

# PHYSIOLOGICAL AND PSYCHOLOGICAL BASES FOR THE MODERN AND HUMANIZED MANAGEMENT OF NORMAL LABOR

Lecture presented by

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PHYSIOLOGICAL AND PSYCHOLOGICAL BASES FOR THE MODERN AND  
HUMANIZED MANAGEMENT OF LABOR

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I. PSYCHOLOGICAL ASPECTS

A. The education, training and psychoprophylaxis of mother and father

Before and during gestation the mother and father are educated about the events that will occur in pregnancy, labor, delivery and after the birth of the child. They are trained in the active participation they should have in these stages of parenthood. The education to start early the interaction of the mother (and father) with the newly born is discussed in Section IX.

By means of appropriate education and psychoprophylaxis, fear of labor disappears and is replaced with the feeling of happiness inherent to motherhood. The normal pregnant or parturient woman is not considered as a "patient" but as a mother, i.e. a healthy woman having a child. She has special physiological, psychological, affective and social needs which should be properly fulfilled.

Normal labor is not regarded as a medico-surgical procedure in which medication is routinely administered and tochurgical maneuvers are performed. Normal childbirth is considered as a physiological and natural episode of life, which should be a source of happiness for the family.

The mother and father should become familiar with the environment where childbirth will occur and with the person(s) who will be in charge of the attention of labor, who should be fully trusted by the parents.

## B. Family centered childbirth

The active and informed participation of the mother and father during labor and the care of the newly born. The fully conscious mother is the protagonist of labor. The father provides her with emotional, psychological and physical support (Figures 1, 2, 3, 4, 5, and 9).

The active participation of the father in labor and childbirth induces his emotional involvement. The sharing of this event with the mother markedly strengthens the loving links between them. The participation of the father (and of other relatives selected by the mother) greatly contributes to relieving the pain and anxiety which she may feel in a less humanized environment and to improve her wellbeing during labor.

## II. AVOID IATROGENIA IN THE CARE OF LABOR

### A. Labor surveillance without unnecessary interferences

At least one member of the perinatal team should be present, keeping a close, continuous surveillance to insure that the health condition of mother and father are good and that labor is making a normal progress (Figure 1).

The best available methods should be employed for this surveillance avoiding to interfere with maternal wellbeing and the family-like environment.

If all maternal and fetal functions are normal and labor is making satisfactory progress, the perinatal team should not interfere with the normal physiology of childbirth: unnecessary medications and routine maneuvers should be avoided.



Fig. 1

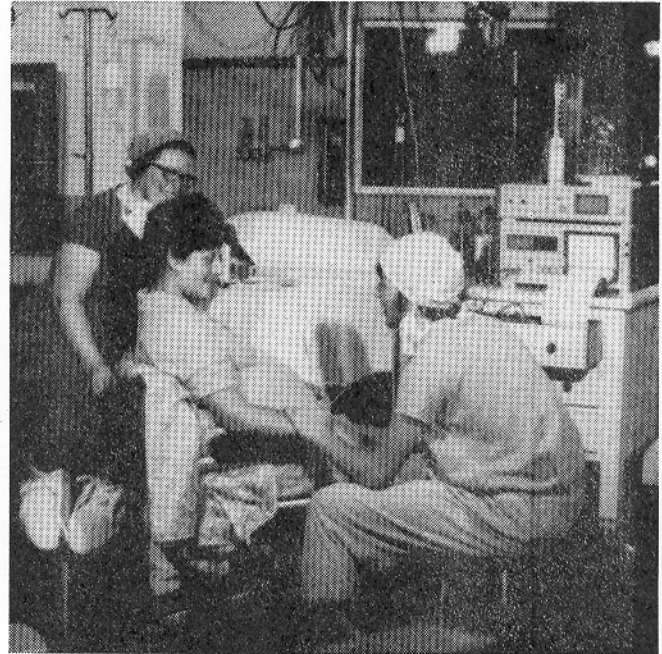


Fig. 2



Fig. 3

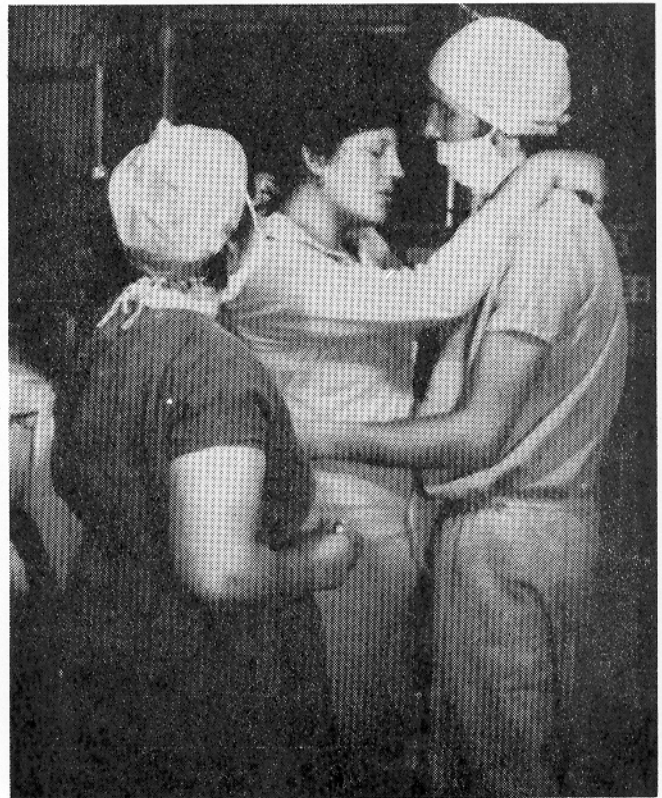


Fig. 4

Legend for Figures 1, 2, 3 and 4:Humanized management of the First Stage of Labor

The parturient woman is the protagonist of labor and is free to choose the most comfortable position and to change it a her wish.

The husband always actively participates in providing affective and physical support to his wife (Figures 1 through 4). In Figs. 2, 3 and 4 (which correspond to the same labor), the smiling mother of the parturient woman also cooperates in supporting her. At the request of her daughter, she massages the suprapubic (Fig. 3) or lumbo-sacral (Fig. 4) area during uterine contractions.

Figures 1 and 2 correspond to the interval between two uterine contractions. The parturient woman is sitting in a comfortable cushioned arm chair; she is smiling and speaking with her husband who is caressing and kissing her. In Fig. 1 the obstetrician is surveying the progress of labor in a partogram and watching the monitor which graphically records uterine contractions and fetal heart rate. Figure 3 was obtained during a uterine contraction of moderate intensity (40 mm Hg); cervical dilatation is 5 cm. Figure 4 corresponds to a contraction of very strong intensity (70 mm Hg); cervical dilatation is 7 cm. The parturient woman is standing, looking into the eyes of her husband (Fig. 3) and embracing him (Fig. 4). No medication (oxytocic, analgesic or anesthesia) was administered to the mother since the progress of labor was normal and discomfort during uterine contractions was minimal.

## B. Justified intervention in abnormal labor

The members of the perinatal team (obstetrician, nurse, midwife, neonatologist, etc.) should actively intervene only to prevent or manage labor complications, which occur in less than 20% of all labors. The appropriate medication should be given; oxytocin, tocolytics, sedatives, ansiolytics, analgesics, anesthesia, oxygen, etc.

The maneuver indicated should be performed: artificial rupture of membranes, episiotomy, forceps or vacuum extraction, cesarean section, etc. The medication and maneuvers employed depend on the type of complication. As example, the criteria for employing two types of medications are summarized below.

1. Oxytocin will be administered during labor only when the progress is abnormally slow, and the cause of prolonged or arrested labor is the weakness and low frequency of uterine contractions. Cephalopelvic disproportion should be ruled out before giving oxytocin.

2. Medication to relieve the pain and anxiety of the mother will always be available, but administered only when requested by the mother (less than 5% of labors in our series). This type of medication causes several undesirable side effects, among others, the depression of the nervous system of mother and newly born, which seriously interferes with the early interaction between mother and child (see Section IX)

## III. POSITION OF THE MOTHER IN THE FIRST STAGE OF LABOR

### A. The vertical positions and the freedom to move

In humanized labor the mother should be free to select the position in which she feels more comfortable during labor, and to change her

position whenever she likes to do so. During the first stage of normal labor, the majority of mothers prefer to be sitting (Figures 1 and 2), standing (Figures 3 and 4) or walking, i. e. with the trunk almost vertical, and to move freely changing from one vertical position to another. Very few choose to be lying in bed all the time, although some would lie horizontally for short periods.

