

Neocortical Inhibition During Labor And Stress Deprivation Associated With Cesarean Section Without Labor**Doğum Sürecinde Neokortikal İnhibisyon ve Doğum Eylemi Başlamadan Yapılan Sezaryen İle İlişkili Stres Yoksunluğu**Michel ODEnt¹, Özlem MORALOĞLU TEKİN²¹ Pithivers Hospital, France² Zekai Tahir Burak Womens Health Education and Research Hospital, Ankara, Turkey**ABSTRACT**

The concept of neocortical inhibition is key to understand human nature. Key to understand nature's solution to overcome a human handicap and make birth possible in our species. This solution is simply that the neocortex must stop working during the birth process. Our neocortex is originally a tool that serves the old brain structures as a means of supporting our survival instinct. The point is that its activity tends to control more primitive brain structures and to inhibit the birth process (and any sort of sexual experience as well). The neocortex is supposed to be at rest so that primitive brain structures can more easily release the necessary hormones.

There are three kinds of cesarean sections: pre-labor c-sections, in-labor non-emergency c-sections, and in-labor emergency c-sections. From the point of view of the baby, it appears that the main differences are between pre-labor cesarean births and the others (whatever the route). In other words, the main differences are between birth with labor and birth without labor. Many unexpected differences have been demonstrated through human studies regarding the effects of cesarean births according to their timing. This is an important point: the multiple negative effects of stress deprivation among babies born by pre-labor c-section have been underestimated until recently. We must also take into consideration the effects of the fetal stress hormones like noradrenaline, endorphins (which induce the release of prolactin) oxytocin, adiponectin and melatonin which released during labor.

Key Words: Birth, pre-labor cesarean section, stress hormones

ÖZET

Neokortikal inhibisyon kavramı, insan doğasını anlamada kilit noktadır. İnsan türündeki bu handicap için doğanın çözümünü anlamak, doğumu türümüz için mümkün hale getirmede kilit noktadır. Bu çözüm, basitçe doğum eylemi sırasında neokorteksin çalışmayı durdurması şeklindedir. Aslında neokorteksimiz, hayatta kalma içgüdümüzü destekleyen ilkel beyin yapılarına hizmet eden bir araçtır. Önemli olan nokta, neokorteksin daha primitif beyin yapılarını kontrol etmesi ve doğum sürecini (aynı zamanda her türlü cinsel deneyimi) inhibe etme eğiliminde olmasıdır. Primitif beyin yapılarının gerekli hormonları salgılayabilmesi için neokorteksin inaktif durumunda olması gerekir.

Sezaryenin üç tipi vardır: Doğum eylemi başlamadan yapılan sezaryen, doğum eylemi sırasında acil olmayan sezaryen, doğum eylemi sırasında acil yapılan sezaryen. Bebek açısından bakıldığında temel farkın doğum eylemi başlamadan yapılan sezaryen ve diğerleri (hangi tür doğum şekli olursa olsun) arasında olduğu görülmektedir. Diğer bir deyişle, temel fark eylem başladıktan sonra gerçekleşen doğum ve eylem başlamadan gerçekleşen doğum arasındadır. Sezaryen doğumların zamanlamasına göre etkilerini inceleyen insan çalışmalarında birçok beklenmedik farklılıklar gösterilmiştir. Önemli nokta şudur: doğum eylemi başlamadan yapılan sezaryen ile dünyaya gelen bebeklerde, stres yoksunluğunun çok sayıda negatif etkileri olduğu yakın zamana kadar göz ardı edilmiştir. Doğum eylemi sırasında salgılanan noradrenalin, endorfinler (prolaktin salınımını destekler), oksitosin, adiponektin ve melatonin gibi fetal stres hormonlarının etkilerini de dikkate almamız gerekir.

