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ABSTRACT

Background: In around 20% of pregnancies across the globe, pregnancy must be induced for different reasons. However, in 20% of all induced deliveries, inducement fails, necessitating a caesarean surgery.

Aim of the work: This may help with effective labor induction by identifying the correct qualities of the applicant.

Patients and methods: We used vaginal misoprostol to induce labor in 100 women after determining their BMI, modified bishop score, transvaginal cervical length, and Posterior cervical angle. These ladies were ≥37 weeks pregnant with a singleton who had a cephalic presentation.

Results: We had a 70% success rate with induction, which was followed by a normal vaginal birth. The modified Bishop score, transvaginal cervical length, and posterior cervical angle, on the other hand, had a strong statistical relevance.

Conclusion: Vaginal labor induction in term women, misoprostol is extremely promising when their modified Bishop score, transvaginal cervical length, and posterior cervical angle are determined.

Keywords: *Induction of Labor; Modified Bishop Score; Transvaginal Cervical Length.*

INTRODUCTION

Softening, ripening, dilatation, and repair are the four phases of connective tissue modification in the cervix during gestation. Despite their proximity in time, each step is governed in its own way.

labor induction is a frequent and necessary part of modern obstetric treatment, with roughly 20% of pregnancies requiring it. [1]

Immediate problems such as ruptured membranes with chorioamnionitis or severe Pre-eclampsia are indications. Some of the more common reasons include membrane rupture without labor, gestational high blood pressure, non-reassuring fetal condition, post-term pregnancy, and other maternal medical illnesses such as persistent high blood pressure and diabetes. [2]

Transvaginal sonographic Ultrasound of the cervix may give a more accurate predictor of effective induction than the Bishop Score, according to several recent research. Hatfield and colleagues (2007) conducted a meta-analysis of 20 studies in which transvaginal ultrasonography (TVUS) was used to determine cervical length and predict effective induction of labor. The authors found that the subject still remained unsolved due to the diversity of research criteria.

Uterine hyper stimulation, unsuccessful induction, umbilical cord prolapses, and uterine rupture are among risks associated with induction of labor. The conventional method of establishing whether an initiated labor will result in a successful vaginal delivery is to digitally check the cervix. Bishop's scoring system, published in 1964, is the most frequently recognized and utilized. A Bishop Score of (9) indicates a high possibility of induction success. A Bishop Score of four or fewer indicates an unfavorable cervix and may signal cervical ripening. [3]

However, the Bishop Score's assessment of the cervix's 'favorability' before to induction is very subjective, and multiple studies have shown that it has a poor prognosis for induction success, especially in women with a poor Bishop Score. [4]

The supra-vaginal part of the cervix accounts for roughly half of the cervical length, and its length

varies from woman to woman. It's tough to digitally assess this part of the cervix.

Cervical length and posterior cervical angle measurement through transvaginal ultrasonography, on the other hand, may be a more objective method of detecting cervical status. [5]

The study's goal was to figure out what qualities a candidate should have in order to have a successful induction of labor.

<div align="center">PATIENTS AND METHODS</div>

This was a prospective randomized study, where 100 pregnant women not in labor indicated for termination of pregnancy, The study was admitted to recruit one hundred (100) women all are primigravidas between 37:42 weeks, patients to whom induction of labour at the casualty of (El Galaa Teaching Maternity Hospital, Al Hussein University Hospital, Cairo, Egypt), between August 2020 and June, 2021.

All patients were subjected to the following:

Data recording include: Maternal age, gestational age at induction, maternal medical disorder if present, indication for induction of labor: Prolonged pregnancy, medical disorder e.g. gestational diabetes and hypertension, bishop Score before induction, cervical length(mm) and Posterior cervical angle before induction, induction delivery time, maternal and neonatal morbidity, percentage of women deliver by Prostaglandins only, percentage of women require oxytocin, mode of delivery (Vaginal or Cesarean Section) and baby weight and Apgar score at first minute after birth.

Inclusion criteria: Singleton Pregnant with cephalic presentation, primigravida, 37:42 weeks gestational age, no prior uterine surgical operations, baby weight 4 kg, and no liquor anomalies.

Exclusion criteria: Non-Vertex presentation, previous uterine surgery, multiple gestations, placenta previa, cervix dilatation higher than 3 cm, fetal or maternal complications requiring caesarean section, liquor anomalies, baby weight less than 4 kg, asthmatic individuals or women allergic to prostaglandins, as well as aberrant umbilical artery Doppler indices or non-stress tests.

Indications for labor induction were: Postdate pregnancy, pre-labor rupture of membranes and term pregnancy for mother with controlled medical disorder (PIH, controlled DM, PET, etc.)

Methods: The following procedures were performed on all of the study's participants:

Pre induction evaluation:

Verbal consent.