Several mothers have given position patterns. One example of such patterns is to sit between uterine contractions (Figure 2) and stand up during each contraction (Figure 3) embracing her husband (Figure 4). Others walk between contractions and stand still during the contraction. Some mothers ask for massage in the suprapubic (Figure 3) or sacroiliac areas (Figure 4) during uterine contractions.

#### B. Influence of maternal position on uterine contractions

The record of intrauterine pressure shows that uterine contractions have a greater intensity when the mother is in a vertical position than when she is in the supine position (Figure 5). Their efficiency for dilating the uterine cervix is also greater in the vertical position. These beneficial effects of the vertical position are more significant before cervical dilatation has reached 7 or 8 cm (Méndez Bauer, C. et al., 1976).

#### C. Influence of maternal position on the wellbeing of the mother during the first stage of labor.

A large majority of parturient women feel much better when allowed to move freely, and adopt vertical positions such as sitting, standing or walking than when restrained to the horizontal position in bed. The vertical positions and the freedom to move greatly relieve the discomfort or pain, particularly that felt in the lumbo-sacral area.





The "natural" maternal position combined with the psychological aspects described in Section I, greatly contribute to the wellbeing of the mother in the first stage of labor.

D. Influence of maternal position on the duration of the first stage of labor

If all other factors are matched the duration of the first stage of labor is significantly shorter when the mothers were all the time in a vertical position (sitting, standing or walking), than when they remained lying in bed.

A prospective study was performed in cooperation with several Latin American hospitals (Díaz, A.G. et al, 1978) in 324 "low risk labors". All were normal, uncomplicated pregnancies in whom labors started spontaneously at term, with a single fetus, in cephalic presentation. Membranes were unruptured. Mothers with cephalo-pelvic disproportion were ruled out. Maternal position during labor was assigned at random. At each cooperating hospital, in 50% of labors, mothers were restrained to the recumbent position in bed, which was the usual practice at these hospitals; this is the "horizontal group" which includes 181 mothers. At each hospital, in the remaining 50% of labors, mothers were allowed to stand up, walk or sit, changing position at their wish. This is the "vertical group" made up of 143 mothers.

The vertical and horizontal groups were matched to insure that there were no significant differences in other factors which might influence the duration of labor, such as parity, gestational age, maternal height, birthweight, cephalic perimeter of the neonate.

The duration of the first stage was arbitrarily defined as the time interval elapsing between the moment in which cervical dilatation was 4 cm and that when it reached full dilatation.

The median duration was 135 minutes for the "vertical" group and 180 minutes for the "horizontal" group (Figure 6). The difference of 45 minutes is highly significant and corresponds to a shortening of 25% in the duration of the first stage for the vertical group.

The shortening in the duration of the first stage in the vertical group is more marked when only the mothers having their first vaginal delivery (primigravidas) are considered (Figure 7). The median duration was 147 minutes for the vertical group and 225 minutes for the horizontal group. The difference of 78 minutes corresponds to a shortening of 36% of the duration in the vertical group.

E. Tentative explanations for the shorter duration of the first stage in the vertical position

1. The intensity of the contractions and their efficiency to dilate the cervix is greater in the vertical than in the supine position (Figure 5).

2. In the vertical position the action of gravity on the fetus is synergic to that of uterine contractions. The weight of the fetus adds 35 mm Hg to the pressure exerted by the fetal head on the uterine cervix (Méndez Bauer, C. et al. 1976).

3. The much greater freedom of movements of the mother in the vertical position might be helpful for the progress of labor.

4. The drive-angle (between the longitudinal axis of the fetal spine and that of the maternal spine) is wider when the mother is in a

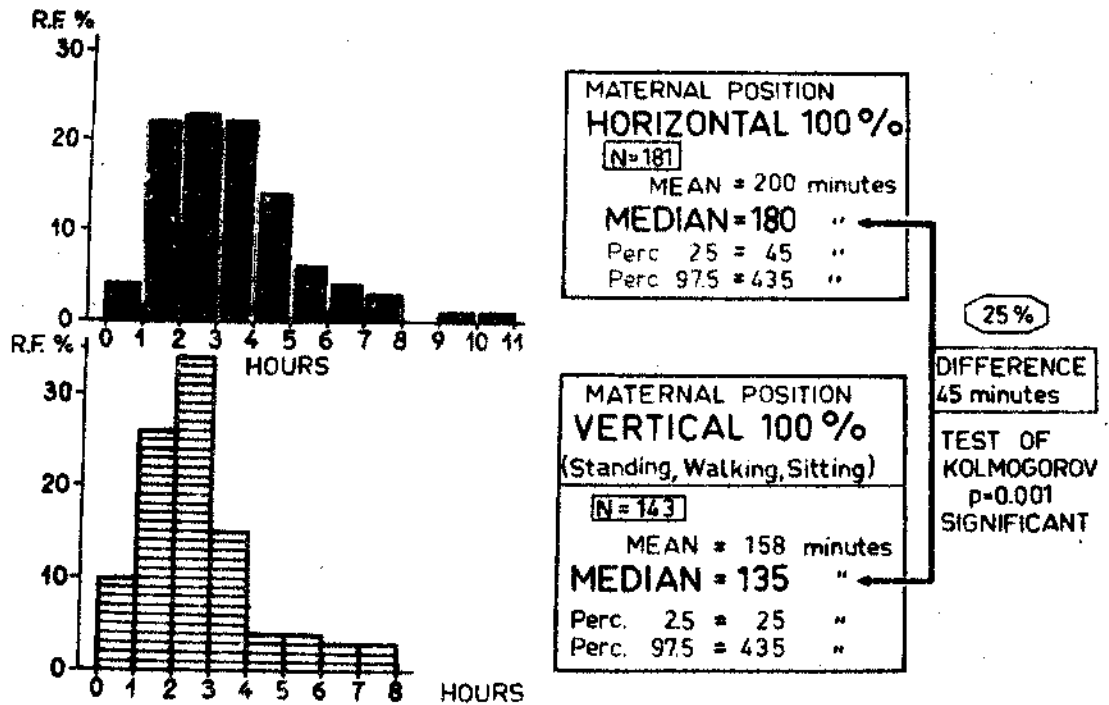


FIGURE 6

Influence of maternal position on the duration of the first stage of labor.  
 Primiparas and multiparas are included. The histograms show the percentage distribution of the duration, for one hour intervals. The median duration of the first stage is 135 minutes for labors in the vertical position and 180 minutes for the labors in the horizontal position. Median duration is 45 minutes shorter in the vertical position. This difference represents a 25 percent reduction in the duration of the first stage in the vertical position (After A.G. Díaz et al., 1978).

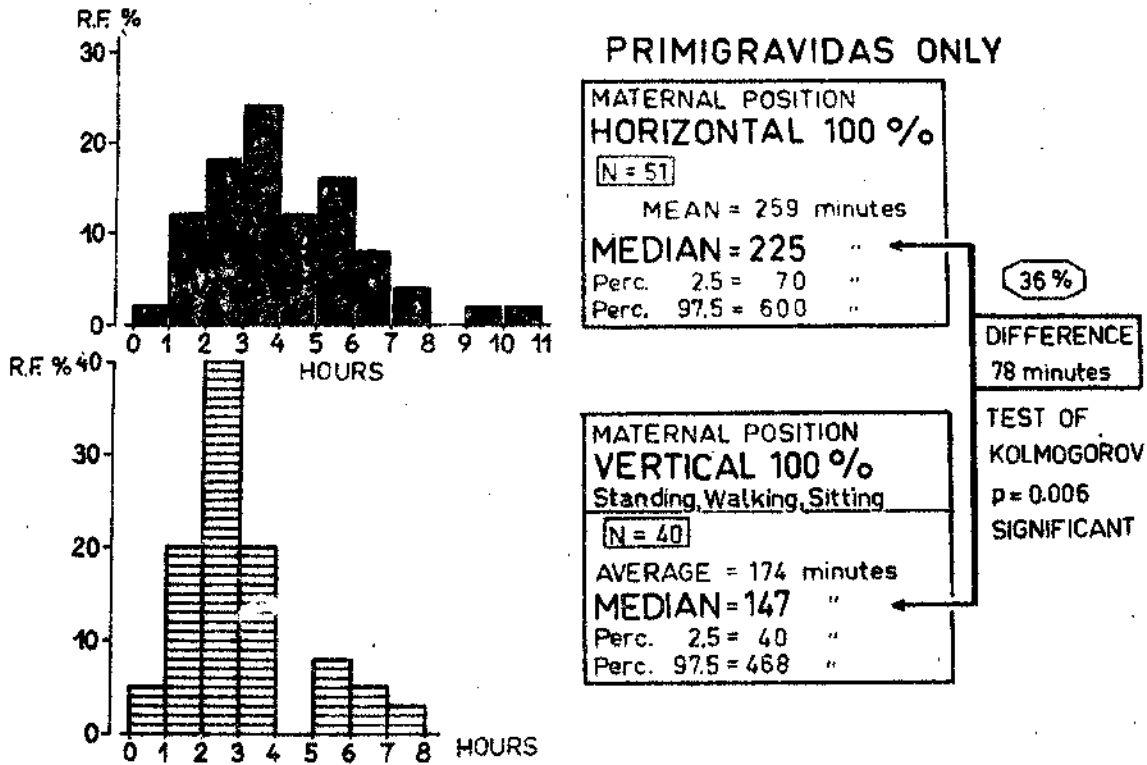


FIGURE 7

Influence of maternal position on the duration of the first stage of labor.

