

APPROPRIATE MATERNAL POSTURE DURING CHILDBIRTH: A COMMENTARY

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INTRODUCTION

This commentary was prepared following a Symposium on 'Appropriate Maternal Posture during Childbirth' held in Rio de Janeiro in October, 1988. After translation into Portuguese it was published as the preface to the Symposium's proceedings. (*Parto Humanizado: Formas Alternativas*. Ed. By H. Sabatino, P.M. Dunn and R. Caldeyro-Barcia. Brazil: Unicamp, 1992). Our intention to republish the commentary in an English journal was interrupted by the poor health and finally the death of Roberto Caldeyro-Barcia. As arguably the most distinguished obstetric scientist of his day, his loss deprived women in childbirth of their greatest advocate*. However, controversy over the best posture for the mother to assume during childbirth remains as important and relevant today as in the past. Hence, the commentary has been recovered from the files in which it has lain buried for twenty years and presented unchanged except for minor editing and the addition of the illustrations.

* Profile: Roberto Caldeyro-Barcia, MD, PhD., FRCOG (ad eundem), FACOG (hon.), FACS (hon.), 1921-1996: obstetric scientist extraordinary. *Neo Reviews*, 2008; 9, e 187-191.

BACKGROUND

Historical and anthropological studies have revealed that until a hundred years ago the overwhelming majority



Figure 1(a) East Africa,



Figure 1 (b) Mongolia,



Figure 1 (c) North America,



Figure 1 (d) Mexico.

Fig 1 Examples of the delivery positions (19thc) in countries not yet influenced by Western obstetrics

of women of all races and cultures adopted an upright posture throughout labour and delivery. They stood, hung, crouched, sat, kneeled or squatted (Fig 1). Typically they displayed restlessness, frequently changing their position during each contraction. An upright posture was considered normal, as in the other



Fig 2. The supine dorsal delivery position widely adopted by modern Western obstetrics.

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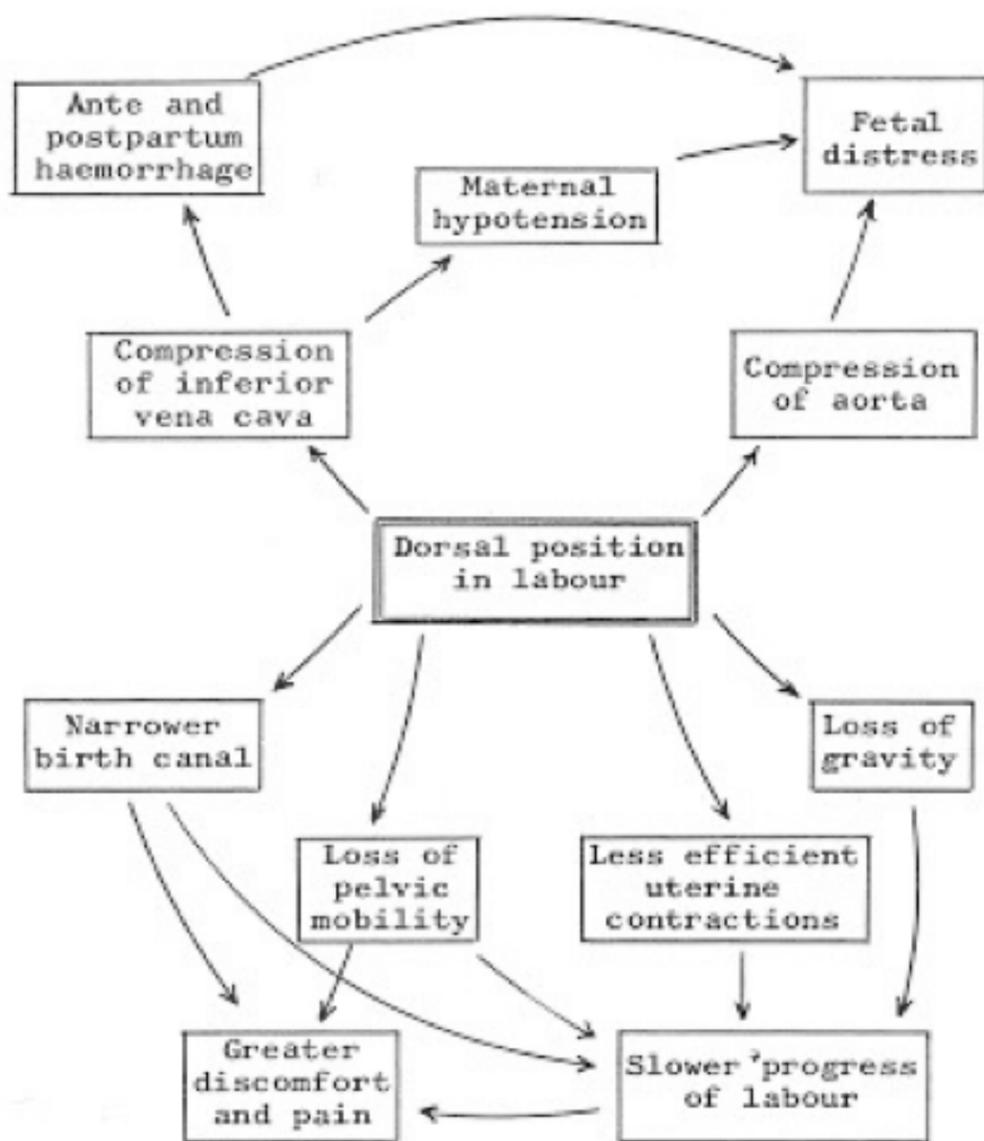