Full history taking: Personal background, with an emphasis on maternal age. Current History: Pay specific attention to warning signs such as headache, vision symptoms, edema of the face and fingers, severe vomiting, epigastric pain, loin pain, watery vaginal discharge, vaginal bleeding, diminished fetal movements, lower abdomen discomfort, and any

drugs. Obstetric history, including any obstetric difficulties in previous pregnancies, such as ICU hospitalization or failure to induce labor. Gravity and parity are two concepts that come to mind while thinking about gravity and parity. Menstrual history: For accurate pregnancy dates, use the first day of the last menstrual cycle or an early u/s. Previous cervix surgeries (e.g. cautery, cerclage, cervical amputation or conization) or any surgical operations are examples of medical and surgical histories.

General examination: Vital signs and BMI.

Abdominal examination: Fundal level, fetal heart tones, and the existence of scars from past abdominal or pelvic procedures are also evaluated.

Vaginal examination: Cervical dilation, effacement, and regularity, cervical position, fetal station, and cervical length, condition of the membranes, pelvic adequacy, and fetal presentation are all assessed to determine the Bishop score of the cervix.

Scoring: A score of 0 to 2 or 0 to 3 is assigned to each component. The maximum score that may be achieved is 13.

Interpretation: With a score of 5 or below, labor is unlikely to begin without induction. A score of 9 or above suggests that labor will most certainly occur naturally. A low Bishop's score frequently suggests that induction will be difficult to achieve. According to some sources, only a score of 8 or above consistently predicts a successful induction.

Ultrasound assessment: Transabdominal: Complete transabdominal ultrasonographic examination in real time, involving validation of gestational age, baby number, viability, presentation, estimated fetal weight, placental position and location, quantity of liquor, and to rule out congenital defects. Transvaginal: Cervical length, funneling and posterior cervical angle.

Instrument: All patients in the research had transvaginal ultrasonography to determine the cervical length and posterior cervical angle, which was done using a Voluson P8 ultrasound equipment. Ultrasound machine Voluson P8: With a frequency of 3.5 MHz for the abdominal probe and 7.5 MHz for the vaginal probe. The posterior cervical angle was calculated as the angle between an imaginary line crossing the cervical canal and another tangential to the posterior uterine wall at its junction with the internal os in a sagittal plane at the level of the internal os, and funneling was recorded.

Non-stress test: To rule out patients who have non-reassuring non-stress tests, a 20-minute preinduction non-stress test will be performed.

Induction and monitoring of labor: The following are the conventional guidelines for induction of labor that were followed: Prostaglandin E1, (misoprostol): With a Bishop score of 7, I began looking for unfavorable cervices. Initial dose: 25 microgram vaginal tablet (ADWIA CO. S.A.E Egypt, vagiprost® 25 microgram). Oxytocin and/or Amniotomy: 5 units of oxytocin were infused into 500 mL of normal saline or "Ringer's solution" 6

hours after the last dosage of misoprostol, at a rate of 12 drops/minute.

Caesarean section was done in the following situations:- A fetal cardiac pattern that is consistently non-reassuring or aberrant. Induction of labor (induction) that failed (patient received 4 doses of misoprostol 25 microgram with 6 hours interval and no labor pains nor cervical dilatation or effacement were noted). Contractile abnormalities that persist. The age, gestational age, and initial Bishop Score of the women were also collected.

Statistical analysis: The statistical tool SPSS version 23 was used to code and input the data. For quantitative variables, mean, standard deviation, median, minimum, and maximum were used, while for categorical variables, frequencies (number of instances) and relative frequencies (percentages) were employed. The unpaired t test was utilized to compare the groups. The Chi square (x2) test was utilized to compare categorical data. When the anticipated frequency is less than 5, the exact test was utilized instead. The ideal cutoff values for detecting successful induction were discovered using a ROC curve and area under curve analysis. A P-value <0.05 was considered statistically substantial.

RESULTS

Variable		Count	% of total patients
Indications for induction:	PASS DATE	40	40.0%
	ROM	29	29.0%
	PIH	20	20.0%
	DIABETEC	11	11.0%

Table 1: Indications for induction of labour:

The most common cause of induction was passed date (40 patients) 36 of them have delivered vaginally. The 2nd common cause was ROM (29 patients) 19 of them have delivered vaginally, then PIH (20 patients) 11 of them have delivered vaginally, then gestational diabetes (11 pregnant women) 4 of them delivered vaginally.