Only women having their first vaginal delivery (primigravidas) are included. The histograms show the distribution of the duration for one hour intervals. The upper histogram shows that for the mothers who are in the horizontal position, the highest proportion (25 percent) of labors has a duration between 3 and 4 hours. The lower histogram shows that for the mothers who are in a vertical position (sitting, standing or walking), the highest proportion (40 percent) of labors has a duration between 2 and 3 hours. The median duration is 147 minutes for the labors in vertical position and 225 minutes for the labors in horizontal position. The difference between the medians (78 minutes) represents a 36 percent reduction of the duration of the first stage in the vertical position. (After A.G. Díaz et al., 1978).

vertical position, than when she is in the supine position. According to GOLD (1950), when the drive angle is wide (between 60 and 80 degrees), the progress of labor is easier than when the drive angle is narrow (less than 45 degrees).

#### IV. POSITION OF THE MOTHER DURING THE SECOND STAGE OF LABOR

##### A. Sitting on an adjustable obstetrical chair

The large majority of mothers feel much more comfortable sitting in the obstetrical chair of our Center (Figure 8) than lying in the lithotomy position usually employed during the second stage of labor. The relative position of the several parts of the obstetric chair (backrest, seat, feet holders and hand grips) can be adjusted to fit the most comfortable position for each mother in the second stage.

Usually the back rest is set at an angle of 15 to 25 degrees with the vertical plane; the seat is at a 15 to 20 degree angle with the horizontal plane. The thighs are flexed on the pelvis and abducted and the knees are free (Figure 9).

##### B. Wellbeing of mothers in the second stage of labor

The physiological position described in the preceding paragraph combined with the psychological factors mentioned in Section I, greatly contribute to relieving and even abolishing the discomfort and pain usually felt by the psychologically unprepared mother placed in the lithotomy position.

Sedatives, ansiolytics, analgesics and anesthesia are very seldom needed. Local anesthesia is employed for episiotomy in the small proportion of cases

in which this procedure is considered necessary. In the majority of mothers of our series, the usually painful sensation caused by the stretching of the birth canal is well tolerated and largely sublimated into the happiness of delivering the baby.

V. NATURAL BEARING DOWN EFFORTS

A. Pushing spontaneously

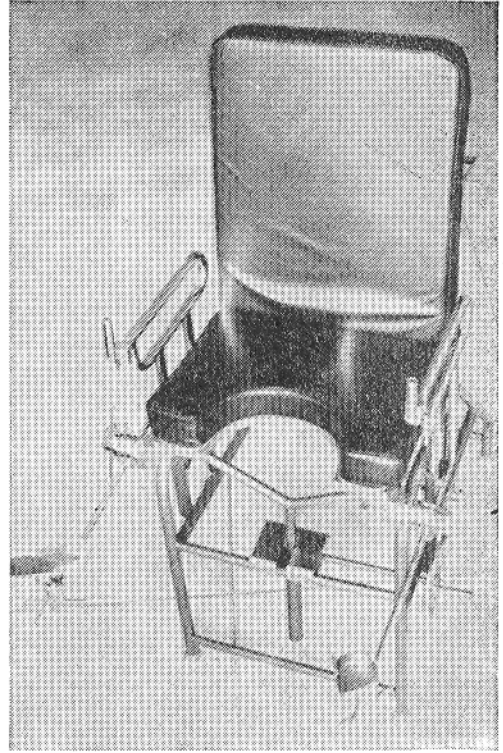
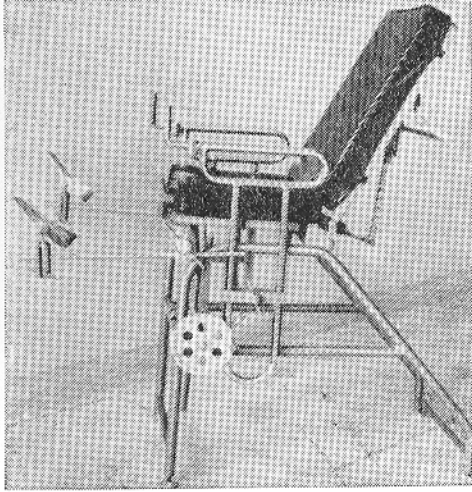
Mothers were instructed to perform spontaneously the expulsive efforts, i. e. whenever they felt the urge to "push" (CALDEYRO-BARCIA, R. et al., 1979). The timing and the number of efforts per uterine contraction, as well as the duration and the force of the efforts were self regulated by the mother. They did not receive the usual instructions to perform long lasting and strong efforts. They were not taught to close the glottis during the efforts in order to avoid the rise of intrathoracic pressure (Valsalva maneuver) with the resulting disturbances in blood circulation.

In this way, it was intended that the bearing down efforts would be natural and have a physiological pattern which has not been recorded until now.

B. Method of recording the expulsive efforts

A catheter was introduced through the vagina and cervix into the amniotic cavity following the usual procedure. It was connected to a pressure transducer which recorded the intrauterine pressure.

1. Pressure range. The sensitivity of the recording system had to be reduced by half in order to record the upper part of the bearing down efforts which usually rise over 100 mm Hg; this is the usual ceiling of pressure recorded by the standard fetal monitors (Figures 10, 16 and 17).



**FIGURE 8.** Obstetrical chair used for the second stage of labor at the Latin American Center of Perinatology. The relative positions of the back rest, seat, feet holders and hand grips are adjusted according to the wishes of each mother.



**FIGURE 9.** Mother in the second stage of labor, sitting in the obstetrical chair shown in Figure 8. The husband is providing affectionate support to his wife. The monitor in the bottom right corner of the figure, is recording uterine contractions, bearing down efforts and fetal heart rate.

2. The speed of the recording paper was increased to 15 cm/min (Figures 10, 16 and 17) i. e. much higher than that employed in the standard fetal monitors (1 to 3 cm per minute). This high paper speed is needed for the accurate measurement of the duration of the efforts and of the interval between efforts. It is also indispensable to recognize the effects of each effort on fetal heart rate, (Figures 16 and 17), which cannot be studied with the recording paper at the speed of 1-3 cm per minute, employed in the standard fetal monitor.

C. Quantitative study of the spontaneous bearing down efforts

Figure 11 schematically shows one uterine contraction with four superimposed spontaneous bearing down efforts. It indicates several of the items which are measured in the real records such as those shown in the lower part of Figures 10, 16 and 17.

1. For analysis purposes, the record obtained during the second stage of labor was divided into three periods of equal duration (Figures 12 through 15).

2. The average number of spontaneous efforts per uterine contraction was 4.29 and no significant difference was found between the three periods.

3. The average intrauterine pressure at the base of the efforts was 42 mm Hg without difference between the three periods. At the peak of the efforts the average pressure was 88, 107 and 119 mm Hg, in the first, second and third periods respectively (Figure 12).

4. The amplitude of the pressure rise caused by the efforts was 44, 67 and 75 mm Hg in the first, second and third periods (Figure 13). This rise



in amplitude was statistically significant ( $p < 0.001$ ). The expulsive pressure exerted by the abdominal muscles increased as the second stage of labor progressed.

5. The average duration of the efforts at the base was 4.15, 4.64 and 5.78 seconds (Figure 14). At the top of the efforts the duration increased from 0.93 to 1.87 seconds, in the first and third periods respectively. Both the duration at the base and at the top of the efforts increased significantly as the second stage progressed.

The duration of the "spontaneous" efforts (average 5 seconds at the base of efforts) is much shorter than the duration of the effort "directed" by the attending obstetrician or midwife, which are usually longer than 10 seconds. Since during the effort the mother is in apnea, the longer the duration of the effort, the more marked will be the fall of  $pO_2$  and the rise in  $pCO_2$  in maternal blood.

6. The surface area within the record of the effort increased from 121 to 299 (mm Hg x seconds) from the first to the third period (Figure 15). This marked increase is highly significant ( $p < 0.001$ ) and indicates the increased expulsive "work" (integration of time and pressure) performed by the abdominal muscles as the second stage progresses.