Fig 3: Potential consequences of the dorsal recumbent position during labour and delivery. (Dunn, 1976)

bodily functions of defecation and urination.

The new discipline of obstetrics emerged in Europe in the 17th century. Doctors wished to observe the delivery process and to intervene when necessary. For these reasons women were encouraged to assume a dorsal supine position, at first just for the second stage of labour and, with the passage of time, also throughout the first stage. As women were increasingly hospitalized for childbirth and attended by an obstetrician doctor, and as new monitoring and intervention technologies were introduced, the static dorsal supine position came to be regarded medically and culturally as the normal posture for childbirth (Fig 2). Often women were placed in the lithotomy position for delivery.

Over the last 250 years, many distinguished obstetricians have warned of some of the disadvantages

of the supine position, especially in respect to the effectiveness of uterine contractions, the length of labour, the need for pain relief, and the increased need for operative delivery. Their warnings have been largely ignored and the dorsal supine position has continued to replace the upright posture in developing countries not previously influenced by 'Western' obstetrics.

Research since 1950 has steadily uncovered many of the disadvantages of the supine posture (Fig 3) and the advantages of an upright posture. Many studies comparing the two positions over the last 15 years have strongly supported the benefits of an upright posture. A minority of studies, mostly small, have concluded that maternal posture has little or no influence on outcome. No study has yet revealed any significant disadvantage of the upright posture when compared with the supine.

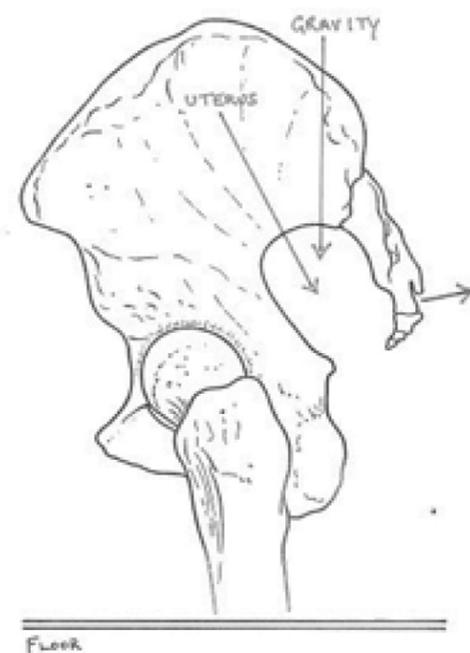
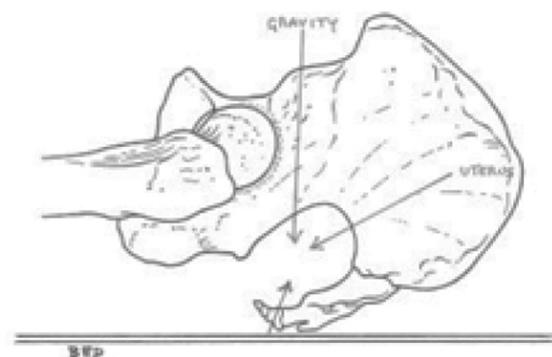


Fig 4 Effect of gravity on the presenting fetal part according to whether the mother is in a vertical (as shown above) or a recumbent position (below).