Variable		Mode of delivery				P value
		NVD		C.S		
		Count	%	Count	%	
Indications for induction:	PASS DATE	36	51.4%	4	13.4%	0.011
	ROM	19	27.1%	10	33.3%	
	PIH	11	15.7%	9	30.0%	
	DIABETEC	4	5.7%	7	23.3%	

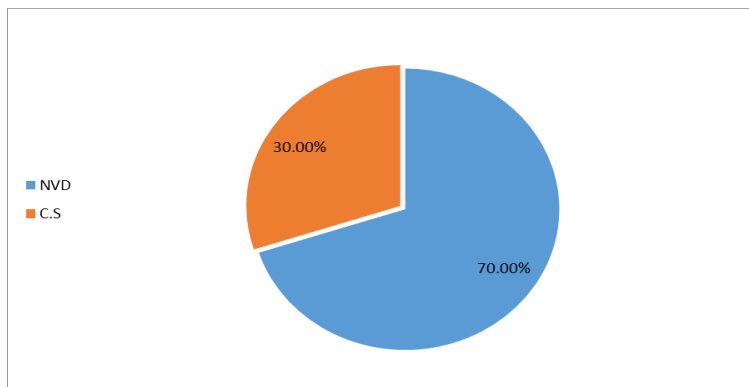**Table 2:** Indications for induction of labour and mode of delivery

Fig. 1: Mode of Delivery and percentage

70 pregnant women were delivered vaginally and 30 by cesarean section. Indications of C.S. were failed induction (patient received 4 doses of misoprostol 25 microgram with 6 hours interval and no cervical dilatation & effacement were noted), failure to progress, fetal distress or abruption placentae.

Parameter	Mode of Delivery										P value
	NVD					C.S					
	Mean	SD	Median	Minimum	Maximum	Mean	SD	Median	Minimum	Maximum	
Neonat-al weight	3035.24	623.56	3050.00	37.00	4000.00	3025.71	464.04	3100.00	2300.00	3900.00	0.950
GA	39.20	1.55	39.00	36.00	42.00	37.81	1.75	38.00	35.00	42.00	0.001
BMI	27.35	3.82	28.00	18.00	34.00	26.14	2.33	26.00	22.00	30.00	0.112
AGE	26.10	4.08	26.00	19.00	37.00	26.81	4.17	27.00	18.00	33.00	0.511

Table 1: Relation between clinical data and outcome (success of induction):

Patients delivered vaginally had an average age of 26.10 ±4.08 years, whereas patients delivered via C.S. had an average age of 26.81 ±4.17 years. There was no statistically relevant link between induction of labor success and

age, BMI, or infant weight. In addition, there was a statistically relevant link between gestational age and induction of labor success (P value 0.001).

Parameter	Mode of Delivery										P value
	NVD					C.S					
	Mean	SD	Median	Minimum	Maximum	Mean	SD	Median	Minimum	Maximum	
C.A (Cervical Angle)	122.74	15.75	125.00	75.00	150.00	90.43	11.86	89.80	70.00	130.00	< 0.001
C.L (Cervical Length)	27.94	5.04	29.00	15.00	40.00	36.71	5.63	38.00	22.00	45.00	< 0.001
BISHOP score	6.86	2.21	6.00	.00	10.00	4.57	1.63	5.00	.00	8.00	< 0.001

Table 2: Bishop score, ultrasonographic criteria and mode of delivery

Patients delivered vaginally had a median Bishop score of 6.8 ±6.21, whereas patients delivered via C.S. had a median Bishop score of 4.57 ±.1.63.

Parameter		Mode of delivery				P value
		NVD		C.S		
		Count	%	Count	%	
Funneling	Present	54	77.6%	0	.0%	< 0.001
	Absent	16	22.4%	30	100.0%	

Table 3: Funneling and mode of delivery:

We discovered a statistically substantial positive link between posterior cervical angle calculated by ultrasound funneling, Bishop Score, and induction success, as well as a statistically substantial negative association between cervical length and induction success, based on the previous data.

Test Result Variable(s)	Area under curve	P value	95% Interval		Confidence Cutoff value	Sensitvity (%)	Specificity (%)
			Lower Bound	Upper Bound			
C.A (cervical angle)	.939	<0.001	.870	1.008	99.75	91.8	90.5
C.L (cervical length)	.872	<0.001	.765	.979	34.5	91.8	81
BISHOP score	.821	<0.001	.717	.925	5.5	73.5	81

Table 4: Bishop Score's reliability in predicting effective induction vs. posterior cervical angle and cervical length: Using a cut-off value Bishop Score 5.5 showed Sensitivity 73.5%, Specificity 81%, while the posterior cervical angle using a cutoff value 99.75 degree showed Sensitivity 91.8 %, Specificity 90.5 %, and cervical length using a cutoff value 34.5 mm showed Sensitivity 91.8 %, and Specificity 81 %
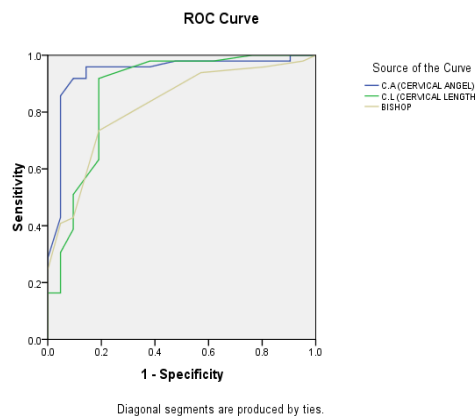

Fig. 1 : Bishop Score's reliability in predicting effective induction vs. posterior cervical angle and cervical lengt

DISCUSSION

There has recently been a rise in interest in developing new indicators to predict induction success.

