The Influence of Maternal Position on Time of Spontaneous Rupture of the Membranes, Progress of Labor, and Fetal Head Compression

Roberto Caldeyro-Barcia, M.D.

ABSTRACT: The results of the Latin American Collaborative Study of maternal Position in Labor are presented. 225 women comprised the “horizontal” group and 145 were allowed to assume the position of choice during labor. All women were matched otherwise and had normal pregnancies and onset of labor. Maternal position had no effect on time of spontaneous rupture of membranes, Labor was 36% shorter in primiparous women and 25% shorter in all women who were upright during labor. Maternal position had no effect on fetal head molding or Type I and Type II heart rate patterns. The upright position was preferred by 95% of women. (Birth Fam J 6:1, Spring 1979)

As many people are aware, until late in the 18th Century most women in the world adopted an upright position during the first, second and third stages of labor. This might have been standing, sitting, kneeling or squatting, but always with the trunk more vertical than horizontal.

In 1738, the French obstetrician, François Mauriceau, proposed the recumbent position in bed to replace the sitting position on the birth stool. Since Mauriceau was the obstetrician to the Queen of France, he was able to impose this position, which then became popular throughout Europe and spread across the Atlantic. According to the book of Mauriceau, the recumbent position was introduced to facilitate the management of labor by the accoucheur and NOT be-cause it might be beneficial for the mother or the fetus. Vaginal examinations, obstetrical maneuvers and the application of the Chamberlen forceps were all easier to do when the woman was recumbent in bed. The first written document proposing that the knees be drawn up was the 1824 book, System of Midwifery, by William Pott Dewees, M.D., a Philadelphia obstetrician. He insisted that delivery is best achieved when the mother is lying on her back and her knees are drawn up.

The “Lying-In Bed” continued as the major posture for parturition during the 19th and early 20th Centuries, when most births were taking place in the home. As hospital births increased, the bed was replaced by the delivery table, and the woman lay on her back in the lithotomy position for the birth. The use of both the delivery table and the lithotomy position has spread, during this century, to modern, up-to-date maternity hospitals in most of the civilized areas of the world.
Figure 1. In Europe the most common position for delivery was using the birth stool. There were many varieties, but all followed the pattern of the one shown here.

Figure 2. An Iroquois Indian woman giving birth in the nineteenth century. (Englemann, 1882)

Figure 3. Squatting position among the Tonkawa Indians (U.S.A.) (Englemann, 1882)

Figure 4. An ancient ceramic from Peru, showing a woman in second stage, her husband behind her giving physical and moral support, a midwife attending. This position was used in different cultures all over the world.
Figures 5 and 6. Here, Dr. Caldeyro-Barcia's eldest daughter, in labor during her third pregnancy, demonstrates the sitting position, which she preferred most of the time, and standing and walking, which she did from time to time. Her husband and father are with her. Her uterine contractions and the fetal heart rate were monitored continuously to provide data for the study.
The lithotomy position is not natural or convenient for labor. It causes well-known ill-effects, such as the compression by the uterus against the spine of the inferior vena cava, aorta, iliac arteries and ureters. This pressure completely disturbs the maternal circulation and the output of urine. Disturbances of the maternal circulation have an unfavorable and distressing effect on the fetus.

A return to a natural position was started in New York by Forrest H. Howard, M.D., in 1954. He designed a table with a back that could be lifted from the horizontal to the vertical position, so that the mother was sitting upright during labor. His table did not become popular, perhaps because he insisted that the back of the table be completely vertical. This position is not very comfortable for the mother.

Other tables have adjustable back rests and the angle can be varied from 15 to about 55 degrees. Dr. Newton found that women were most comfortable when their backs were between 30 and 45 degrees up from the horizontal position.

At our center in Montevideo, we use an adjustable table. The inclination of the back and the position of the foot holders can be changed. The woman is free to move arms and legs, and there are hand grips for helping her to push during second stage. With this type of table, the obstetrician or midwife also has great facility to maneuver to attend the birth of the child.