Although the weight of evidence confirms the importance of an upright posture, medical and cultural prejudice, and habit, ensure that the supine posture remains the 'normal' one throughout most of the 'civilized' world. Yet if the supporters of an upright posture are correct, this single practice is largely responsible for many of the hazards and problems that are encountered during childbirth and for the need for many interventions such as augmented labour, pain relief, operative delivery and episiotomy.

INFLUENCE OF MATERNAL POSTURE

In an upright posture gravity directs the weight of the fetus and amniotic fluid downwards, successively dilating the cervix, the birth canal and the introitus. This force, estimated as equivalent to 28mm Hg, is constantly applied regardless of whether or not the uterus is contracting. It is lost

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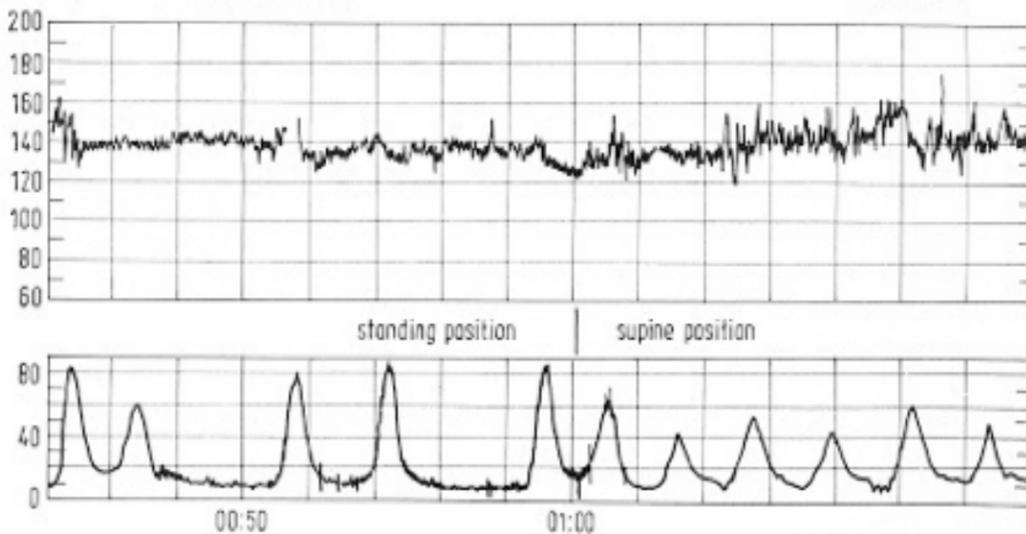


Fig 5 Influence of maternal posture, standing or supine, on the strength and frequency of uterine contractions (Arroyo, et al, 1974)

when the mother lies in the supine position (Fig 4). Indeed in the lithotomy position, she may have to push the baby upwards, through the introitus.

The ability of a woman to push down to aid the expulsive force of the uterus during the second stage of labour has been shown to be best in an upright position and worst when supine or in the lithotomy position.

Uterine contractions have been shown to be better spaced, stronger and also more efficient in dilating the cervix when the mother is in an upright position than when she is supine (Fig 5).

Contractions are similarly stronger in the lateral than in the dorsal supine position. Yet though stronger, the contractions appear to be accompanied by much less pain and discomfort.

Under the influence of pregnancy hormones in late gestation, the ligaments binding the bones of the pelvis together become lax. In the upright position, the weight of the woman's body is transmitted to her legs through the hip joints lateral to the pelvic birth canal. The combined force of gravity and of uterine contraction on the descending fetus causes the pelvic bones to separate or 'open outwards' and the sacrum to pivot backwards, considerably

increasing the size of the birth canal.