The goal of this research was to see whether there was a link between preinduction ultrasonographic readings and Bishop score when it came to predicting a successful vaginal birth. In this trial, 100 pregnant women between the ages of 37 and 42 weeks were given 25g Misoprostol vaginally to induce labour owing to a missed due date, ROM, PIH, or gestational diabetes. The dosage was given every 6 hours for a total of 24 hours. Patients had a transvaginal sonogram followed by a digital cervical evaluation utilizing the Bishop Score before being inducted into labor.

Seventy percent of the women in our research were delivered vaginally, whereas thirty percent were delivered via C.S.

The Bishop score (p value 0.001), posterior cervical angle (p value <0.001), and ultrasonographic cervical length (p value <0.001) were all shown to be substantially associated to effective induction of labor in this research. In addition, there was a statistically substantial link between GA, funneling, and effective labor induction (P value <0.001).

There was no substantial variation in maternal age (26.10 ±4.08 vs 26.81 ±4.17 years), maternal BMI (27.35 vs. 26.14), or mean neonatal birth weight among women who had a successful induction and those who had a failed induction (3035.24 vs 3025.71 kg).

This agreed with Yang et al. [6] who studied induction of labor in 105 women as they found that The Bishop Score and cervical length were shown to have a strong relationship with effective induction.

Bishop Score of 5.5 had 73.5 percent sensitivity and 81 percent specificity for predicting effective induction of labor in our research.

Trans-vaginal ultrasound examination of the cervix had a sensitivity of 91.8 percent for predicting effective induction of labor at a cervical length of 34.5 mm and a specificity of 81 percent. At a threshold value of 99.75 degrees, the posterior cervical angle had an accuracy of 91.8 percent and a specificity of 90.5 percent.

As a result, the validity of the posterior cervical angle and cervical length as predictors of effective labor induction, according to our research, both of them were more sensitive and specific predictors of a successful induction of labor than the Bishop score.

Umut et al. [7] concluded that posterior cervical angle and Bishop Score can determine effective induction of labor.

Agreeing with our results also, Bastani et al. [8] At 37–42 weeks, 200 women with singleton pregnancies were inducted into labor. Prior to induction, all subjects had a transvaginal ultrasound. They discovered that cervical length assessed by trans-vaginal ultrasonography has the potential to replace the conventional Bishop score, given that such a facility is accessible when required, in order to compare the prognostic value of the approaches.

Also, Laencina et al. [9] Bishop Score was calculated by digital examination and cervical length was estimated by transvaginal ultrasonography in 177 women with a single pregnancy, 36–42 weeks of gestation, and a live infant with cephalic presentation before induction of labor with both prostaglandin and oxytocin. Similar to our results, they observed that the Bishop Score, cervical length, and parity all had independent effects in predicting the likelihood of giving birth vaginally within 60 hours. Cervical length was a better predictor than the Bishop score, as we discovered.

Tan et al. [10] in their Prospective research was conducted on 249 women who had been hospitalized for labor induction. The researchers discovered that the Reciever Operating Characteristic (ROC) curves for cervical length and Bishop Score both predicted Cesarean deliveries. They also discovered that trans vaginal sonography was substantially lower uncomfortable than digital assessment for determining the Bishop Score.

In women undergoing induction of labor, Rane et al. [11] discovered that pre-induction cervical length gives substantial independent prediction of induction-to-delivery interval within 24 hours, chance of vaginal birth within 24 hours, and probability of caesarean section. Sonographic metrics beat the Bishop score in predicting the result of induction.

Peregrine et al. [12] found They found the same outcomes when they looked at induction of labor in 267 women who were 36 weeks or more pregnant at the time. They discovered that parity, BMI, height, and ultrasonic transvaginal cervical length (p <o.oo1) are the most reliable indicators of the likelihood of a caesarean birth after induction of labor.

Roman et al. [13] observed that Cervical length by ultrasonography is not a stronger predictor of the outcomes of labor induction than Bishop Score.

Rozenberg et al. [15] The Bishop score was shown to be more accurate than cervical length in determining the efficacy of induced labor in a trial of 166 women who were given prostaglandins.

CONCLUSION

The cervical length and posterior cervical angle, as determined by sonography, may predict effective labor induction and can be used instead of the Bishop Score.

Conflict of interest : none

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