The Latin American Collaborative Study on Maternal Position During Labor

The Latin American Collaborative Study on Maternal Position During Labor represented the coordinated efforts of 11 Maternity Hospitals in 7 countries: El Salvador, Costa Rica, Venezuela, Brazil, Uruguay, Argentina and Chile. The project was directed by R. Schwartz, G. Diaz, R. Fescina and R. Caldeyro-Barcia.

These were the conditions fulfilled by all the subjects included in this study:

Low-risk labors: uncomplicated pregnancies

Labor started spontaneously at term

Cervical dilatation progressing normally from 3 to 5 cm

Single live fetus, cephalic presentation

Anterior position, unruptured membranes

No cephalo-pelvic disproportion

Normal pelvis

These are the most favorable conditions you can find. They wanted to have this homogeneous group in order to rule out as far as possible any variables which could interfere with the study. The only factor which changed was the mother’s position in labor.

The mother’s position during labor was selected at random; at each hospital, 50% of the laboring mothers remained in the recumbent position in bed during the first stage. This was the usual practice at these hospitals. The other 50% of the mothers were allowed to stand up, walk, or sit or lie in bed as they chose. Only 5% of the mothers preferred to lie down; 95% preferred to stand, walk or sit.

The two groups of mothers (“horizontal” and “vertical”) were carefully matched to assure that there were no significant differences in any other variables which might influence the course of labor. The two groups were matched for parity (there were equal numbers of mothers with 0, 1, 2, 3, 4, 5, 6 and 7 previous pregnancies), maternal weight, height, age, weight gain. In addition, neonatal data were matched for these factors: birthweight, height, loops of umbilical cord, perimeters of head, abdomen and thorax. There were no significant differences found between the vertical and the horizontal groups for any of these factors.

There were 225 women in the “horizontal” group and 145 in the vertical group.
The management of the labors was conservative. The membranes were not ruptured artificially. No medication was given routinely, no oxytocin, sedatives, analgesia, anesthesia, except local anesthesia for episiotomy. Less than 3% of labors required medication, and the data from these medicated labors are not included in this study. This very low need for medication can be explained by the fact that all women and their husbands were prepared by the psychoprophylactic method, and that many could select favorable positions for labor.

Results

Figure 7 illustrates the phase of labor at which the membranes ruptured spontaneously in the two groups. In the great majority of labors (whether spent in the horizontal or vertical position) spontaneous rupture occurred at an advanced phase of labor. In 85% of cases, spontaneous rupture occurred at 9 cm or beyond.

Now, what are the differences in uterine contractions occurring when the woman is lying on her left side and on her back? As seen in Figure 8, this graph
of uterine contractions occurring during 30 min. of the labor of a woman typical of those in our study, contractions are stronger but less frequent when the woman is on her side, than when on her back.

A similar change is found when the woman goes from a supine position to a standing position, except that there is no difference in the frequency of contractions. The intensity of contractions is greater, and the frequency of contractions is about the same when the woman is standing, than when she is lying on her back. Therefore, the efficiency in dilating the cervix is much greater when standing than when supine or in the side-lying position.

Another illustration of the difference in labor progress accomplished in the standing and supine positions is the labor of a 22 year-old primigravida at 37 weeks’ gestation. Pregnancy had been normal and her membranes had ruptured spontaneously at the onset of labor. Delivery was spontaneous after 4 hrs. 15 min. of labor. Apgar scores were 8 at 1, 5, and 10 min. of age. The mother stood and lay supine alternately for 30 min. periods. Dilatation and intensity of contractions were far greater while she was standing; frequency of contractions did not change.