7. Interval between "spontaneous" efforts during one uterine contraction  
The average interval is 2 seconds. During this interval the mother usually makes several breathing movements which contribute to minimize the fall of  $pO_2$  and the rise in  $pCO_2$  in maternal arterial blood during the second stage of labor.

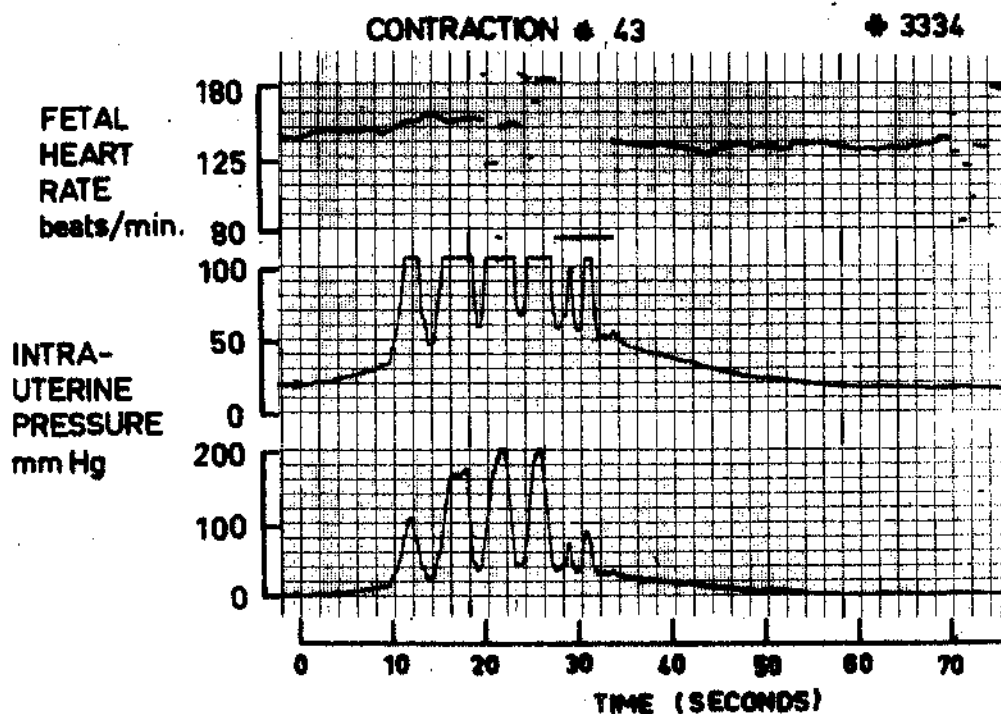


FIGURE 10

Record obtained during the second stage of labor. The middle and lower records correspond to intrauterine pressure recorded at different amplifications. The bearing down efforts are performed spontaneously by the mother when she feels the urge to push. They produced sharp pressure rises superimposed on the slower and prolonged rise caused by the uterine contraction.

QUANTITATIVE STUDY OF THE BEARING-DOWN  
EFFORTS DURING THE SECOND STAGE OF LABOR

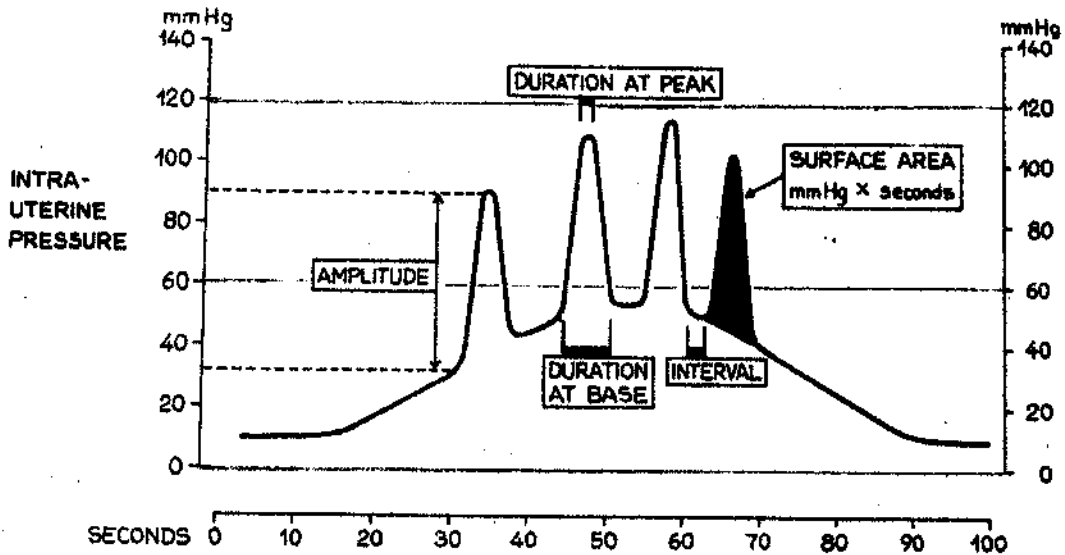


FIGURE 11

Schematic diagram illustrating the record of intrauterine pressure during one uterine contraction. The contraction causes a slow rise in pressure starting at second 15 and ending at second 90. Superimposed on the contraction are 4 sharp pressure rises caused by the spontaneous bearing down efforts. Some of the measurements made are indicated. The values of pressure and time shown in this diagram correspond to the average values reported in the present paper.

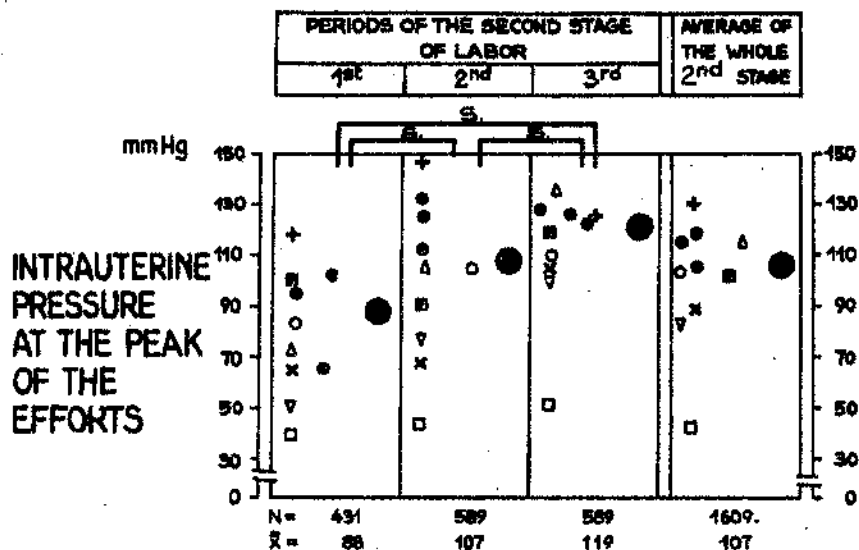


FIGURE 12

Intrauterine pressure at the peak of the bearing down efforts. This pressure is the addition of the pressure developed by the uterine contraction plus the pressure developed by the bearing down efforts. The second stage of labor is divided into three periods of equal duration (the three columns on the left). The column on the right indicates the average values for the whole second stage of labor. In each column the different symbols correspond to a given labor. The large black circle indicates the mean value for all labors. This value is shown in digits below the column ( $\bar{X} =$  ). The total number of bearing down efforts measured for each column is also indicated below the column ( $N =$  ). At the top of the column, S indicates that the difference between the means is statistically significant.

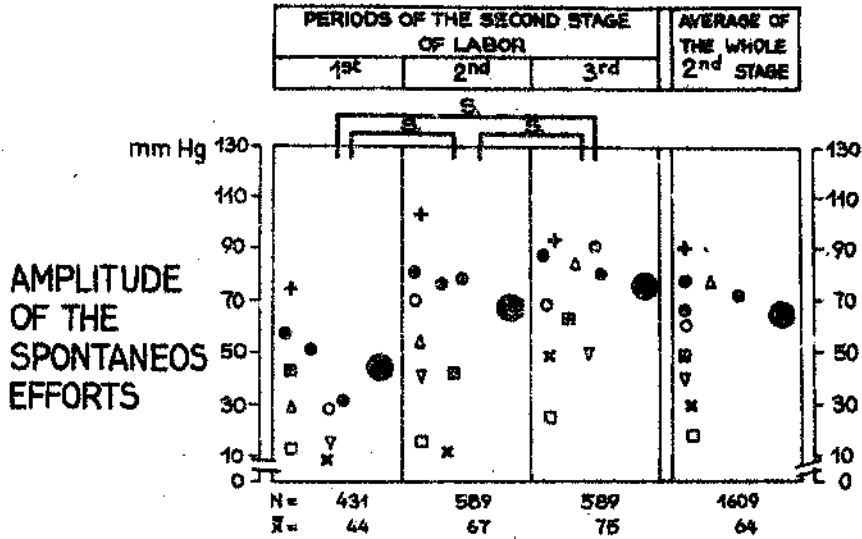


FIGURE 13

Amplitude of the spontaneous bearing down efforts. The amplitude is measured as shown in Figure 11. This figure is designed just like Figure 12.

