



## Original Article

## Fetal fibronectin is more valuable than ultrasonographic examination of the cervix or Bishop score in predicting successful induction of labor



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## ABSTRACT

**Objective:** To compare fetal fibronectin (fFN) assessment, ultrasound parameters, and Bishop score in the prediction of successful induction of labor at term when cervix is unfavorable.**Materials and Methods:** Seventy-three nulliparous women undergoing labor induction at term with Bishop score less than 5 were enrolled in this study. Successful labor induction was defined as vaginal delivery occurring within 24 hours of initiation of induction. fFN obtained from vaginal secretion was measured by immunoassay.**Results:** Patients who delivered within 24 hours ( $n = 33$ ) differed significantly from the remaining patients by a positive fFN (84.8% vs. 15.2%,  $p = 0.002$ ). The mean cervical length or Bishop scores were not statistically different between women who delivered vaginally before 24 hours of induction and those who did not (28.9 mm vs. 27.9 mm,  $p = 0.468$  and 3.3 vs. 3.2,  $p = 0.928$ , respectively). Binary logistic regression analysis showed only the fFN immunoassay to be an independent statistically significant predictor of vaginal delivery within 24 hours of induction (odds ratio 6.168; 95% confidence interval 1.897–20.059;  $p = 0.002$ ). A positive fibronectin assay had a sensitivity and specificity of 84.9% and 50%, respectively.**Conclusions:** In cases with unfavorable cervix, presence of vaginal fFN predicts the success of labor induction.Copyright © 2016, Taiwan Association of Obstetrics & Gynecology. Published by Elsevier Taiwan LLC. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## Introduction

The incidence of caesarean section following labor induction when the cervix is unfavorable has been reported to be between 22% and 24% [1,2]. Currently, the only method in practice to predict whether an induced labor will result in successful vaginal delivery is preinduction Bishop score [3]. However, the specificity of the Bishop score among patients with transitional (6–9) or low ( $\leq 5$ ) scores is poor. Although many of these patients can deliver easily, such low scores have been associated with high rates of prolonged labor and caesarean section [4]. Therefore, more sensitive selection criteria are needed with regard to induction of labor.

Transvaginal ultrasound examination of the cervix has been reported to be a simple and reproducible examination for the

prediction of successful labor induction [5]. However, the results of previous comparative studies are contradictory [5–10].

Recently, increasing attention has been focused on the presence of fetal fibronectin (fFN) in the cervical secretions. fFN is a glycoprotein involved in the adhesion of cells present in the extracellular matrix of decidua basalis, adjacent to the intervillous space [11]. When delivery is imminent, fFN enters into cervical and vaginal secretions, and therefore may become detectable. fFN has been reported to be an indicator for premature delivery and can be used as a complementary test to confirm the clinical diagnosis of premature rupture of fetal membranes [12–15]. There are also studies reporting correlation between fFN presence and successful labor induction at term pregnancies [16–19]. However, its role in predicting successful induction has been less clear. This prospective study was designed to compare the presence of fFN in cervicovaginal secretions with ultrasound parameters or Bishop score in predicting successful labor induction when the cervix is unfavorable.

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## Material and methods

This study was conducted at Zekai Tahir Burak Women's Health Care, Training and Education Hospital. A total of 73 women undergoing labor induction at term were enrolled in this prospective study. The study protocol was approved by the Ethics Committee of the Hospital. The inclusion criteria were as follows: nulliparity, singleton pregnancy, gestational age between 37 weeks and 42 weeks, cephalic presentation, Bishop score of 5 or less, and no clinical evidence of regular contraction. Women with coexisting obstetric conditions such as ruptured membranes, vaginal bleeding, or any contraindication to vaginal birth were not included. The date of the confinement was calculated according to the duration of amenorrhea and checked by an ultrasound examination performed before 20 weeks of gestation.

The sample was obtained from the posterior vaginal fornix with a Dacron swab and tested for fFN by a qualitative fast-reacting immunoassay with the positive cutoff value set at 50 ng/mL or greater (Maya Biomedical, Istanbul, Turkey), analyzed, and evaluated at the bedside. Specimens were combined with an antihuman fibronectin–gold colloid conjugate, and passed through a membrane containing a monoclonal antibody specific for fFN. A visible colored spot within 5 minutes indicates a positive result. Digital cervical examination was performed and the Bishop score was assigned [3].

After the digital examination, transvaginal ultrasonographic examination of the cervix was performed using the General Electric Logic 200 ultrasound machine equipped with a 6.5-MHz transvaginal transducer. Sonography was performed by one of the first three authors. Cervical length was measured from the internal ostium to the external ostium, the furthest points at which the cervical walls were juxtaposed [20]. Because the compression may artificially lengthen the cervical measurement, care was taken not to compress the cervix with the endovaginal probe. Wedging or funneling, defined as any triangle—“V or U pattern”—at the area of the internal ostium with its apex anywhere along the cervical canal, was measured longitudinally [20].

