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Relationship between Ambulation and Position Changes during Labor and Hormonal Physiology
of Childbearing

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The birthing process for many women is a complex period of time that involves many changes in the mother's body as well as the baby's preparation to enter the world. Medical advances and technology have improved care for at-risk women but the increased number of unnecessary interventions during labor currently may actually hinder a healthy mother from having the best possible birth experience and outcomes for her and her child. Mothers can use many different, non-medical, non-pharmacological strategies to cope with the stress of labor. These strategies may include ambulating or position changes during the first stage of labor, massage or reflexology, many forms of hydrotherapy (i.e. showering, bathing), hot and cold therapy, and birthing environment mediation. The purpose of this thesis is to examine the relationship between ambulation, or movement, and position changes during labor and the hormonal physiology of childbearing. "Hormonal physiology of childbearing" here refers to the innate, endogenous hormones and hormone systems that regulate the biologic processes of childbirth (Buckley, 2015).

"Ambulation during labor" here will refer to moving from place to place during early and active labor that reduces the amount of time a woman spends laying down during these phases. Ambulation during labor may include but is not limited to walking, dancing, swaying or rocking while standing, squatting or in an all fours posture, or any combination and movement to different positions. Ambulation and movement in labor may help to reposition a fetus from a position that is not ideal for birthing to a more favorable position (Simkin & O'Hara, 2002; Stremler, Hodnett, Petryshen, Stevens, Weston, & Willan, 2005), to promote gravity to move the fetus to a lower station (Prabhakar, George & Karkada, 2015), and may also reduce pain

perception associated with contractions and discomforts of the labor process (Gau, Chang, Tian & Lin, 2011; Ondeck, 2014; Romano & Lothian, 2008; Simkin & Bolding, 2004; Spiby, Slade, Escott, Henderson & Fraser, 2003; Stremler et al., 2005).

This thesis will include a literature review that explores different aspects of ambulation related to the progression of labor and current practice recommendations of the use of ambulation in labor. It will also compare the benefits of and potential barriers to ambulation in labor to the mother and baby. A brief exploration will be made of the similarities and differences between ambulating in labor and showering in labor. Finally, it will investigate the relationship between ambulation in labor and its influence on hormone levels associated with physiologic labor and birth.

Use of Ambulation and Position Changes in Labor

A woman's laboring body instinctively cues ambulation, movement and positional changes. Societal and cultural norms and high use of medical interventions decrease a woman's confidence and trust in the cues that are instinctively programmed in her laboring body and continuously increase her dependency on others to control and promote her birthing experience. The increased use of medical interventions such as epidural analgesia, continuous electronic fetal monitoring, intravenous infusions for fluids and electrolytes, and a restrictive birthing environment limits women's instinctive responses to labor pain and contractions rather than assisting the woman to cope with the pain and anxiety of labor (Simkin & Bolding, 2004; Spiby et al., 2003).

The introduction of many, often unnecessary, medical interventions creates an environment in which a woman cannot move about freely or easily. Women are connected to devices and equipment that contraindicate free movement (ie. electronic fetal monitoring,

epidurals, etc.), are unable to support themselves due to pain medication, and may be told to stay in bed and not to walk around – as is the case with a labor epidural (Simkin & Bolding, 2004).

This restrictive, dependent laboring environment does not promote or encourage a mother that is stressed, anxious, fearful, and in pain to naturally cope with the discomforts of labor. Releasing a mother from medical interventions that are not medically indicated puts her back into a position of control to choose and experiment with coping strategies, such as ambulation or position changes, that support labor progress in a more natural fashion.

The experience a woman has with her pain in labor, dictates how she will perceive her progress towards delivery. Often the approach that is taken by health-care professionals in assisting the laboring woman in dealing with her pain sets the tone for the laboring and birthing experience. Rather, when a woman that is encouraged to direct her own labor and birth is more likely to show higher satisfaction and perceive a smoother birthing process than a woman that may be told what to do and when to do it during her labor by healthcare professionals (Gau, Chang, Tian & Lin, 2011; Ondeck, 2014; Prabhakar, George & Karkada, 2015).