Uterine activity, measured in Montevideo Units, is computed by multiplying the frequency of contractions per 10 min. by the intensity in mm Hg. The mean uterine activity in 20 normal full-term labors spent in the horizontal position was 129 Montevideo Units; that of 20 normal full-term labors spent in the vertical position was 160 Montevideo Units. Contractions are more efficient in the vertical and sitting positions when compared to the horizontal position. This means that the work of the uterus results in more dilatation when the woman is vertical or sitting than when she is horizontal, by 1.7 to 1.9 times.
Figure 9. Influence of maternal position on the duration of labor from 4-5 cm to 10 cm in primiparas only. This graph shows that those primigravidas who spent the first stage of labor in the vertical position had shorter first stages by a median length of 78 minutes (or 36% shorter). (Diaz et al., 1977)

Figure 10. Influence of maternal position on the duration of labor from 4-5 cm to 10 cm in both primiparous and multiparous labors. This graph shows a similar difference in the duration of the first stage when primigravidas and multigravidas were combined in the study. The vertical position was associated with a shorter median duration of first stage by 45 minutes, or 25%. (Diaz et al., 1977)
What is the influence of maternal position on the duration of the first stage of labor? In order to make for more precision in our study, we measured the length of time beginning when the mother was at 4 to 5 cm. of cervical dilatation and ending when she was at 10 cm. We divided our results to show the influence of maternal position on the duration of the first stage for primigravidas only and for all subjects in the study.

Figure 9 indicates those primigravidas who spent the first stage of labor in the vertical position had shorter first stages by a median length of 78 minutes (or 36% shorter).

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Figure 11. The effect of maternal position in labor on incidence of caput succedaneum

In the upright position the effect of gravity on the fetus is synergistic with effects of uterine contractions and of bearing-down efforts. In fact, gravity adds 35 mm Hg to the pressure exerted by the fetal head on the cervix in the first stage or on the birth canal in the second stage of labor.

This was well-shown by Dr. Mendez-Bauer in 1976. He placed a balloon between the fetal head or bag of waters and the cervix, and recorded the pressure on that balloon when the woman was supine and when she was standing. Pressure in the balloon increased by 35 mm Hg when the woman changed from the supine to the standing position. This increase in pressure may explain the increased efficiency of uterine contractions while standing.

Even though, as Mendez-Bauer reported in 1976, the vertical position of the mother causes an increase in pressure on the fetal head, the vertical position causes no increase in the incidence of caput succedaneum (swelling of the tissue over the fetal head caused by pressure during labor) when the membranes are intact. This is shown in Figure 11.

Another indication of fetal head compression is the number of Type I Dips or early decelerations in the fetal heart rate associated with uterine contractions. When the incidence of Type I, Type II and combined Types I & II were compared between vertical and horizontal positions, there were no significant differences between the two groups in the incidence of each type of dip.

Disalignment of cranial bones (molding) of the neonate was not associated with maternal position during labor. Disalignment in one or more cranial sutures (sagittal, coronal and/or lambdoid) was found in 66% of neonates whose mothers spent labor in the vertical position; 69% in the horizontal position. The difference is not significant. Therefore, in conclusion, the vertical position of the mother...
in labor is not significantly associated with an increase in caput succedaneum, fetal heart rate decelerations, or increased molding of the neonatal head. However, as I reported in 1977 at the ICEA Eastern-Southern Regional Conference, early amniotomy is associated with a shortening of labor by 28% and increased molding of fetal head by three times.

What about the comfort of the mother? Does the fact that her labor is shorter when she is in the vertical position mean that her labor will be more painful? The fact that 95% of mothers chose to be vertical when they were given the choice between vertical and horizontal indicates that they were probably more comfortable when upright. We found that when mothers spend time in different positions in labor (supine, lateral, sitting and standing) they report less or equal pain and greater comfort in lateral, sitting and standing positions than supine.

Summary

The conclusions which may be drawn from our studies are that in normal, spontaneous labors, the vertical positions facilitate the progress of labor by increasing the strength of contractions and the rate of cervical dilation. Thus, in upright positions, labor is effectively shortened. The frequency of contractions is unaffected by maternal position, as is the percent of fetuses with head compression and late deceleration fetal heart patterns, and the percent of fetuses with caput succedaneum. The upright positions are reported to be associated with less pain during labor and are preferred by women when they are given their choice of position in labor.

REFERENCES