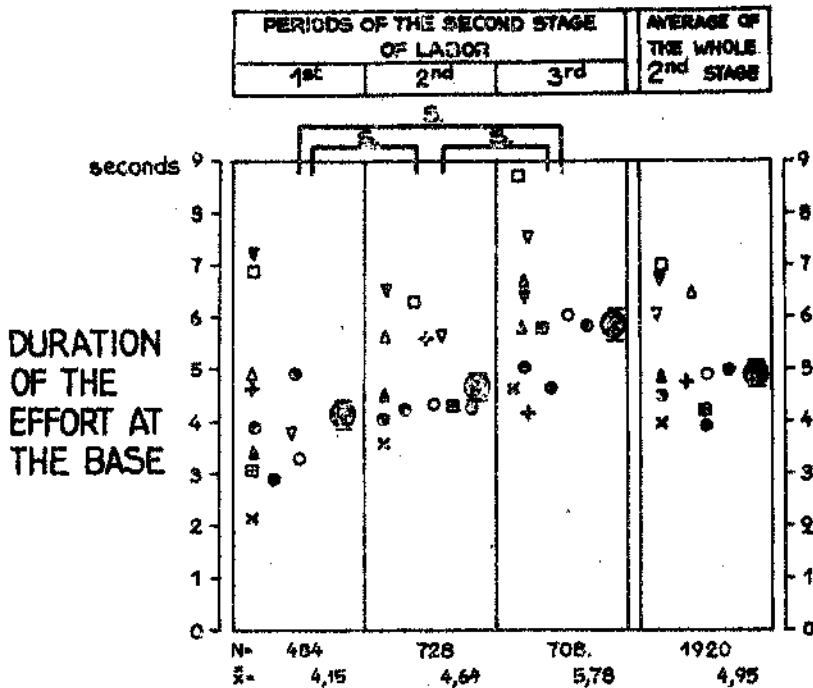


FIGURE 14

Duration of the spontaneous bearing down efforts measured at the base. The duration is measured as shown in Figure 11. The design is the same as that in Figure 12. (After R. Caldeyro-Barcia et al., 1979).

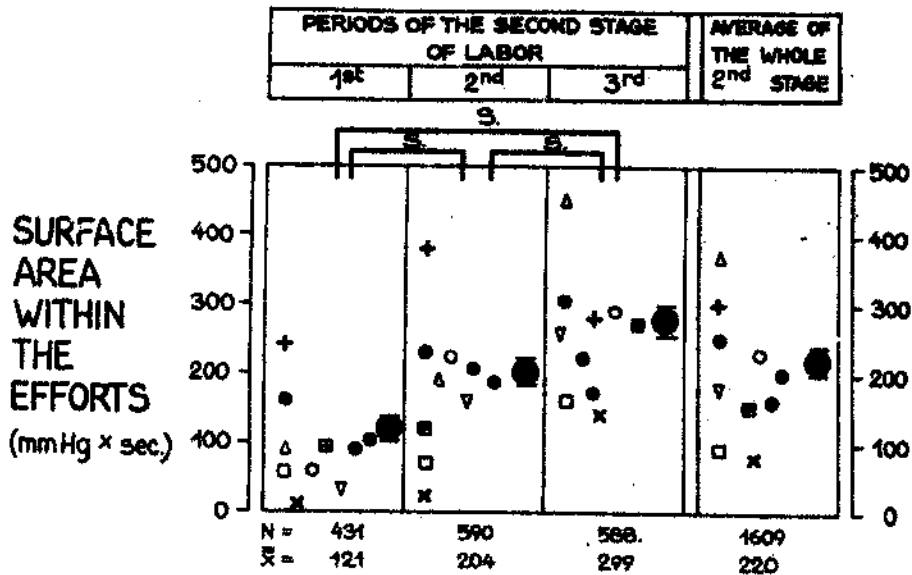


FIGURE 15

Surface area within the tracing of the bearing down efforts.

The surface area is measured as shown in Figure 11. The design is the same as that of Figure 12.

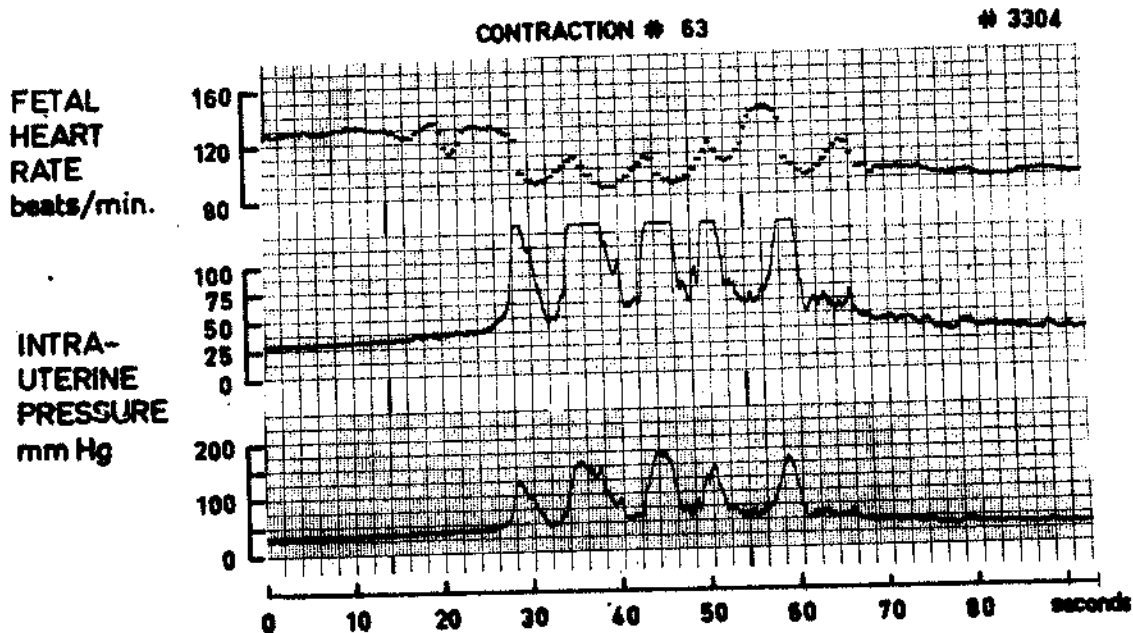


FIGURE 16

Effects of bearing down efforts on fetal heart rate. Record obtained with the same method as that used in Figure 10 (After R. Caldeyro-Barcia et al., 1979).

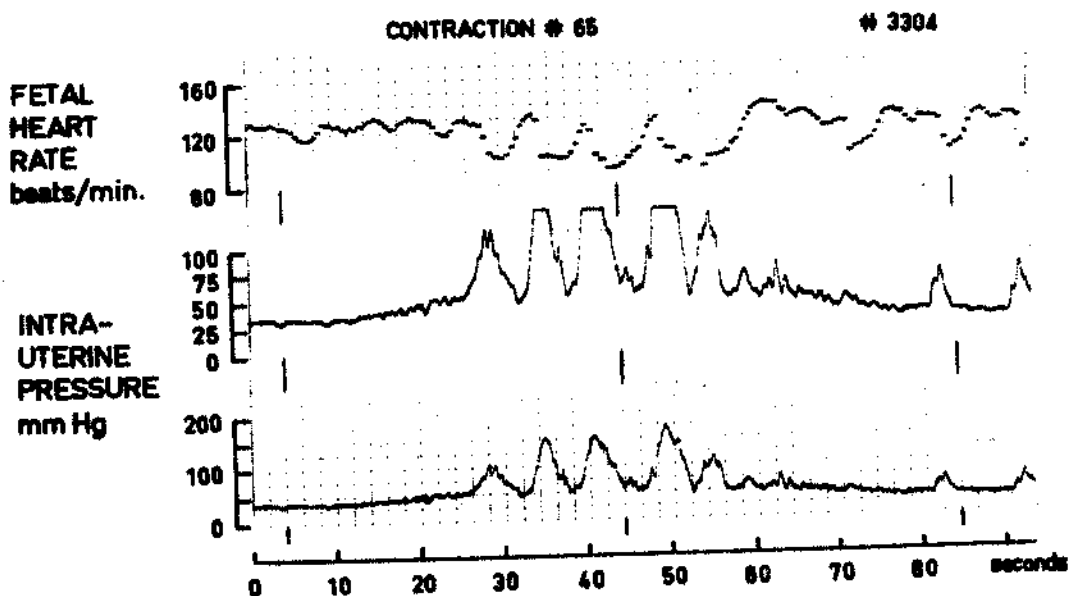


FIGURE 17

Effects of bearing down efforts on fetal heart rate. Record obtained with the same system as that used in Figure 10.