In a medical model, the complete elimination of the physical sensation of labor pain is the focus and goal of treatment and interventions. Laboring women subjected to this model become dependent on those that hold the control of pain relief which creates a cascade of necessary interventions to monitor the mother's and baby's well being, as is the case with parenteral medications and epidural analgesia. With these medical interventions, women are restricted in their basic human functions such as eating, drinking, toileting and walking leaving women with few decisions and little freedom to manage and cope with labor. In contrast to a medical model, a midwifery model of childbirth places emphasis on the prevention of suffering. Instead of

attempting to make the pain disappear completely, the goal is to empower the laboring woman to cope with the pain (Simkin & Bolding, 2004).

Postural changes can be one of the simplest ways of promoting labor, as women can use them while remaining in bed, if medically indicated. Spiby et al. (2003) found that the assumption of and rotation between kneeling, squatting and side-lying positions assisted in pain relief, as well as reduction of anxiety, fear and stress. Introduction of interventions such as electronic fetal monitoring (EFM) and intravenous infusions were stated as reasons that women discontinued postural changes as a means of decreasing discomfort. Posture was also used to help labor progress, although it was not found to be a deliberate, strategic postural change but an instinctual move by the woman. Similarly, Stremler et al. (2005) found that assuming a hands and knees position helped to facilitate fetal head rotation from occipitoposterior (OP) to occipitoanterior (OA), when used for at least 30 minutes over a one-hour period during the first stage of labor. A significant reduction in back pain was also found in the hands and knees experimental group. Simkin and Bolding (2004) assert that walking, swaying, lunging and/or flexing and extending the legs changes pelvic dimensions to facilitate fetal rotation and descent. Such movement also mitigates pain caused by abnormal positioning of the fetus and/or prolonged labor.

Gau et al. (2011) introduced the use of a birth ball during the first stage of labor by sitting, rocking, standing, kneeling or squatting with the ball as support or counter pressure. The birth ball experimental group was found to have spent an increased amount of time in an upright position, had decreased labor pain and increased childbirth self-efficacy. Those women with an increased sense of self-efficacy were found to have decreased pain scores, indicating that as

women were supported in labor and were able to position themselves freely their satisfaction and comfort were increased.

Ambulation positively affects the progress of labor and a woman's behavioral response to childbirth. Prabhakar et al. (2015) conducted a study in which an experimental group was ambulated for one hour to one and a half hours during the first stage of labor. Walking keeps the mother in an upright position and includes pelvic rotation and slight expansion in diameter, as well as incorporation of gentle swaying and rocking motions. Venacaval compression is prevented, descent of the fetus's head is encouraged by the gravitational effect of being upright and the first stage of labor is shortened in duration. Prabhakar et al. (2015) also found that ambulation in the first stage of labor was effective in bringing about a positive mood and attitude in mothers toward their progress in labor. Most importantly, it can be noted that by retaining the choice to ambulate or remain seated or in bed, was key in improving a mother's perception of childbirth. To explain further, mothers that were told to stay in bed and not walk around experienced lower satisfaction with childbirth than mothers that were given the choice to stay in bed, walk around or move from one position to another. Therefore, ambulation itself is beneficial to the natural promotion of the physical processes of labor and birth, but retaining the choice and freedom to ambulate, move around or stay stationary whenever the mother chooses is perhaps more influential than being told when and how to ambulate.

Practice Recommendations of Ambulation and Position Changes in Labor

Regular practice with ambulation and position changes during the third trimester of pregnancy increases a woman's self-confidence in those techniques. Practicing increases the likelihood that she will turn to these techniques during labor for comfort and support, rather than medical interventions. Gau et al. (2011) encouraged women in the experimental birth ball group

to practice positions with their birth ball for 20 minutes, three times per week for six to eight weeks during the third trimester. It was found that regular birth ball use improved alignment and perception of muscle sense and changes in body center of gravity. Birth ball practice was perceived to be useful by the participants of Gau et al. (2011) in preparing for labor – they found that keeping good posture and maintaining abdominal and back strength reduced pain and promoted a sense of self-efficacy.

Simkin and O'Hara (2002) recommend encouraging women to labor and deliver in whichever position is most comfortable for and familiar to them. Changing positions throughout labor, including upright, side lying and gravity neutral positions, may result in more efficient labors. Positioning such as hands and knees are recommended for rotating the fetus from occipitoposterior presentation to occipitoanterior presentation, while ambulating, swaying/rocking or squatting aid in correcting slow progress in dilation or descent (Simkin & O'Hara, 2002).