This change, which has been demonstrated radiologically, does not occur when a woman is supine. In this position and also to a lesser extent in the sitting or in the semi-recumbent position, her weight and that of the baby is born by the sacrum which cannot then swing backwards.

An upright position enables the woman to readily and frequently change her position during each contraction. This she does in response to the pressure of the baby's head in her birth canal. In this way she

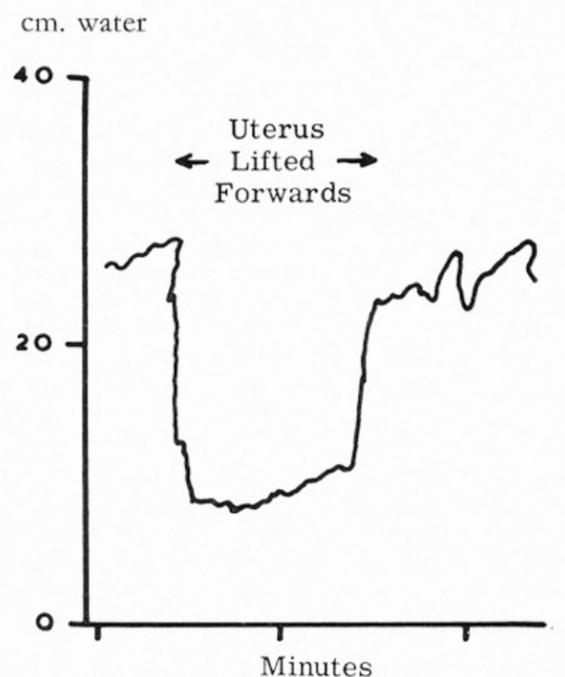


Fig 6 Inferior vena caval pressure at Caesarean section showing the influence of manually lifting the pregnant uterus forwards (Kerr, 1965)

wriggles her pelvis and birth canal over the baby as he or she is pressed downwards. This freedom to move is lost when a woman assumes a supine or semi-supine position and also when she is in a modern bucket-like delivery chair.

When a mother assumes an upright posture, both the first and second stages of labour are significantly

