

University of Medicine and Pharmacy CRAIOVA

DOCTORAL SCHOOL

ABSTRACT

The role of transperineal ultrasound in the second stage of labor

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Key words: fetal head position, labor, transperineal ultrasound, ultrasound markers

General considerations

Birth is one of the most important experiences of all mankind. Despite the complexity and equipment of modern obstetrics is important to remember the simple objective of each pregnancy, namely the birth of a healthy baby from a healthy mother. The exhaustive understanding of the process of birth, possible disruptions and appropriate management guidelines are essential to achieving this goal. Current obstetric practice strives to avoid difficult vaginal deliveries. Although it is the "gold standard" for midwifery practice, medical training mainly based on digital transvaginal examination is a subjective assessment with several limitations.

Over the last decade new ultrasound machines have been designed and have become increasingly available, compact, mobile, high resolution to allow assessment at the patient's bedside. As a result, most labor and delivery wards have the opportunity of continuous ultrasound evaluation. This technology has become so easy to use that trained non-professionals can provide basic ultrasound services of high quality.

In recent years, several reports have suggested a role for ultrasound in the monitoring of patients in labor. An increasing amount of information is accumulated on the labor ultrasound, which is a relatively new use. Labor ultrasound has allowed a deeper understanding of the

complex physiology of the mechanism of birth. It has been proved that it can provide objective information on different stages of labor dynamics, and can also be used to assess the prognosis for or instrumental vaginal birth. Several studies have developed basic ultrasonographic parameters and studied their evolution during labor both individually and in combination to provide an objective measure of progression of labor. Transperineal ultrasound could allow objective quantification of fetal head descent in the birth canal.

State of knowledge

Chapter II GENERALITIES ON THE BIRTH MECHANISM - reviews general concepts about labor periods and birth mechanism and reproduces the statistical and epidemiological data on birth by parity, duration of labor, and qualification of healthcare professional which monitor birth.

Chapter III Overview of the role of ultrasound in obstetrics .- succinctly describes the data on the safety of obstetric ultrasound, underlining the non-invasive nature and lack of adverse effects on mother-child binome of this investigation. Also presented are general indications of obstetric ultrasound and technical data on physical principles, logistics and documentation.

Chapter IV Overview of the role of ultrasound in labor –the most extensive chapter of the general part of the thesis describes in detail ultrasound markers to be used in the personal evaluation the study group using data from the most significant studies and articles,. This chapter contains two important chapters, ultrasound during prelabor (new field that tries to go one step further in terms of precocious labor prognosis), and ultrasound during labor (with particular importance in understanding the author's personal contributions).

PERSONAL CONTRIBUTION

Objectives of the doctoral thesis –

- Assess the feasibility of assessing the exact position of the fetal head during the 2nd period of labor using transperineal ultrasound.
- Assessment of the usefulness of transperineal ultrasound in differentiating patients who will

require caesarean section for the lack of progress of labor from patients who will have a vaginal delivery

- Analysis of improvement of neo-natal outcome using this technique
- Temporal variation of ultrasound measurements in normal labor vs labor dystocia in fetuses with occiput anterior or posterior
- The relationship between different ultrasound parameters
- Cut-off values that can help clinicians to choose between natural delivery or caesarean section
- Psychological benefits of patient who is able to watch the ultrasound screen as the fetal head descent and position are objectively assessed

Methods - The study group included 322 patients in the 2nd stage of labor, with gestational age over 37 weeks and estimated fetal weight 2500 g, single fetus pregnancies, cranial presentation, emptied bladder. Exclusion criteria were the indications for cesarean established due to antepartum maternal or fetal pathologies associated. Sonographic measurements we used an ultrasound probe 3,5-5MHz which was introduced in a glove covered with ultrasound gel. TPU (transperineal ultrasonography) was performed immediately after clinical examination and the data were obtained during uterine contractions. TPU was carried out at different times in accordance with the stages of labor: every hour until complete dilatation (the first phase) and every 10 minutes at complete dilatation (the second stage). Clinical examination and TPU for the same patient has been practiced by different examiners.

Patients were examined in the delivery room. Patients were informed of the the experimental nature of transperineal ultrasound and agreed to be evaluated in this way. The probe was first positioned suprapubic using occiput position to identify signs of fetal skull (orbits, thalamus), then the probe was positioned across the labia to evaluate meadiene line angle formed between the cerebral median line (defined as a hyperechoic line between the two brain hemispheres) and anterior-posterior axis of the maternal pelvis. This angle decreases when the occiput rotates to the symphysis pubis.

To examine patients the ultrasound machines used were GE Voluson Pro (multifrequency convex probe 3D/4D model RAV 4-8 L, multifrequency convex probe 2D model 4C) and ultrasound GE Logic.