Similarly, Romano and Lothian (2008) advise standing, kneeling or squatting to aid gravity in bringing the fetus down and protecting the birth canal and the fetus from excessive pressure that may cause excessive fetal hypoxia or distress. Gravity neutral positions, such as kneeling on all fours, side lying and semi-sitting, allow women to rest between contractions and help conserve energy during contractions. Squatting is recommended in labor because it widens the pelvic diameter creating more room for the baby to descend. Interspersing upright positions with other positions is shown to decrease pain and shorten labor as long as the change in position is voluntary and guided by the mother (Simkin & Bolding, 2004). As labor progresses, pushing in upright positions is endorsed to help in decreasing the incidence of severe maternal pain and abnormal fetal heart rate (Romano & Lothian, 2008).

Laboring women are also affected by their perception of autonomy and mobility in their birthing environment (Ondeck, 2014). These aspects are affected by her permission, physical environment, practices by health-care professionals, and the people involved in her labor. Permission and people relate to the respect shown toward her choices, the extent to which she is aided in achieving her wishes, and advocacy shown on her behalf to respect her choices/wishes. The physical environment should be tailored to the woman's desires, including any tools she does or does not want available – shower, bathtub, birthing ball, birthing bed. In an environment where a woman feels safe, beta-endorphins help a woman respond to pain by using coping strategies (Ondeck, 2014). Practices by professionals that promote a woman's freedom of mobility include offering oral fluids and calories, intermittent fetal monitoring, non-pharmacologic coping strategies (position changes, ambulation, relaxation, massage, acupuncture, immersion in water, warm showers), and enabling her to choose the positions of their choice in labor (Ondeck, 2014). Romano and Lothian (2008) also endorse enabling a woman's freedom of movement to encourage her to assume instinctive positions and movements to cope with labor.

Comparison of Ambulation and Position Changes to Showering in Labor

Ambulation and position changes are similar to the labor pain reduction mechanisms that are provided by showering in labor (Simkin & Bolding, 2004). Movement and positioning offer the benefits of decreasing anxiety and fear, while providing reassurance, increasing a woman's sense of control in reducing pain perception, and cues rhythmic activity and rituals, providing a sense of calm and peace. Showering, or hydrotherapy, provides stimuli from peripheral sensory receptors to inhibit pain awareness as well as a decrease in muscle tension. According to Simkin and Bolding (2004), movement and showering share the effects of increasing joint mobility,

altering pressures within the pelvis and soft tissue, and providing a distraction of attention from pain.

It can be assumed that women are showering in upright positions, including standing, rocking, swaying, squatting or sitting and that they are also changing positions within the shower to direct water wherever it is needed to provide pain relief or soothing effects. Therefore, showering evokes many of the labor benefits that are provided by movement alone. Intentionally incorporating showering into positioning, movement and ambulation has the potential to improve the birthing experience two-fold. The potential benefits include but are not limited to the promotion of gravity, enhancement of the baby's descent and progressing further into the pelvis and birthing canal, pain relief, increased sense of self-efficacy, calming and comfort, and perception of control over the environment and birthing experience. (Simkin & Bolding, 2004)

Ambulation and Position Change Effects on Physiologic Hormones in Labor

Physiologic hormones involved in labor and childbirth are specifically timed and released at key points when they will be the most beneficial to the process (Buckley, 2015; Sakala, Romano & Buckley, 2016). The release or suppression of these hormones is internally and externally affected, in a complex manner that is key to the mother's and baby's survival and success of the birthing process, in addition to the success of breastfeeding and maternal-infant attachment. For example, when a mother is anxious, fearful or under great stress from her environment or the people surrounding her, this disrupts the normal hormonal physiology and may inhibit or slow down labor when her hormones are focused on preserving the woman or surviving the "threat". In contrast, a mother feels safe, comfortable, and supported she is free to focus completely on her labor and her hormones follow their natural course to promote labor (Sakala, Romano & Buckley, 2016).

Weeks before the onset of labor, the mother-baby dyad starts to be prepared hormonally so that at the beginning of labor both are completely primed for the delivery and birth. Hormone systems are connected and inhibit or promote one another's activity to specifically amplify certain hormonal effects, depending on the stage and phase of labor. Because of the complexity of the connection between hormonal systems, a disruption to one or more of these systems has the potential to be catastrophic to childbirth. Often, when one disruption occurs from a medical intervention, it can lead to a cascade of additional interventions to monitor the effects of the initial intervention. This continues in a circular fashion until the mother is overwhelmed with interventions and physiologic childbirth is crippled (Buckley, 2015).