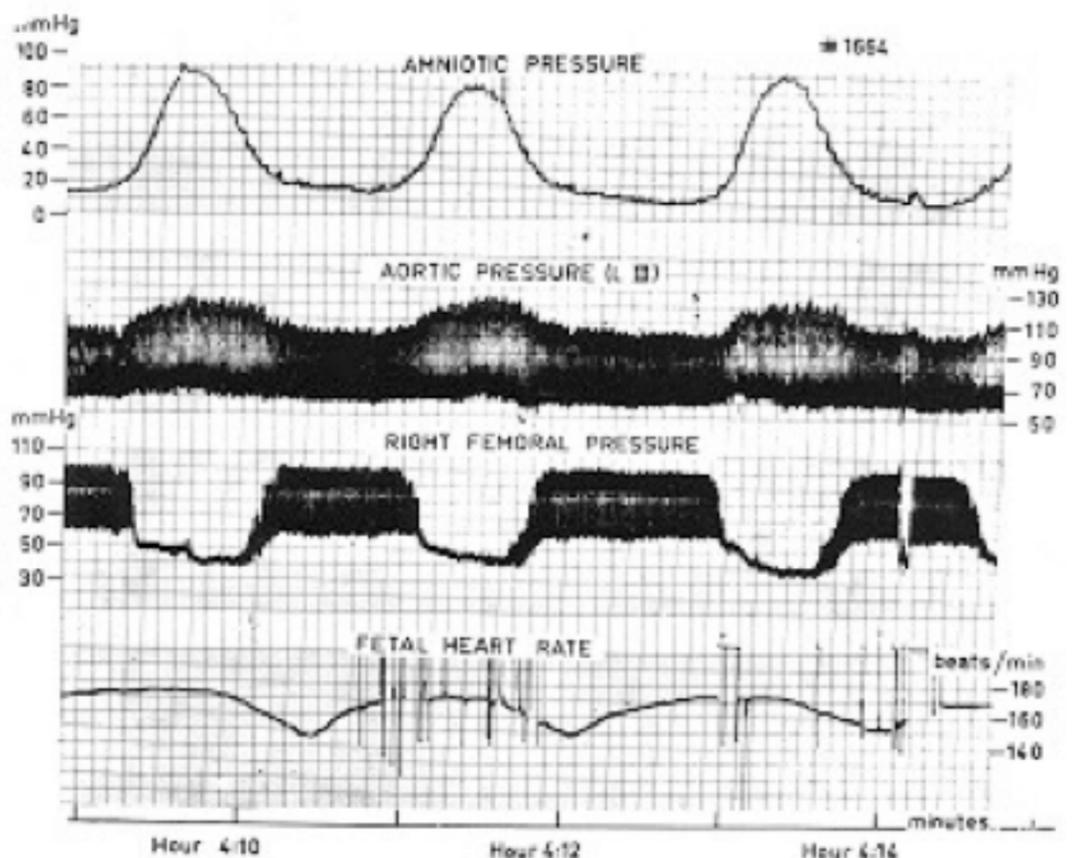


Fig 7 The occlusive effect of uterine contractions on the aortic and femoral blood pressures. Note the influence of contractions on the fetal heart rate (Bieniarz et al, 1968).

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shorter and the need for forceps delivery is reduced. Some studies have failed to show this advantage of the vertical position but none have shown any advantage of the supine position. Pulmonary function studies have revealed significant disadvantages of the dorsal supine compared with the upright position. The difference is also reflected in the mother's blood gas and acid-base status. It seems highly probable that the semi-recumbent position is similarly disadvantaged.

In the dorsal supine position the weight of the gravid uterus compresses the inferior vena cava (Fig 6), obstructing venous return from the lower half of the body to the heart. This leads to a fall in cardiac output and hence to a fall in systemic blood pressure. The resulting 'maternal hypotension syndrome' is potentiated if the mother's legs are flexed and pressed against her abdomen by birth attendants wishing to support her efforts to push during the expulsive phase of labour. As resistance to blood flow to the placental site is low, a fall in maternal blood pressure automatically leads to a fall in placental perfusion from the maternal side. The maternal hypotension syndrome may be relieved by the mother adopting an upright position or by lying on her side. It may be only partially relieved in the semi-recumbent position or in the lateral tilted position.

The weight of the contracting gravid uterus during the expulsive phase of labour may also occlude the aorta as it crosses over the sacral promontory when the woman is in a dorsal supine position (Fig 7).

This will temporarily cut-off the maternal blood supply to the utero-placental circulation with a potential impact on the wellbeing of the fetus. The aorta is not compressed when in an upright or lateral position. Transcutaneous monitoring of the fetal scalp TcPO₂ during labour has



Fig 8 Delivery of the fetal head in the maternal supine position. Compare this with the delivery in the vertical position seen in Fig 9.

demonstrated the improved oxygen status of the baby when the mother is in a vertical position or in a lateral supine position as compared with the dorsal supine position. Indeed for many years obstetricians have appreciated the importance of turning a woman on her side when fetal distress was detected. The blood gas and acid-base status of the umbilical artery and vein blood are more normal when the mother has laboured and delivered in the upright rather than in the dorsal supine position.

Compression of the vena cava by the gravid uterus, when the woman is in a dorsal supine position, leads to a considerable rise in venous pressure in the lower part of the body including the utero-placental circulation. Such a rise may predispose to ante- or intra-partum haemorrhage. Even after delivery of the baby the weight of the uterus may still increase the possibility of post-partum haemorrhage. This hazard is reduced when the mother is in an upright position or lying on her side. It must be added that some studies have suggested the post-partum blood loss is increased in the upright position. This matter is discussed later and requires further study.

Following the birth of the child, the upright position and gravity aid the delivery of the placenta, shortening the third stage and reducing the incidence of retained placenta and post-partum haemorrhage. Some studies have suggested that this is not so and further work is required.