The patient was subsequently managed according to the standard induction protocol of the unit. Intravenous oxytocin administration was started at 2 mU/min and increased every 15 minutes by 2 mU/min to a maximum of 20 mU/min. Cervical ripening agents were not used at all. Clinicians involved in the patients care were blind to the result of the fFN assay.

The main outcome parameter was defined as successful labor induction occurring within 24 hours.

The Statistical Program for Social Sciences (SPSS) 17.0 for Windows software was used for the calculations (SPSS Inc., Chicago, IL, USA). The normally distributed data are presented as the mean (standard deviation) for baseline and descriptive statistics, whereas the non-normally distributed data are presented as the median and range. Data with a normal distribution were analyzed using the unpaired *t* test. The Mann–Whitney *U* test was used to analyze non-normally distributed data. The accuracy of each test was evaluated separately and a multiple binary logistic regression model was generated to identify variables that were significantly associated with the outcome of interest. All *p* values were calculated as two tailed and *p* value less than 0.01 was accepted as statistically significant.

## Results

The indications for induction of labor were as follows: postdate pregnancy (*n* = 45), pregnancy-induced hypertension (*n* = 3), nonreassuring testing (*n* = 7), oligohydramnios (*n* = 18). The mean gestation age at induction was 41 weeks (range 37–42 weeks).

Thirty-five women (47.9%) had vaginal deliveries and in 33 (94.3%) of these women, vaginal deliveries were within the 24 hours of labor induction. Thirty-eight women (52.1%) underwent caesarean section. Table 1 presents the obstetric characteristics of the 73 women. The mean birth weight was 3401 g. The mean duration of labor was 9.5 hours (range 2.25–29 hours).

In 48 of the 73 women (65.8%) included in the study, the fFN assessment gave a positive result. Patients who succeeded to vaginal delivery within 24 hours (*n* = 28) differed significantly from the remaining patients (*n* = 5) by a positive fFN (84.8% vs. 15.2%, *p* = 0.002). The caesarean section rate was higher in patients with negative fFN results, with 18 of 25 (72%) requiring caesarean section in the group with negative results, compared with 20 of 48 (41.7%) requiring caesarean section in the group with positive results (*p* = 0.014). A positive fibronectin assay had a sensitivity, specificity, positive predictive value, and negative predictive value of 84.9%, 50%, 58.3%, and 80%, respectively, for prediction of the induction success.

There was no statistically significant difference in cervical funneling between women who delivered vaginally before 24 hours of induction and those who did not (30% vs. 12.1%, *p* = 0.09). Neither the mean cervical length (28.9 mm vs. 27.9 mm, *p* = 0.468) nor the Bishop score (3.3 vs. 3.2, *p* = 0.928) between women who delivered vaginally before 24 hours of induction and others was different. A binary logistic regression model was constructed, which included Bishop score, fFN immunoassay, cervical length, and funneling (Table 2). Stepwise multiple regression analysis showed only the fFN immunoassay to be an independent statistically significant predictor of vaginal delivery within 24 hours of induction (odds ratio 6.168; 95% confidence interval 1.897–20.059; *p* = 0.002).

## Discussion

In our study, we have confirmed the importance of fFN as a predictive marker for delivery within 24 hours of labor induction, whereas the presence of funneling or cervical length measurements by transvaginal ultrasound and Bishop score failed to predict successful labor induction.

fFN has been proposed as a new tool for cervical evaluation before labor induction [17,18]. Our results are in agreement with those of Ahner et al [16] and Garite et al [18]. Ahner et al [16] reported the presence of fFN in the cervicovaginal secretions of term deliveries to yield a high probability of success for induction [16]. They also concluded that in the case of a woman with fibronectin-negative cervicovaginal secretions and unfavorable cervix score, induction of labor should not be attempted. Garite et al [18], in a study that included 73 nulliparous women with low Bishop scores,

**Table 1**  
Characteristics of the study population (*N* = 73).

Maternal age (y), mean ± SD (range)	23.3 ± 4.5 (17–34)
Nulliparous ( <i>n</i> )	73
BMI (kg/m <sup>2</sup> ), mean ± SD (range)	28.1 ± 3.3 (21.9–36.3)
Gestational weeks, mean ± SD (range)	40.7 ± 0.9 (38–42.5)
Education (high school or university), <i>n</i> (%)	44 (60.3)
Birth weight (g), mean ± SD (range)	3401 ± 390 (2370–4300)
Bishop score, mean ± SD	3.3 ± 1.4
Cervical length (mm), mean ± SD (range)	28.4 ± 5.8 (14–48)
Funneling present, <i>n</i> (%)	16 (21.9)
Positive fFN assay, <i>n</i> (%)	48 (65.8)
Vaginal delivery within 24 h, <i>n</i> (%)	33 (45.2)
Sex, male, <i>n</i> (%)	37 (50.7)

BMI = body mass index; fFN = fetal fibronectin; SD = standard deviation.

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