Results and discussions - The study included 322 parturient for which we analyzed: the way of delivery, variety of position, weight at birth, Apgar score, the average number of examinations, the time between the first examination and delivery, the correlation between clinical examination and ultrasonography regarding fetal skull station and rotation and the 5 sonographic parameters. The following results were obtained:

- At the 28 patients who gave birth through caesarean section accounting for 8,69% of the study group, the indications for the extraction were: the lack of progress of labor, acute fetal distress uncorrected medical and cefalo-pelvic disproportion through fetal macrosomia;
- 26 of the 28 patients who gave birth to through OCST were primiparous.
- The percentage of delivery through caesarean section obtained in our study falls within WHO recommendations (10-15%) and is significantly lower than the national average (about 30%) or the percentage of university centers exceeding 50%. However bear in mind that in our study were excluded the indications of cesarean set antepartum due to maternal or fetal associated pathology.

An important factor that influenced the evolution of labor was parity, resulting in significant differences between primiparous and multiparous in studied parameters.

A strong point of this paper is the high percentage of primiparous studied, given that the majority of dyskinetic labors and instrumental deliveries occur in this group of patients. Ultrasonographic monitoring of these patients in labor has allowed for a percentage of only 9 % of deliveries to be made by caesarean section, thus checking one of the objectives of the thesis: the usefulness of transperineal ultrasound in differentiating patients who will require caesarean section for the lack of progress of labor from patients who will have a vaginal delivery.

Analyzing the literature, digital pelvic examination in labor has a higher accuracy in large dilatation in the determination of the position and station of the fetal skull. However, from the same point of view, ultrasound was clearly superior in the evaluation of the same parameters, reducing also the large differences between primary physician and residents examinations. The need for accurate assessment of fetal skull position and station early in labor derives from the

possibility of establishing a diagnosis of early dyskinesia based on the parameters proposed by transperineal ultrasonography.

Data from our study indicate that dilatation of the cervix does not correlate with fetal skull station nor to multiparous or to primiparous, meeting the angle corresponding to station 0 (120 °) both at large dilatation and at small dilatation, thereby supporting the use of transperineal ultrasound for proper diagnosis of fetal skull station. However, there is a difference between primi and multiparous, namely the different evolution of the progression angle.

Based on the consensus that station 0 is consistent with a progression angle of 120 ° and correlating progression angle values with direction angle values (direction of progression) in our study we obtained values of approximately 90 ° to the direction of skull progression corresponding to engagement of the fetus. These values were consistent at both primiparous and multiparous.

Considering ultrasonographic parameters only in cesarean delivery we notice their different evolution in the labors that were resolved through vaginal delivery. Thus, with reference to our previously established cut-off values for the four parameters we see that the majority of patients who delivered by cesarean, the cut-off value was not reached, the exception to this rule is represented by measurements in patients with occiput persistent posterior.

The result of this thesis is to propose the idea that the combination of the four ultrasound parameters with their values cut-off in terms of labor can produce a sonopartogram installed to serve as a model for further studies, exceeding the threshold for each individual parameter studies and focusing on establishing a protocol on ultrasound in monitoring labor.

Conclusions - Despite significant advances in clinical obstetrics, assessment of the fetal head and strategies of prediction regarding the method of delivery still remains a matter of controversy. TPU was at first considered a useful tool for clinicians in the management of labor and delivery.

Ultrasound used in our study allowed us to:

- dramatically increase the accuracy of diagnosis,
- increase the safety of waiting

- Take a more timely decision regarding cesarean section, depending on the position of the fetal head.

Ultrasonographic assessment of fetal position during labor is feasible in a delivery room and is useful in the prediction and diagnosis of a prolonged / extended labor. Ultrasonography seems to be a solution to planning and monitoring of labor, and at least equally in guiding instrumental deliveries, because: it is available, we have small and compact ultrasound, is safe, non-invasive and provides an immediate and most important objective outcome. Enables recording of data and is easy to learn and simple to use.

Using the TPU in the measurement of the progression is:

- Objective (using precise ultrasound signs for true evaluation of fetal head station)
- Reproductive
- Non invasive
- Easy technique

Analyzing the results of the study there were registered as follows:

- Precise identification of fetal head position variety, superior to clinical assessment
- A significant linear association was established between digital clinical assessment and measurement of the angle of progression in the 2nd stage of labor (P <0.001).
- An angle of at least 120 ° measured during second stage of labor was associated with spontaneous vaginal birth.
- TPU provides an objective method to assess the fetal head descent during 2nd stage of labor.
- Analysis of the incidence of cesarean delivery for fetal distress and Apgar score in both groups had no statistical significance. Immediately fetal prognosis is apparently not improved by using this technique.
- All patients tolerated TPU into labor and apparently conferred confidence to the patients.
- Our results showed that transvaginal assessment of fetal head station is not reliable, which means that clinical training should be promoted.

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