In the dorsal supine position (and even more so in the lithotomy position) the presenting part is pushed through the perineum, greatly distending it before turning the corner upwards and distending the introitus (Fig 8). This perineal distension is increased by flexion of the thighs and is associated with a high tear and episiotomy rate. In the vertical position gravity and the force of uterine contractions push the presenting part directly through the introitus. When the thighs are extended, the perineum is relaxed and is thus much less likely to tear or require episiotomy (Fig 9).

Much of the pain and discomfort experienced by women during labour is felt in their back and may be caused by pressure from the contracting uterus on sensitive nerve plexuses in the cervix and in the posterior abdominal and pelvic walls. It is

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Fig 9 Modern approaches to the re-introduction of an upright delivery position, whether crouching, kneeling, standing or squatting

well recognised that great relief may be obtained when women lying in a dorsal supine position either turn on their side or assume an upright posture. It must be added that some recent studies failed to confirm this observation.

In an upright position the mother is more in control of her labour and delivery. She can participate in the event and see her child born. In the supine position she can only watch the ceiling.

Modern obstetric effort is mainly directed towards trying to make labour shorter, less painful, and safer for the

baby. Evidence is accumulating to show that this can best be achieved by encouraging the mother to assume a vertical posture with mobility throughout childbirth. Conversely, a dorsal supine position (including the lithotomy and semi-recumbent positions) works in an opposite direction.

THE PRESENT SITUATION

In spite of accumulating evidence as to the importance of the upright posture during childbirth, the dorsal supine position remains the most favoured one throughout the 'civilized' world and is being increasingly introduced into developing countries. In some developed countries a more flexible

approach has been made, women being allowed to choose the position they prefer, especially during the first stage (Fig 9).

The reasons for the slow recognition or even rejection of the importance of an upright posture would seem to be as follows:

The static dorsal supine position is more convenient for the obstetrician both for observation, monitoring, vaginal examination and for interventions such as amniotomy, fetal blood sampling, forceps delivery and episiotomy. The woman is lying on a bed at a height which does not require the obstetrician to stoop too much. If she has had an epidural anaesthetic it may be difficult or impossible for her to assume an upright position. Then a woman lying down on her back may be more readily kept still which facilitates maintenance of good external monitoring of uterine contractions and fetal heart rate.

Both obstetricians and women in developed countries have become culturally prejudiced in favour of the supine position over the last 100-300 years. Most women in developing countries are now delivered in hospital. In hospital people expect to lie down in bed. Even when given a choice of labour position many women opt for a supine one.

Although the weight of evidence clearly demonstrates the advantages of an upright posture, some recent studies have failed to confirm this, though none have shown a superiority of the dorsal supine position – with one possible exception: some studies have also suggested that post-partum blood loss may be greater when the woman adopts an upright posture during the third stage of labour. This will be discussed in a later section.

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Fig 10 Semi-recumbent posture in a delivery chair.
This posture is not vertical or weight-bearing and robs the woman of her mobility.

Few would disagree with the view that, if the upright position leads to a safer, quicker and less painful labour, the convenience of the obstetrician should take second place. Anyway it is possible to design a delivery platform which enables the obstetrician to attend to his patient without stooping or crouching (Fig 9). Likewise it has been shown to be possible to monitor the progress of labour and the status of the fetus while the mother maintains an upright posture and telemetry permits ambulatory monitoring. As to the cultural prejudice and habit, it is the responsibility of obstetricians to re-educate mothers once the former have become convinced of the advantages of an upright posture.

The most stubborn problem is that of persuading obstetricians and midwives as to the advantages of the upright position when their habits and their convenience and sometimes that of their patients, prejudice them in favour of the supine position. The problem is made more difficult in that some controlled studies have failed to confirm that the matter is of major importance. The reasons for differences in conclusion probably lie

in methodological difficulties which will now be discussed.

METHODOLOGICAL PROBLEMS

While some studies on posture in childbirth have been satisfactory, others have not been properly controlled. Some that have purported to be controlled have been small and have demonstrated methodological

problems. There are also very considerable natural difficulties to be overcome in making these studies. These problems will now be discussed.

Labour and delivery last several hours during which a woman, following her own inclinations, may successively adopt many positions. Indeed she may change her position several times during a single contraction. In these circumstances it may be difficult and indeed unethical to restrict her movement and impose a single posture against her wishes. The problem becomes particularly acute once an obstetrician has become convinced of the benefits of the upright (or supine) posture.

