

Ultrasound – Useful Tool in Labor Critical Decisions

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The normal expected outcome of labor is spontaneous vaginal delivery without instrumental intervention. Alternatives to spontaneous labor and vaginal delivery may be needed in some conditions that should be diagnosed and managed as early as possible. Some of them are usually evident before onset of labor, but others, as protraction / arrest disorders, develop during labor or the delivery period. In such cases, urgent operative delivery may be required, including primary Cesarean section, instrumental delivery (forceps or vacuum), or Cesarean section after failed instrumental delivery. The outcome of these active management operative techniques in labor is mainly influenced by two important issues: the timing of diagnosis and the safety of the intervention. Appropriate and early decision making are essential, because of the fetomaternal risk. This currently relies on the accuracy of clinical diagnosis regarding fetal head progression, position and rotation [1,2].

Extensive research showed that digital pelvic evaluations are subjective and poorly reproducible between clinicians [3] and imprecise in relation with fetal head position or progression [4], when verified using modern birth simulators. Obviously, we need objective diagnostic tools to increase precocity in prediction of complication and achieve a better selection for patients at risk for interventional obstetric maneuvers or surgical birth. Why not ultrasound? Important progress in clinical obstetrics and maternal fetal medicine in the last decades have been made using this investigational tool. Increasingly available, safe and non-invasive, ultrasound scans in pregnancy offers a high degree of objectivity indifferently the gestational age. Ultrasound-guided interventions are frequently used in pregnancy and also this technology is suitable for emergency situations, as it offers immediate result. Compact and mobile machines have been developed, able to offer service at the patient's bedside in a busy labor ward. It seems therefore that monitoring the labor and "guiding" instrumental delivery can be achieved using intrapartum ultrasound. Some of the potential advantages have been already demonstrated, as the objective evaluation and recording of labor, an increased security related to the critical decisions - especially interventional obstetrics. Another advantage is the fact that is a quick to learn technique and simple to use by the medical personnel involved in the birth process (specialists, residents, midwives). In the following, we will try to summarize and highlight some of the medical evidence related to these aspects. However, we should keep in mind that generally the studies are limited by the small number of cases especially with interventional and operative delivery and included only fetal occipitoanterior position.

Fetal head position is an important parameter in labor management and essential in conducting instrumental delivery, because of the potential fetal traumatic risk. Generally, the studies are similar in design and report significant higher error rates in case of clinical evaluation when compared to the rapid and simple ultrasound technique. The most "optimistic" results regarding the concordance between vaginal digital and transabdominal ultrasonographic examinations of the fetal head position reveal an agreement of about 70% between the two exploration techniques only in the second stage of labor and with a 45 degrees variation tolerated [5-11]. The potential advantages of ultrasound use in guiding instrumental delivery by fetal head position determination have been demonstrated [12,13], and consecutively the authors concluded that transabdominal ultrasonography should be performed routinely before vacuum extraction or forceps delivery.

Transabdominal and transperineal evaluations may be used for depiction of fetal head engagement and progression as precise techniques irrespective of caput succedaneum formation or the presence of significant molding. Many studies provided sonographic data regarding fetal head progression in an infrapubic or translabial approach with the parturient in a similar position as used for the clinical assessment in labor. The fetal head progression evaluated in sagittal infrapubic or transversal translabial planes was demonstrated as a quick, objective and reproducible way of increasing the accuracy of the assessment compared to clinical digital evaluation; linear and angular measurements proved useful: distance of progression [14], head direction [15-18], angle of progression [19-21] and head-perineum distance [22,23].

The internal rotation during the fetal head descend may be assessed by surface rendering of the fetal skull [24], or easier by appreciation of the "midline angle" between the anterior-posterior axis of maternal pelvis and cerebral midline echo in the perineal transverse plane [18]. Therefore, the application of ultrasound in labor may serve not only to monitor the progress of labor, but also is of crucial importance in performing a safe operative delivery and can help in the prediction of whether a vaginal delivery would be successful.

Lately three-dimensional assessment software designed for labor measurements was developed and all the measurements mentioned above may be calculated based on a single three dimensional volume scan, stored, superimposed and displayed with previous set of measurements in order to visually appreciate any significant changes in fetal head progression and rotation during labor.

Nowadays, we have increasing evidence that ultrasound can be a valuable monitoring tool for the physicians in order to take clinical decisions with enhanced confidence and intervene earlier when needed. Also this technique permits to confidently and automatically document the entire labor procedure with objective ultrasound data. The ultrasound machines used in this process does not necessarily require special features of resolution, Doppler or 3D/4D, the learning process is shorter than with digital examination [25] and the methods are highly reproducible [26,27]. Therefore little supplementary costs are needed to implement clinical ultrasound examination in routine practice and/or educational purposes.

Do we have enough or is it room for more? We can still ask for much more regarding the long-term expected efficiency of the techniques. Only large population randomized studies would answer the questions if the routine use of ultrasound in labor reduces the birth-

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related fetomaternal morbidity and if it offers a psychological benefit to the parturients in terms of increasing the confidence and satisfaction of patients objectively evaluated during labor. Another interesting aspect to investigate is whether this technique will meet the clinician's confidence. A significant number of failed instrumental deliveries attempts performed by obstetricians blinded to the ultrasound unfavorable results may be needed and thus we may face ethical dilemmas in order to prove the direct superiority of the machine over the human skills.

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