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Reassessing the Labor Curve in Nulliparous Women

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Objective: To examine the pattern of labor progression in nulliparous parturients in contemporary obstetric practice.

Methods: The authors analyzed data from an earlier study in which detailed labor and delivery information were collected. The study group included 1162 women who delivered vaginally between 1992 and 1996 and met the following criteria: nulliparity, term pregnancy, singleton vertex presentation, spontaneous onset of labor, birth weight between 2500 and 4000 g, cervical dilatation < 7 cm at admission, and duration of labor from admission to delivery > 3 hours.

Results: The authors' average labor curve differed markedly from the Friedman curve. The cervix dilated more slowly during the active phase. It took approximately 5.5 hours from 4 cm to 10 cm, compared with 2.5 hours under the Friedman curve. No deceleration phase was observed. The 5th percentiles of rate of cervical dilatation were all below 1 cm/h. The 95th percentile of time interval for fetal descent from station +1/3 to +2/3 was 3 hours during the second stage.

Conclusions: The pattern of labor progression in contemporary practice differs significantly from the Friedman curve. The diagnostic criteria for protraction and arrest disorders of labor may be too stringent in nulliparous women.

Commentary

The vocabulary and practice of clinical obstetrics owe much to the work of Emanuel Friedman. His eponymous labor curve has guided obstetric management in the United States since it was first described in 1954.^[1] The concepts of *latent phase*, *active phase*, *protraction*, and *arrest disorders* are Friedman's. His lifetime of research and practice, promulgated in over eighty publications, are most clearly expounded in his book *LABOR: Clinical Evaluation and Management*.^[2]

This seminal work features a historical review of studies on human parturition from 1861 to 1976. Friedman acknowledges his debt to the pioneering research performed by Leroy A. Calkins (from Kansas) between 1930 and 1944. Calkins kept detailed records on over 16,000 patients and -- he had a Ph.D. -- was probably the first obstetrician to analyze his data using modern statistical techniques. In 1955, he published a very readable book summarizing his life's work.^[3] Calkins considered the first and second stages of labor to be independent of each other. On physiologic grounds, he believed the length of the first stage to be determined solely by the strength of uterine contractions and the resistance of the cervix; neither maternal age, size, nor fetal size influenced the first stage. Using criteria similar to what is now called the Bishop Score (engagement of the head, effacement, firmness of the cervix) and rating the contractions as poor, fair, or good, he drew up a [table](#) to estimate the length of the first stage at the time of admission. The subjectivity of these parameters limited the application of Calkin's method to clinical practice.

Friedman's contribution was to recognize that, of all the clinical features of the woman in labor, only cervical dilatation and fetal descent were useful in assessing the progress of labor. By plotting these parameters graphically as a function of time, Friedman observed an S-shaped curve. Although the rate of change is specific to each patient, Friedman combined measurements from many women undergoing labor in an attempt to define normality in statistical terms.

There are in fact several Friedman curves. His purpose was at first academic: to provide baseline data that could be used for experimental comparisons between groups of patients. By analyzing a select group of women at term, all with adequate pelvis, vertex presentation, well-flexed occiput anterior position, whose labors progressed normally without interference, conduction anesthesia or heavy sedation, and who delivered spontaneously or by outlet forceps, Friedman defined a composite ideal labor course. The ideal nulligravida had an average latent phase of 6.1 hours, an active phase of 3.4 hours, and a second stage of 0.76 hours. What was more notable, however, was the large standard deviation of all these measurements.

Between 1969 and 1971, Friedman and Kroll^[4,5] published composite data on the course of labor, based on observations from 10,293 women representing a cross-sectional sampling of the gravid population at large. This last iteration of the Friedman data is *the* Friedman curve that has been used in clinical practice. The average nullipara has a latent phase lasting 6.4 hours, an active phase of 4.6 hours, a maximum dilatation of 3.0 cm/h, and a second stage of 1.1 hours. Once again, the wide range of normal was emphasized. More importantly, from a clinical perspective, Friedman explicitly defined the limits of normality and used these limits in his classification of protraction and arrest disorders. These numbers represent the 5th or 95th percentile of the measured variable. In the nullipara, a latent phase > 20.1 hours, an active phase >11.7 hours, maximum dilatation <1.2 cm/h, a deceleration phase >2.7 hours, maximum descent < 0.96 cm/h or a second stage > 2.9 hours were considered abnormal enough to warrant investigation and intervention of some sort.

Friedman's data and definitions have proved useful in standardizing the management of patients in labor but were never intended to be applied without thought. The concept of normalcy is population-based, and it should come as no surprise that other authors, from different counties, or using different management styles, have observed different characteristics in their patients.

In Texas, the use of epidural analgesia lengthened the average active phase of labor from 5.0 to 6.0 hours in nullipara.^[6] In Ireland, using an active management protocol in place since the 1960s, the mean duration of the first stage was only 4.9 hours, and 97.2% of nulliparas delivered within 12 hours of admission, despite an epidural rate of 76%.^[7] In New Mexico, Rogers and colleagues, using the Dublin active-management protocol, were able to shorten the length of nulliparous labor from 11.4 hours to 9.7 hours and deliver 75% of their patients within 12 hours of admission.^[8]

The old adage that the poor workman always blames his tools is apt in this context: Friedman's curve is just a tool. Whatever one's approach to the management of labor, whether we believe in the existence of a deceleration phase or not, partograms inspired by Friedman's work serve as a reminder not to neglect the patient. Expectant management is not the same as doing nothing unless there is a problem, or until after office hours; it means making a conscious decision to stay the course, and this can only be done by regular and thoughtful assessments of every woman in labor.

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