



Developing Process of Regular Labor Contraction

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Abstract

Aims: To clarify the developing mechanism of uterine contraction curve in the birth process. **Methods:** Uterine contraction curve, which was constant in old and new studies and recording methods, and it is similar to the electric oscillation, thus, their developing mechanisms were compared. **Results:** The labor contraction will be a physiological oscillation, similar to electric oscillation, namely it is a physiological oscillation developed by positive feed-back loop. **Conclusion:** The novel analysis of regular uterine contraction will be applied to the analysis of labor developing mechanism and for the treatment of preterm labor.

Keywords: Uterus, Labor contraction, Preterm labor, Oscillation, Electric, Physiologic.

Introduction

Since reported uterine contraction curves are uniform in intramyometrial pressure and external tocodynamometry, and regular preterm labor contraction has been unable to be alleviated by medicinal treatment to prolong the pregnancy duration until full term birth. The clinical difficulty will be caused by no understanding of the process to develop labor contraction, but thinking only to suppress uterine myometrial activity, namely, labor contraction will develop by the coordination of a positive feed-back system composed of the uterus, uterus-brain nerve, hypothalamus and hypophysis which produce oxytocin to enhance uterine contraction until physiological oscillation of whole feed-back system.

As the myometrium is simple compound of myometrial cells which has no particular center of contraction rhythm, but there is close similarity of contraction interval and the contraction curves of intramyometrial pressure reported by Roberto Caldeyro-Barcia 1958 in Monte-Video [1] and external tocodynamometry recorded in 1980s in Tottori. Although there was no communication among two studies, they were highly similar.

As there was close similarity between labor contraction recorded by Caldeyro-Barcia and enlarged ultrasound oscillation (Figure 1), the author understood the mechanism of developing labor contraction, namely, both curves are the result of oscillation, which is produced by the presence of positive feed-back system, both in electric and physiologic oscillations.

Electric signal is enlarged in an amplifier, of which output is fed back to the input of amplifier, and further enlarged until saturation, where the frequency is constant according to the frequency constant of the feed-back loop, and its amplitude is also.

Methods and Results

The electrical oscillation developed in a positive feed-back loop composed of an amplifier, of which output is fed back to the input of amplifier through the feed-back loop, of which time constant determines output wave frequency. Signal amplitude is limited by the saturation of amplifier system, then constant amplitude of constant frequency signal is produced after the saturation of the feed-back system

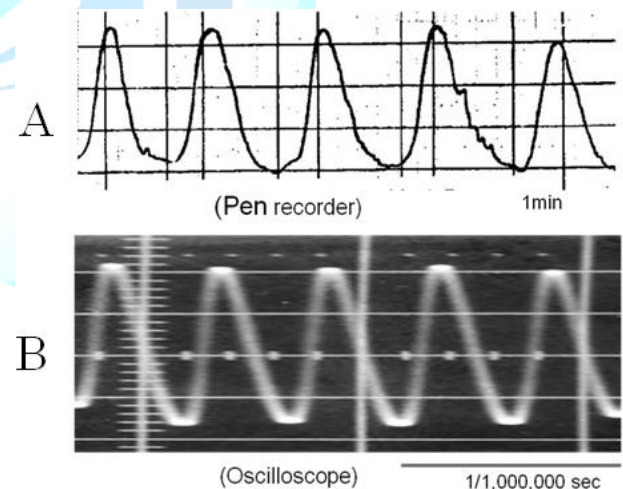


Figure 1: Uterine contractions are close to electric oscillation. **A:** Uterine contraction, Caldeyro-Barcia, 1960 [1]. **B:** Electric oscillation, 2MHz ultrasound, 1975.

The labor will be initiated by local and weak uterine contraction, which is distributed whole uterus through the gap junction, the contraction signal is conducted hypothalamus through the uterus-brain nerve [2-5] which amplifies the signal then the hypophysis

is stimulated to discharge oxytocin, which further stimulates uterine contraction, and the positive feed-back loop is further stimulated to saturate uterine contraction to constant intensity and frequency, that is the physiologic oscillation (**Figure 2**).

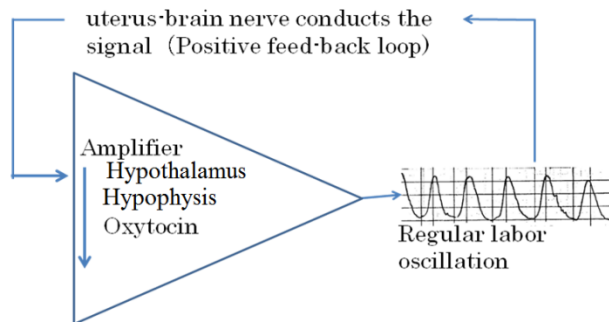


Figure 2: Regular labor is physiologic oscillation caused by positive feed-back through uterus.

Discussion

Braxton-Hicks contraction is after 30 weeks of pregnancy, while it does not proceed to the vaginal delivery, is an example of incomplete uterine oscillation, namely, local early contraction appears, while the positive feed-back system does not work to make the contraction to regular labor contraction. That should be discussed in the treatment of preterm labor,

Tocolysis is common in the preterm labor, while it is unable to stop the contraction to prolong the pregnancy to full-term delivery. The author thinks that the preterm labor is a complete uterine oscillation, which is difficult to stop with common tocolysis. Therefore, it will be necessary to suppress the formation of positive feed-back loop with any anesthesia of uterus-brain nerve, or to detect local uterine contraction and suppress it by tocolysis, and so on, namely, more early stage suppression will be effective, after detection of the early weak contraction and tocolyzer is administered.

Conclusion

Labor contraction of uterus is developed by a positive feed-back system including brain until physiologic oscillation. As preterm labor contraction develops by the same process, preterm labor treatment will be started from the understanding of the oscillation of positive feed-back system.

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