Anahtar Kelimeler: Doğum, doğum eylemi başlamadan yapılan sezaryen, stres hormonları

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Neocortical Inhibition During The Birth Process

From a physiological perspective, the birth process is under the control of archaic brain structures shared – with some variants - by all mammals. From this starting point we can present the birth process as an involuntary process, and immediately refer to the main particularity of *Homo sapiens*, the enormous development of the part of the brain called neocortex. Human instinctive behaviors that have mysteriously grown weaker or even disappeared are in fact repressed, or stifled by neocortical activity. The concept of neocortical inhibition is key to understand human nature. Key to understand nature's solution to overcome a human handicap and make birth possible in our species (1). This solution is simply that the neocortex must stop working during the birth process. Dark, warm, quiet surroundings are critical for her to maintain this space of consciousness safely and have the best possible labor and birth experience/outcome. When our neocortex is at rest we have more similarities with other mammals. The neocortex is supposed to be at rest so that primitive brain structures can more easily release the necessary hormones (1). During an easy unmedicated birth, there is a time when the laboring woman is as if cut off from our world, indifferent to what is happening around her. She tends to forget what she read, what she learned and what her plans were. She can behave in a way that usually would be considered unacceptable in a civilized woman: for example she dares to scream or to swear. She can be impolite. She can talk nonsense. She can find herself in the most bizarre unexpected postures. These postures are often primitive, quadrupedal. Starting from the concept of neocortical inhibition one can understand that the birth process needs to be protected against all stimulants of the neocortex - particularly light - and all attention enhancing situations, such as being exposed to language, feeling observed, or perceiving a possible danger. The keyword is protection. Language, particularly rational language is one such factor. When we communicate with language we process what we perceive with our neocortex. This implies, for example, that if there is a birth attendant, one of her main qualities is her capacity to keep a low profile and to remain silent, to avoid in particular asking precise questions.

Whatever the physiological concept that is taken as a point of departure, it always appears that, when a woman is in labor, the important point is to reconcile the need to feel secure and the need for privacy (not to feel observed). This is an opportunity to recall that the midwife is originally a mother figure. The mother is the prototype of the person with whom one can feel secure without feeling observed. She is the prototype of the protective person. This reduction of the activity of the neocortex is an essential aspect of birth physiology among humans. This aspect of human birth physiology implies that one of the basic needs of labouring women is to be protected against any sort of neocortical stimulation (1).

Stress Deprivation Associated With Pre-Labor Cesarean Section

In countries where the cesarean section has become a frequent way to be born, the main questions are about the timing of the operation. From that perspective, there are three kinds of cesareans: pre-labor c-sections, in-labor non-emergency c-sections, and in-labor emergency c-sections. We must reconsider the usual classifications, which confuse the terms "pre-labor" and "elective", and also "in-labor" and "emergency": it is possible to plan an in-labor c-section, and an in-labor operation can be decided and performed before the stage of emergency.

In the current scientific context, we should also go beyond the usual classifications according to the route of birth. From the point of view of the baby, it appears that the main differences are between pre-labor cesarean births and the others (whatever the route). In other words, the main differences are between birth with labor and birth without labor.

It is easy to anticipate differences between babies born pre-labor and the others and to interpret in particular the increased risks of respiratory difficulties after pre-labor birth, since we understand today that the fetal lungs themselves provide a signal to initiate labor: surfactant serves as a labor hormone that indicates to the mother's uterus when the fetal lungs are mature enough to withstand the critical transition from life in fluid to air breathing (2). Furthermore, the well-known role of maternal and fetal stress hormones in the maturation of the baby's lungs just need a reminder. Everybody knows that when a premature birth is considered imminent the mother is given analogues of stress hormones (corticosteroids) to prepare the respiratory function. The stress of labor is associated with the release of endorphins, which induce the release of prolactin. One of the many effects of prolactin is to participate in lung maturation (3). We must also take into consideration the effects of the fetal stress hormone noradrenaline released during labor. Fetal noradrenaline has multiple roles to play - apart from the protection against lack of oxygen during uterine contractions and lung maturation.

This is an important point: the multiple negative effects of stress deprivation among babies born by pre-labor c-section have been underestimated until recently. For example, it has been demonstrated that, under the effect of noradrenaline, the sense of smell has reached a high degree of maturity at birth among babies born by in-labor c-section. The principle of a Swedish experiment was to expose babies to an odour for thirty minutes shortly after birth and then to test them for their response to this odour (and also to another odour) at the age of three or four days (4). Since the concentrations of noradrenaline had been evaluated, it was been possible to conclude that fetal noradrenaline released during labour is involved in the maturation of the sense of smell. We must emphasize the paramount role of the sense of smell immediately after birth. I had already mentioned in the 1970s that the sense of smell is the main guide towards the nipple as early as during the hour following birth (5,6). It has been demonstrated that it is mostly through the sense of smell that the newborn baby can identify its mother (and, to a certain extent, that the mother can identify her baby).