Buckley (2015) explores four different hormone groups that are active in labor and common maternity practices that impact that hormones physiology: oxytocin, beta-endorphins, epinephrine-norepinephrine and cortisol, and prolactin. Movement and positioning directly affects oxytocin, beta-endorphins and epinephrine-norepinephrine, while cortisol and prolactin are indirectly mediated by a woman's perception of her environment and permission to control her environment and her labor. Thus, oxytocin, beta-endorphins and the epinephrine-norepinephrine systems will be the focus here.

Oxytocin provides uterine contractions and late-labor urge to push, calming and analgesic effects, augments and accelerates labor, and supports maternal-infant bonding. Exogenous (synthetic) oxytocin administration reduces the body's production of endogenous oxytocin. Buckley (2015) states that it is thought that synthetic oxytocin does not to cross the blood-brain barrier, therefore not providing natural analgesia and creating a need for other pain management, such as an epidural. Continuous electronic fetal monitoring and epidural anesthesia are often co-interventions with oxytocin administration. This greatly reduces the mother's ability to move and

re-position her body because of attached lines and monitors. Simkin and O'Hara (2002) found that women in upright positions during the first stage of labor, whether that was sitting/rocking or standing/ambulating, were less likely to use narcotic or epidural pain relief. These upright positions shortened the first stages of labor and it was found that women needed less oxytocin administration to augment labor because positioning enhanced gravity brings the baby down. Movement, in combination with upright positions, also increased levels of endogenous oxytocin in the mother.

Exogenous (synthetic) oxytocin administration is titrated by human judgment. Therefore, the rate of oxytocin delivered can only be estimated to compensate for the actual need of the body to promote labor progression at any given time. In contrast, Buckley (2015) recognizes that endogenous (natural) oxytocin is produced and the mother's body controls its release at the exact time it is needed to facilitate labor best. Endogenous oxytocin, unlike exogenous oxytocin, crosses the maternal blood-brain barrier, which has been shown to provide some reduction in pain perception. In summary, when a mother moves and/or uses upright positions in labor, she increases her levels of endogenous oxytocin. These increased levels of endogenous oxytocin allow labor to progress at the mother's own pace with some natural pain relief (Buckley, 2015).

Within a sensitive range, beta-endorphins also provide analgesic properties to a laboring woman in addition to promoting adaptive responses to stress and pain because they activate the brains reward and pleasure centers (Buckley, 2015). However, in an environment where women are under excessive stress, beta-endorphin levels are increased to supraphysiologic levels that actually inhibit oxytocin and slow labor. Promoting an environment in which women feel in control, are free to move and position as they please and are safe increases beta-endorphins to a

physiologic beneficial level that helps women respond to pain by using coping strategies (Ondeck, 2014).

Epinephrine-norepinephrine (EN) systems mediate “fight or flight” and are released with increased levels of stress and/or perceived danger or threat. This system is important during the catecholamine surge during late-labor to prepare the fetus for passing through the birth canal and adapting to the external environment successfully. EN also has the effect of slowing or stopping labor and may be induced when a mother is in an unfamiliar or restrictive environment. (Buckley, 2015)

Conclusion

Natural, hormonally, and physiologically normal labor and childbirth depend on a variety of factors. The most important of these being supporting a woman in her choices and wishes related to her laboring and birthing experience. Respecting her choices and wishes includes maintaining an intervention free environment, as much as the situation allows, and empowering her to direct her own birth. Encouraging a woman to use non-pharmacologic interventions, such as ambulation, movement, and position changes can reduce pain, promote labor and provide empowerment with natural coping strategies. Position changes and ambulation are recommended to promote labor progress by encouraging fetal descent and optimal fetal presentation. In addition to the physical and hormonal benefits, movement and more precisely the choice of movement, enhances the mother’s sense of self-efficacy and control while reducing her perception of pain, by increasing endogenous oxytocin, providing regulation to beta-endorphins and reducing excessive and inappropriate epinephrine-norepinephrine levels produced by stress.

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