Childbirth is a time of stress and danger for the mother and her baby. Their interests must always come first over the requirements of any research study. Inevitably, when difficulties arise the obstetrician finds it next to impossible not to exhibit their own prejudice in respect to maternal posture, usually in Western countries to the detriment of the upright posture which is frequently referred to by such workers as 'unorthodox', 'unconventional' or even 'unnatural'

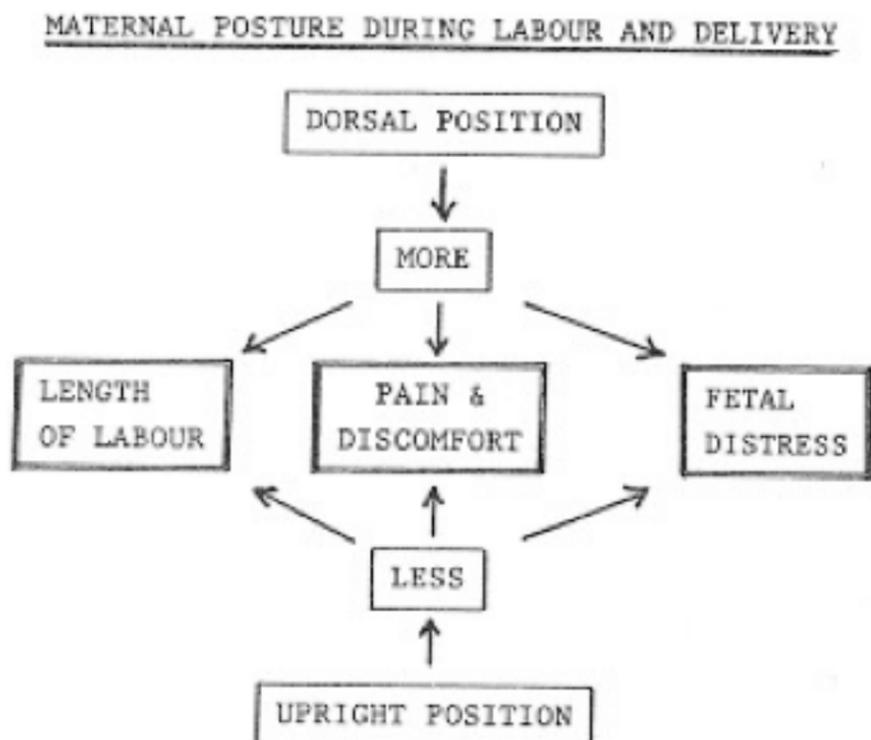


Fig 11 The influence of maternal posture, supine or upright, during labour and delivery (Dunn, 1989).



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(Fig 9).

Many of the obstetric interventions that have become frequent and sometimes routine during labour and delivery either make the upright posture difficult or impossible to maintain or require the woman to lie supine. A woman receiving analgesia and/or sedation may understandably wish to lie down. A woman in receipt of epidural anaesthesia may be unable to assume an upright posture. Intravenous infusions, uterine and fetal monitoring, forceps extraction and episiotomy are among the interventions more easily undertaken with the woman lying down.

A further problem is that many of the parameters on which the success or failure of maternal posture studies are judged are subjective and liable to observer bias or unintentional manipulation.

The lengths of the first and second stages of labour are notoriously difficult to determine. No one has satisfactorily defined in more than vague terms the point at which true labour is established. In the same way the commencement of the second stage, taken usually when the cervix is fully dilated, is difficult to time accurately without very frequent vaginal examinations. Other workers prefer to note the commencement of the wish to bear down or push, but this too is variable and may be altered by epidural anaesthesia, and possibly too by maternal posture. Artificial rupture of the membranes and augmentation of labour will also influence the length of labour.

The use of operative delivery, forceps, ventous or caesarean section not only influence the length of labour but may be used as outcome parameters in their own right. The need for them may be subject to unconscious obstetric bias.