There has been recently an accumulation of data multiplying the reasons for waiting, whenever possible, the onset of labour before performing a cesarean. Many unexpected differences have been demonstrated through human studies regarding the effects of cesarean births according to their timing.

Among such studies, we must mention the evaluation of adiponectin concentration in cord blood of healthy babies born at term (adiponectin is a metabolic hormone involved in fat metabolism). The concentration is significantly lower after pre-labor cesarean compared with in-labor cesarean or vaginal route (7). These data suggest a mechanism according to which stress deprivation at birth might be a risk factor for obesity in childhood and adulthood. We must also give great importance to data regarding the milk microbiome. There are significant differences between the milk of mothers who gave birth by pre-labor cesarean and those who gave birth by in-labor cesarean or the vaginal route (8). These results suggest that there are other factors than the operation per se that can alter the process of microbial transmission to milk. Similar differences were found by a Canadian study of the gut flora of four-month-old babies (9). Joanna Holbrook and her team, in Singapore, suggest interpretations for these surprising data. They collected fecal samples from 75 babies at the age of 3 days, 3 weeks, 3 months and 6 months (and they evaluated the degree of adiposity at 18 months). It appears that, apart from the route of birth and exposure to antibiotics, a shortened duration of pregnancy tends to delay the maturation of the gut flora: one week more or less in the duration of pregnancy is associated with highly significant differences: a pre-labor cesarean implies the association of all the known factors that can delay the maturation of the gut flora. This study is all the more important since it also reveals that a delayed maturation of the gut flora is a risk factor for increased adiposity at

the age of 18 months (10).

In the framework of human studies, we may include also evaluations of the concentrations of melatonin in the cord blood. It is low after pre-labor births (11). This is an important point, since melatonin (the “darkness hormone”) has protective anti oxidative properties. Furthermore, it confirms that the “darkness hormone” is involved in the birth process. There are other reasons why the role of melatonin during labor is topical, at a time when we are learning about a synergy between its receptors in the uterus and oxytocin receptors.

In general, a baby born after a pre-labor cesarean is physiologically different from the others. For example, babies born pre-labor tend to have a lower body temperature than the others during the first 90 minutes following birth (12).

In spite of possible interspecies differences, we must seriously consider animal experiments suggesting that the stress of labor influences brain development. Such is the case of studies demonstrating that the birth process in mice triggers the expression of a protein (uncoupled protein 2) that is important for the hippocampus development (13). Let us recall that, among humans, the hippocampus is a major component of the limbic system. It has been compared to an “orchestra conductor” directing brain activity. It has also been presented as a kind of physiological GPS system, helping us navigate while also storing memories in space and time: the work of three scientists who studied this important function of the hippocampus has been recognised by the award of the 2014 Nobel Prize in physiology and medicine. This is also the case of studies with rats suggesting that oxytocin-induced uterine contractions reverse the effects of the important neurotransmitter GABA: this primary excitatory neurotransmitter becomes inhibitory (14). If uterine contractions affect the neurotransmitter systems of rats during an important phase of brain development, why would not the same occur in humans?

This overview of the multiple effects of stress deprivation in the case of pre-labor birth suggests the conclusion that the ideal kind of cesarean is the one performed during labor, before the stage of a real emergency. Other reasons to avoid pre-labor caesareans will probably appear in the near future, particularly from the epigenetic perspective. It seems that the prevalence of placenta previa is significantly increased only in the case of a pregnancy following a pre-labor cesarean (15). There is already an accumulation of data confirming the negative effect of pre-labor cesarean on breastfeeding prevalence, particularly at the phase of initiation of lactation (16,17). We must also keep in mind that emergency caesareans are associated with comparatively bad short-term statistics. Furthermore, they are associated with negative long-term outcomes. For example, according to an American study, women with a full term second stage cesarean have a spectacular increased rate of subsequent premature births (13.5%) compared to a first stage cesarean (2.3%) and to the overall national rate (7-8%) (18).

In such a context, we must prepare for new basic obstetrical strategies, if we accept the way of thinking of modern physiology and improve our understanding of the basic needs of laboring women. The first objective would be to create environments compatible with easy and fast birth (for example nobody around the laboring woman, apart from one experienced and silent midwife keeping a low profile). If the midwife becomes pessimistic, the best alternative to the vaginal route would be an in-labor cesarean before the stage of emergency.

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