8. The average pressure at the onset of the first effort of each contraction shows little variations from the first to the third period of the second stage. The average value is 32 mm Hg; this is the threshold pressure which elicits the urge to push and triggers the expulsive effort in non-medicated mothers without anesthesia.

#### VI. EFFECTS OF SPONTANEOUS BEARING DOWN EFFORTS ON FETAL HEART RATE (FHR)

In some labors each effort caused a distinct, transient fall in FHR ("dip caused by effort"). These dips, when present, have a one to one relation with the causing expulsive efforts (Figures 16 and 17). Sometimes, the onset, bottom and recovery of the "dip" are delayed 1 to 4 seconds in relation to the effort. The "dips caused by the efforts" may start from a type I dip ("early deceleration") coinciding with one uterine contraction (Figure 16). In such cases the amplitude of the type I dip appears to be augmented by the additional falls caused by the efforts.

When the uterine contraction does not cause a type I dip, the "dips caused by the efforts" start from the baseline of the FHR (Figure 17).

#### VII. OXYGEN TENSION AND ACID-BASE BALANCE IN FETAL BLOOD AT BIRTH

A. The  $pO_2$ . In the present series of 15 labors the average values of  $pO_2$  are 27 mm Hg in umbilical artery (SE = 1.5 mm Hg) and 33 mm Hg in umbilical



vein (SE = 1.2 mm Hg)(Figure 18). These values are much higher than those reported as "normal" by all the authors who have published their findings in uncomplicated labors occurring spontaneously at term in low risk pregnancies.

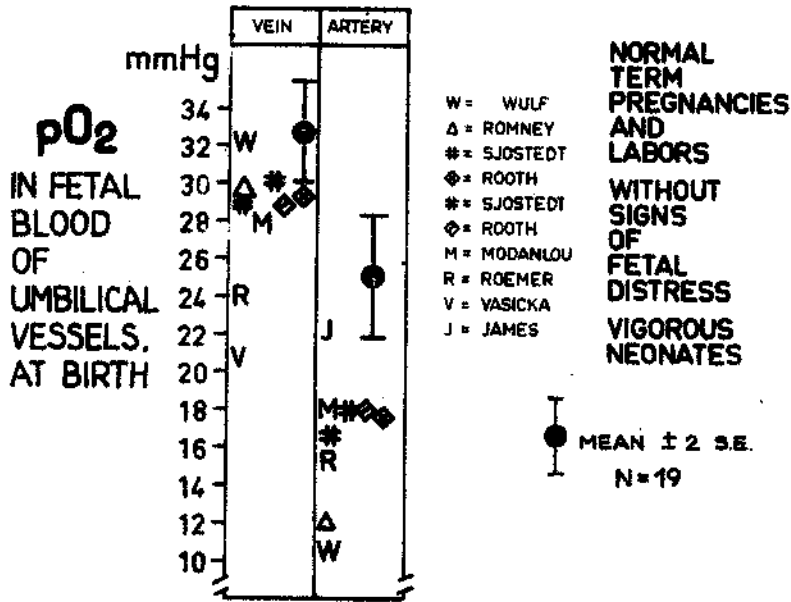
B. The pH. A similar statement can be made for the average pH which in this series is 7.32 in the umbilical artery (SE = 0.013 pH units) and 7.37 in the umbilical vein (SE = 0.012)(Figure 20).

C. The pCO<sub>2</sub>. The average pCO<sub>2</sub> of this series is 40 mm Hg in the umbilical artery, and 35 mm Hg in the umbilical vein (Figure 19). These values are much lower than those reported as "normal" by the same authors mentioned in the previous paragraph.

D. Tentative explanations for the high values of pH and pO<sub>2</sub> and low value of pCO<sub>2</sub>. Several factors may contribute to the high values of pO<sub>2</sub> and pH in fetal blood at birth reported in the present series (and the low values of pCO<sub>2</sub>).

1. The sitting position of the mother, which increases pulmonary ventilation at the lower lung zones, raising pO<sub>2</sub> and pH and reducing pCO<sub>2</sub> in maternal blood (ANG, C. K. et al., 1969).

2. The sitting position also prevents the compression of the inferior vena cava and of the aorta and iliac arteries. These vessels are compressed between the pregnant uterus and the spine when the mother is in the lithotomy position; the resulting circulatory disturbances may reduce the maternal perfusion of the placenta causing fetal hypoxia, hypercapnia and acidosis (HUMPHREY, M. D. et al., 1974; ANG, C. K. et al., 1969).



**FIGURE 18**

Partial pressure of oxygen (pO<sub>2</sub>) in the fetal blood of umbilical vessels at birth. The umbilical cord is clamped at birth before the first inspiration of the newly born is performed. The black circle indicates the average value of the present series of 15 labors managed as described in this paper ( $\pm 2$  Standard Error). The other symbols correspond to the average values reported for normal pregnancies, labors and neonates, by the authors listed in the middle of the figure (From G. Giussi, R. Caldeyro-Barcia et al., in preparation).

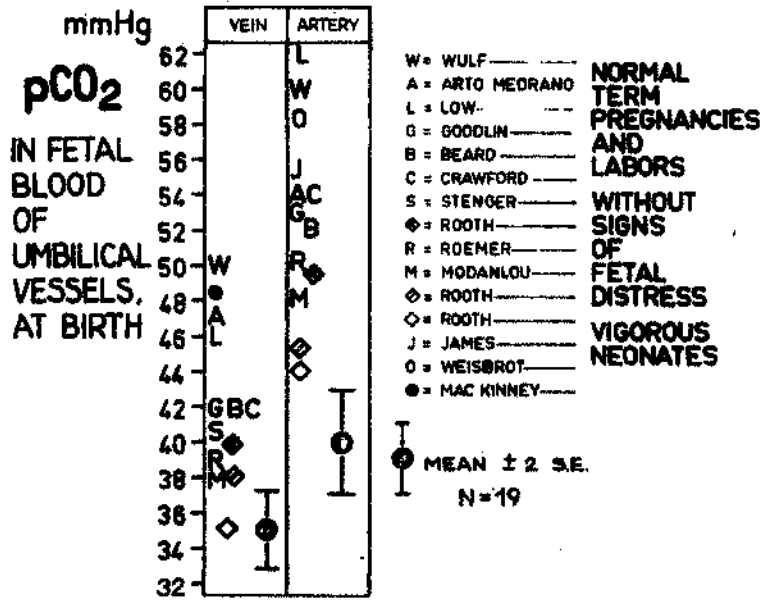


FIGURE 19

Partial pressure of CO<sub>2</sub> in the fetal blood of umbilical vessels at birth. This figure is designed like Figure 18 (From G. Giussi, R. Caldeyro-Barcia et al., in preparation)

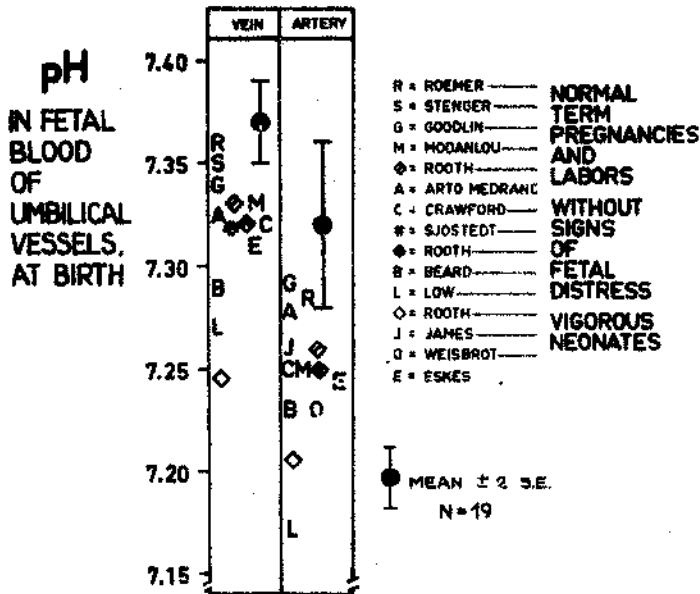


FIGURE 20

The pH in fetal blood of umbilical vessels at birth. This figure is designed like Figure 18 (From G. Giussi, R. Caldeyro-Barcia et al., in preparation).

