length was significantly decreased in those with spontaneous onset of labor within the subsequent 7 days [16]. Also, Chung et al., showed that cervical funneling could be a predictive marker for vaginal delivery during labor induction [17]. S. Khazardoost et al., reported that cervical length is a good predictor of successful labor induction [18].

According to the Bishop score, it is directly related to the number of vaginal deliveries among the group of spontaneous onset of labor pains and among the vaginal deliveries in the group of labor induction. But it is inversely related to the number of cases who delivered by Cesarean section in both groups with statistical difference between them. These results are consistent with Vankayalapati et al., [14]. Also, Varalakshmi et al., concluded that Bishop score when complimented with cervical length by transvaginal ultrasound could predict the success of labor induction better compared with assessment by Bishop score alone [19].
**Conclusion:**

Patients with no specific medical indications for delivery at 41 weeks gestation, a policy of delaying induction of labor by 7 days would reduce substantially the rate of induction for prolonged pregnancy, and as well reduce the overall rate of Cesarean section. It is recommended that scoring of the cervix by Bishop score and cervical length measurement by trans-vaginal ultrasound should be done at 41 weeks gestation to predict vaginal delivery. The vaginal deliveries are positively correlated with Bishop score but negatively correlated with cervical length.

**References**

تقييم طول عنق الرحم بواسطة الموجات الصوتية في الحمل المطول والتنبؤ بالولادة الزائدة ونجاح الولادة الطبيعية ومتطلباته بقياسات بيشوب

تمكِّن إستطاعة الحمل مشكلة حقيقية، فعادة ما تكون مصطلح بالقلق كثير من السيدات. إنها تحدث بعض الإضرابات النفسية، و ربما يزيد من وضع هذه المشكلة هو تقدم الحمل والإشراب الطبي.

ومن المعروف أن هناك سبب واضح لإستطاعة الحمل حيث أن شباء بالدماغ غير معروف حتى الآن. هناك اختلاف على تعريف الدقيق لاستطاعة الحمل. يمثل حالات إستطاعة الحمل حوالي 10٪ من إجمالي حالات الحمل ويتختلف هذه النسبة مع استخدام الفحص بالموجات الصوتية في بداية الحمل لتقديم الخطة في حساب هذه الحمل.

ومن يمكن إستطاعة الحمل العديد من المشاكل للجنين سواء أثناء الحمل أو الولادة أو ما بعد الولادة. إن احتمالية الولادة الطبيعية أو اللموع إلى طريق تجريب الهوليت والتي يمكن أن تنتج عن الولادة الطبيعية أو القصيرة يمكن النتيجة بين خلال قياس طويل عنق الرحم. وقد تم استخدام عنق الرحم كمؤشر لاحتمالية الولادة الطبيعية، وسابقا تم استخدام مقياس بيشوب لقياس عنق الرحم. وحديثا تم الرجوع إلى قياس طويل عنق الرحم عن طريق إستخبار طول الرحم المجهول للموجات فوق الصوتية بحبس الولادة الطبيعية. أن قياس طويل عنق الرحم وكما يبدو في الموجات فوق الصوتية هو جدير بإن تحوي عن عنق الرحم.

ونظرا يمكن أن تشير قياس عنق الرحم بالموجات فوق الصوتية أكثر دقى في الفحص الطبي، الولادة الطبيعية بالانتهاء أو نجاح تحريس الولادة لمجموعة مختلفة من السيدات. والوقت للإجابة تكملة breve باستخدام مقياس بيشوب بنفس الفصل.

الطريق لبحث: هذه الدراسات قد تم في مستشفى قصر العيني العام في الفترة من فبراير 2012 وحتى أكتوبر 2014. وقد شملت الدراسة طول 200 حالة كانت آخر اسماء على الحمل بطول التدريب وذلك لتحديد مقياس بيشوب. تم ذلك سلوك مفاهيم عنق الرحم يعتمد الفحص بالموجات فوق الصوتية لقياس عنق الرحم كمؤشر لاحتمالية الولادة الطبيعية أو اللموع. يتم قياس فحص الرحم بحاسة الولادة الطبيعية بعد الولادة. نهبت الولادة المجهولة بطلاق الرحم المجهول للموجات فوق الصوتية بحاسة الرحم المجهول.

نتائج البحث: تبين أن عدم متابعة الحمل في الفترة الأولى لاستخدام الأسبوع 41 من الحمل وجد أن معظم الحالات بيدان الولادة تلقائيا، وهذه النتائج مع قياس طول عنق الرحم بطول بيسوب. إن طول عنق الرحم بطول بيسوب يتناسب مع الولادة الطبيعية أو اللموع. بإعادة التدريب بعد الولادة، ثم قياس طول عنق الرحم بطول بيسوب. كما سبقنا إستبيان العلاجات التي تقوم بتحريس الولادة. فقد وجد أن قياس طول عنق الرحم باستخدام الموجات الصوتية يعتبر من أكثر الطرق إيجابية في موقع بيدان الولادة في فترة للولادة الطبيعية أو اللموع. والتمتش بالولادة القصيرة.