Pain and discomfort during labour are subjective sensations that are difficult to measure and compare. They are affected by analgesia and anaesthetics and may be influenced by psychological factors and obstetric interventions such as augmented labour, uterine and fetal monitoring and episiotomy.

Blood loss during the third stage of labour may be influenced by many factors besides maternal posture including timing and management of delivery of the placenta (timing of cord occlusion, use of cord tractions, use of oxytocic agents) and the presence or absence of a perineal tear or episiotomy. Blood collection may be easier, more complete and hence apparently increased in the upright position.

Another major methodological problem concerns the failure to define clearly the maternal posture under examination. Not infrequently some workers describe women as being in the upright position when they are in fact semi-recumbent at 45° to the vertical (Fig 10). Some workers who are aware of this, do not appreciate that the difference may be important and that an upright position should be taken as synonymous with being vertical. Another difference that may be overlooked is the way that the body weight is transmitted through the hips or ischial tuberosities (and/or sacrum) and the effect that this may have on the ability of the birth canal to distend as the forces of uterine contraction and gravity press the baby downwards.

Yet another important matter that is often ignored is the position of the thighs. These may be fully flexed as in the squatting position, partially flexed as in sitting, or fully extended as in kneeling or standing. The more the

thighs are flexed the more the introitus is brought forwards away from the line of the birth canal, and the more the perineum is put on tension. This is likely to influence the actual delivery, the incidence of perineal tears, and the need for episiotomy. Therefore it is important to describe the degree to which one or both legs are extended or flexed during the second stage of labour, regardless of whether the body is in the vertical or supine position.

In some reported studies, the position assumed by the mother is changed during labour. For example, a mother may be in the upright posture during the first stage and in the dorsal supine position for the expulsive phase. It would be misleading then to judge the effect of the upright posture in terms of fetal outcome at delivery (e.g. cord acid-base status and Apgar score).

Some modern electrically operated delivery chairs are bucket shaped so that even when they are positioned in an upright position, the woman is unable to change her position freely.

FUTURE RESEARCH

Further research is urgently required to clarify matters of present controversy and to direct medical practice along correct lines. Randomised controlled trials are especially desirable. Preferably they should be undertaken in environments in which the upright posture is regarded as normal as well as in those in which the dorsal supine position is customary. Alternatively the mother may act as her own control, first adopting one posture and then another.

While controlled studies are to be preferred, these will not always be possible. For example, the obstetrician who has become convinced of the advantages of one maternal position over others, may be unwilling to



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expose his patients to the adverse effects of disadvantageous postures. In such circumstances operational research on outcome may prove very valuable. For example, if it can be shown that labours are shorter, less analgesia is used and there are fewer interventions and complications in an obstetric service using one type of maternal posture as compared with the outcome in another service using a different posture, then the inference can be made that the former maternal posture is likely to be preferable, especially if the observation is repeated in other studies.

In order to reduce conflicting variables and events such as obstetric interventions, women should be selected for study in the first instance who are low-risk and are likely to deliver spontaneously and naturally. Women whose labours have been induced or augmented should be excluded, as should those who have had an epidural anaesthetic. Indeed, if possible, all analgesia should be avoided, as should episiotomy. Obstetricians studying the problem should appreciate that the upright posture means a vertical position. They should also distinguish between the dorsal and lateral supine positions in their reports. Investigators should also define accurately the posture adopted by the woman they are studying in respect to the position of the spine, thighs, and legs. If more than one position is assumed, the time spent in each position should be accurately recorded. Video films of the whole birth process provide a convenient method of recording these events. Photographs or diagrams should accompany publications in order to ensure that the maternal posture is fully understood by others.

CONCLUSIONS

Logic and the overwhelming evidence of research over the last 50 years suggest that an upright posture and mobility are very important in achieving a quicker, safer and less painful labour and delivery (Fig 11). While many studies have revealed the benefits of the upright posture, none have revealed significant disadvantages. More research is required using randomised controlled trials that avoid previous methodological errors. It is the responsibility of obstetricians encouraging women to adopt the dorsal supine posture to show that it does not have clinical disadvantages over the vertical posture. Until this controversy over maternal posture during childbirth is concluded, women should be permitted to adopt the position of their preference and change it as and when they wish.

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