3. The short duration (average 5 seconds) of the spontaneous bearing down efforts and of the concomitant apnea of the mother.
4. The pulmonary ventilation performed by the mother between two consecutive efforts made during one uterine contraction.
5. The fact that the glottis is not closed during the efforts, avoiding thoracic hypertension and circulatory disturbances in the mother that may reduce the placental perfusion.
6. The absence of administration of sedative, analgesic, ansiolytic or anesthetic drugs which may depress the pulmonary ventilation of the mother.
7. The absence of administration of oxytocin which may produce uterine hyperactivity and hypertonus with the consequent reduction of the placental perfusion with maternal blood.
8. The late, spontaneous rupture of the ovular membranes, which in a previous paper from this Center (MARTELL, M. et al., 1976) has been associated with higher values of  $pO_2$  and pH and lower values of  $pCO_2$  than when artificial rupture of membranes was performed early in labor.
9. Based on the facts listed in the preceding paragraphs D.1 through D.8 we postulate that the normal values of  $pO_2$ , pH and  $pCO_2$  in fetal blood at birth, are very close to those of the present series of labors which were managed in a natural way, without medication or other interferences, with the mother in the physiological position and performing spontaneously the bearing down efforts.

VIII. LACK OF INFLUENCE OF THE DURATION OF THE SECOND STAGE OF LABOR ON THE CONDITION OF THE FETUS AND NEWLY BORN BABY.

A. The pO<sub>2</sub>, pH and pCO<sub>2</sub> of fetal blood at birth

No differences are found in pH, pO<sub>2</sub>, pCO<sub>2</sub> or Base Deficit in fetal blood at birth between the group of labors in which the second stage lasted 15 to 60 minutes and in that in which it lasted 60 to 120 minutes (Figures 21, 22, 23 and 24). These results agree in part with those found by HUMPHREY, M. D. et al., 1974, who found no changes in fetal pH (up to 30 minutes duration of the second stage) when the mother was in a position tilted to the left side, whereas a progressive fall of fetal pH and a rise in pCO<sub>2</sub> and in Base Deficit occurred when the mother was in lithotomy position (WOOD, C. et al., 1973).

B. The Apgar score

All 15 newly born infants were vigorous with Apgar scores of 8 or higher at the first minute of life. No differences could be detected in the Apgar score at 1, 5 and 10 minutes between the group of labors in which the second stage lasted between 15 and 60 minutes, and in that in which it lasted between 60 and 120 minutes (Figure 25).

The lack of effects of the prolongation of the second stage of labor reported above in the preceding paragraphs, may be explained by the factors listed in paragraphs D. 1 through D. 8 in Section VII.

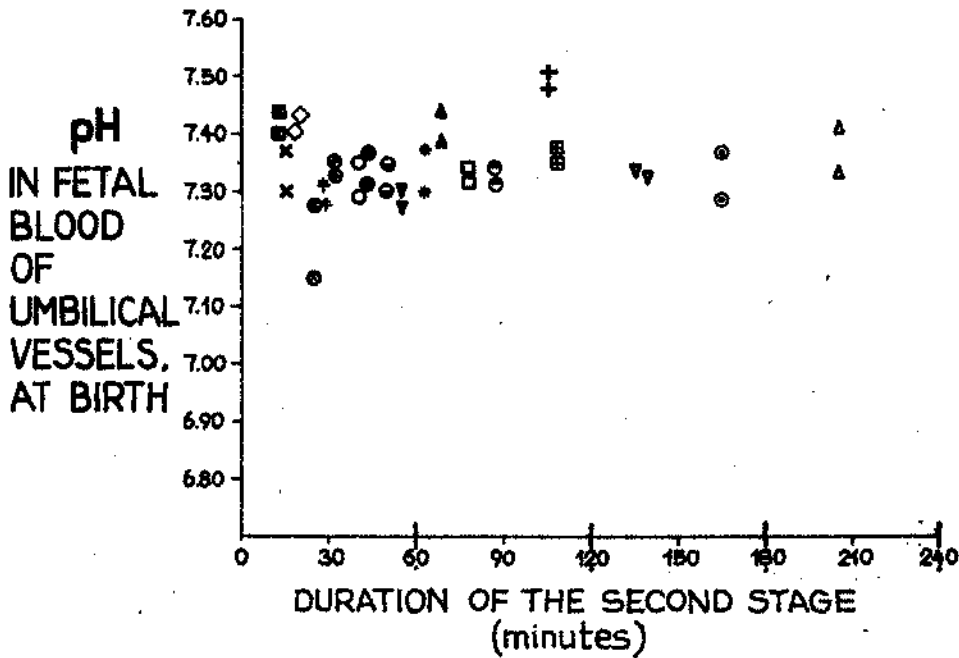


FIGURE 21

pH in fetal blood of umbilical vessels at birth. The values of pH are plotted against the duration of the second stage of labor. The symbol corresponding to each labor appears twice on the same vertical line; the lower value corresponds to the umbilical artery and the higher one to the umbilical vein.

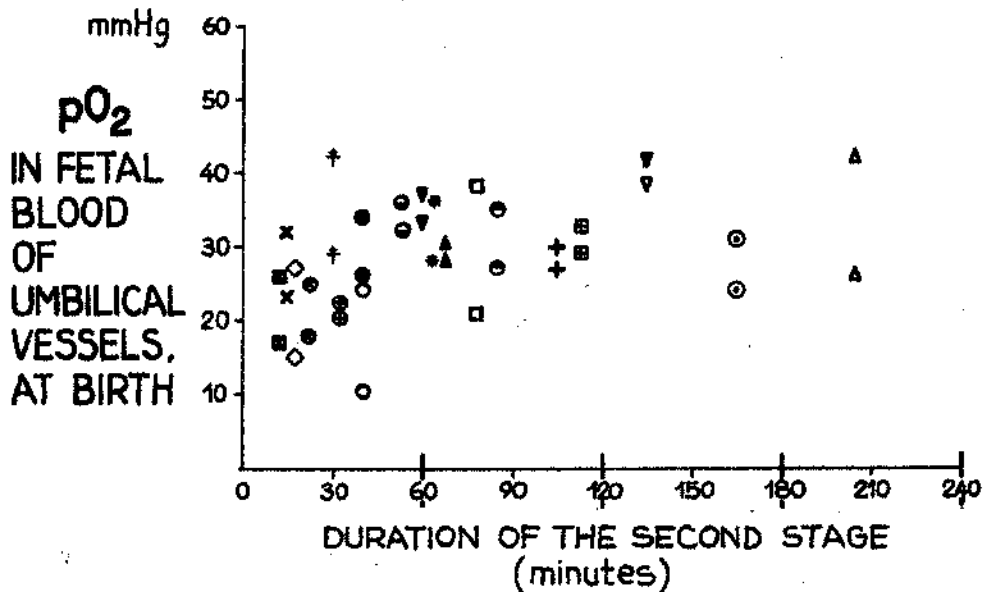


FIGURE 22

pO<sub>2</sub> in fetal blood of umbilical vessels at birth. This figure is designed like figure 21.

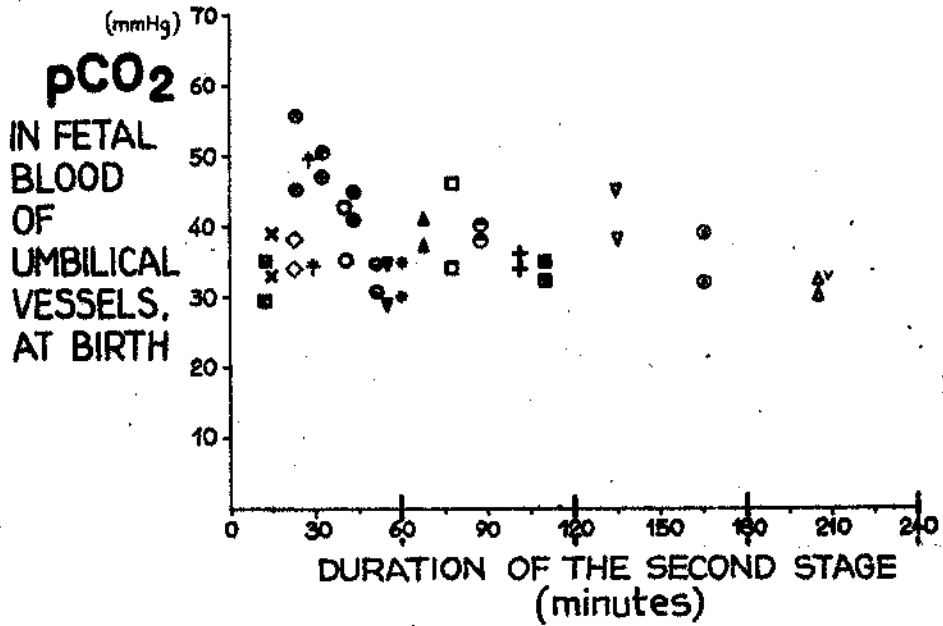


FIGURE 23

pCO<sub>2</sub> in fetal blood of umbilical vessels at birth. This figure is designed like Figure 21. The lower value for each labor corresponds to the umbilical vein and the higher one to the umbilical artery.

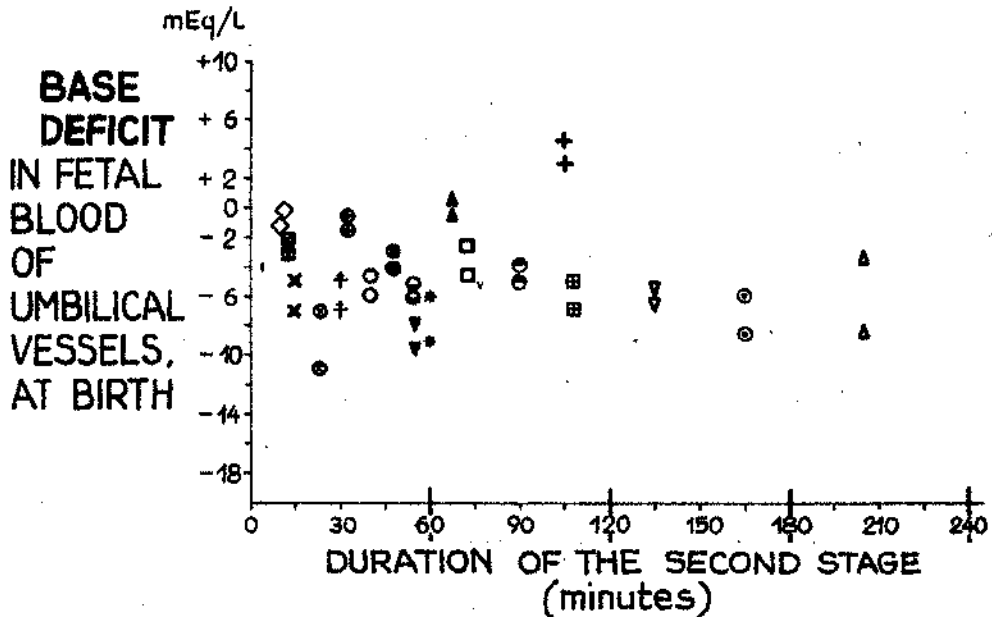


FIGURE 24

Base Deficit in fetal blood of the umbilical vessels at birth, Same design as in Figure 23.

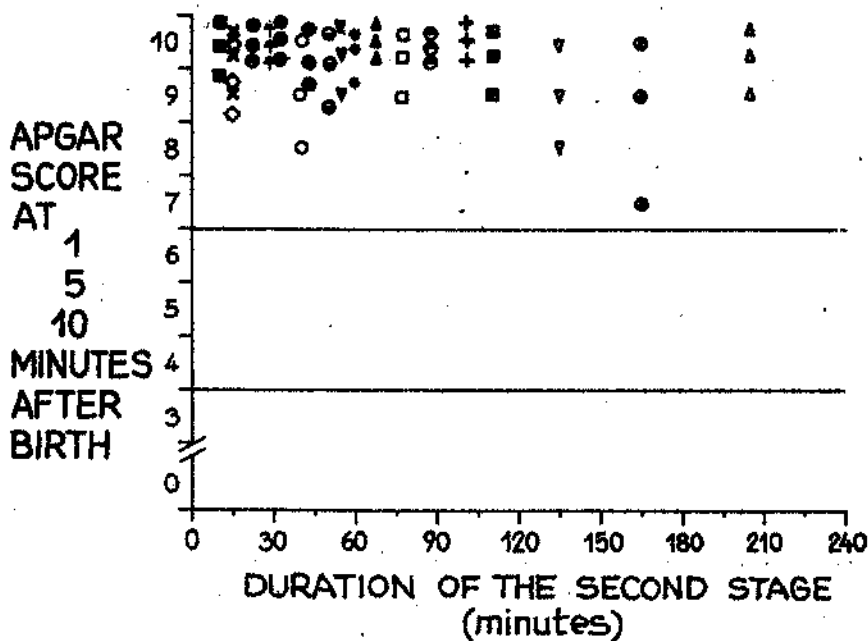


FIGURE 25

Apgar score of the present series of labors.

For each labor the same symbol appears three times on the same vertical line. The lowest symbol corresponds to the Apgar score at 1 minute; the middle symbol to the Apgar score at 5 minutes, and the upper symbol to the Apgar score at 10 minutes.



## IX. HUMANIZED CARE OF THE NEWLY BORN BABY

### A. Early start of parent-infant bonding

Mother and father are educated to start early the natural interaction with the newly born baby. Within a few minutes after birth the normal baby is given to the mother who holds it in her arms and starts breastfeeding it as soon as possible (Figure 26). The vigorous neonate does not need the oropharyngeal suction which is routinely performed (BUSTOS, R. Personal communication). The fully awake mother will caress the baby and speak to it. The normal, well oxygenated, non-acidotic and not narcotized baby will soon respond, looking at the mother's face, listening to her voice, moving its head and eyes to regard "en face" the eyes of its mother (KLAUS, M.H. and KENNEL, J.H., 1976). It will soon start sucking the maternal breast, triggering the release of oxytocin and prolactin in the mother.

The early start of interaction between mother and child has a primary role in the creation of an "affective bonding" between them, which will greatly facilitate the normal maternal behavior and the loving response of the child (KLAUS, M.H. and KENNEL, J.H., 1976).

The father should also participate in the early interaction with the baby which greatly helps in awakening paternal love and sustained affection for his child.

### B. Rooming-in

In the following hours and days the mother will keep the normal baby close to her (rooming-in). She will breastfeed it "at demand". She will take

care of the baby's health supervised by a nurse. The interaction of the baby with the father will continue and that with the siblings will start as soon as possible.

C. Breastfeeding promotion

The previously described management of labor, childbirth and of the newly born, contributes to promote breastfeeding as the only source of nutrition for the first trimester. Breastfeeding supplies the best nutrition for a normal growth; the early start of breastfeeding provides the baby with antibodies and immunocompetent cells (present in the colostrum) which will protect it against infections.



**FIGURE 26.** Immediately after birth the baby is given to the mother who holds it in her arms and starts breastfeeding. Interaction between the baby and its mother and father starts early after birth.

REFERENCES

1. Méndez-Bauer, C. Personal communication.
2. Méndez-Bauer, C., Arroyo, J., Menéndez, A., Salmeán, J., Manas, J., Lavilla, M., Martínez San Martín, S., Villa Elízaga, I., Zamarriego Crespo, J.: Effects of different maternal positions during labour. In: 5th European Congress of Perinatal Medicine, Uppsala, Sweden, 9-12 June 1976, pp.233-237. Almqvist & Wiksell, Stockholm, 1976.
3. Díaz, A.G., Schwarcz, R., Fescina, R., Caldeyro-Barcia, R.: Efectos de la posición vertical materna sobre la evolución del parto. Clin. Invest. Gin. Obst. (Barcelona, España) 5(1978)101.
4. Gold, E.: Pelvic drive in obstetrics. An X ray study of 100 cases. Amer. J. Obstet. Gynec., 59: 890, 1950.
5. Caldeyro-Barcia, R., Giussi, G., Storch, E., Poseiro, J.J., Lafaurie, N., Kettenhuber, K., Ballejo, G.: The bearing-down efforts and their effects on fetal heart rate, oxygenation and acid base balance. In: 1st International Berlin Meeting of Perinatal Medicine, 15-16 June 1979, Berlin.
6. Ang, C.K., Tan, T.H., Walters, W.A.W., Wood, C.: Postural influence on maternal capillary oxygen and carbon dioxide tension. Brit. Med. J., 4: 201-203, 1969.

7. Humphrey, M. D., Chang, A., Wood, E. C., Morgan, S., Hounslow, D.: A decrease in fetal pH during the second stage of labour, when conducted in the dorsal position. *J. Obstet. Gynaec. Brit. Cwlth.*, 81: 600-602, 1974.
8. Martell, M., Belizán, J. M., Nieto, F., Schwarcz, R.: Blood acid base balance at birth in neonates from labors with early and late rupture of membranes. *J. Pediatr.*, 89 (1976) 963-967.
9. Wood, C., Hing, K., Hounslow, D.: The influence of differences of birth times upon fetal condition in normal deliveries. *J. Obstet. Gynaec. Brit. Cwlth.*, 80: 289-294, 1973.
10. Bustos, R.: Personal communication.
11. Klaus, M. H. and Kennell, J. H.: *Maternal-infant bonding*. The C. V. Mosby Company, St. Louis, USA, 1976.