

Birth ball for pain management and its effects on natural childbirth

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Abstract

Pelvic exercise with the birth ball stretches and relaxes pelvic muscles. When it's incorporated to labor, it reduces the duration of the first phase, and reduces pain. The objective of this review is to describe the use of the birth ball as a non-pharmacological strategy for pain management, and their effect on the evolution of labor. To achieve this, a bibliographic review was carried out based on scientific articles published within the last five years. This non-pharmacological technique has shown benefits in the management of maternal pain and anxiety. During pregnancy and labor, the use of the birth ball promotes postural correction as well as relaxation and stretching of the pelvic floor muscles. In addition, it helps in the descent and rotation of the fetal head, and increases cervical dilation, facilitating natural delivery. The use of the birth ball is an effective non-pharmacological technique for pain management and reduces labor time. Also, it helps to correct fetal presentation and avoids obstetric procedures.

Keywords

Natural childbirth, exercise movement techniques, labor pain, obstetrics.

Resumen

La terapia de balón, también conocida como esferodinamia, es un ejercicio que estira y relaja los músculos pélvicos al usar una pelota suiza, que, al ser incorporada al trabajo de parto, reduce la duración de su primera fase y disminuye el dolor. El objetivo de la revisión es describir su aplicación como medida no farmacológica para el manejo del dolor y sus efectos en la evolución del trabajo de parto. Para alcanzar esto, se realizó una revisión bibliográfica basándose en artículos científicos publicados en los últimos cinco años. Esta técnica no farmacológica ha demostrado beneficios en el manejo del dolor y la ansiedad materna. Durante el embarazo y el trabajo de parto, esta terapia promueve la corrección postural, la relajación y el estiramiento de los músculos del piso pélvico. Además, ayuda en el descenso y rotación de la cabeza fetal y aumenta la dilatación del cuello uterino, facilitando el parto natural. La terapia de balón reduce el tiempo de trabajo de parto y es una medida eficaz no farmacológica para el manejo del dolor. Así mismo, ayuda a corregir la presentación fetal y evita procedimientos obstétricos.

Palabras clave

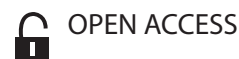
Parto natural, técnicas de ejercicio con movimientos, dolor de parto, obstetricia.

Introduction

Labor is a set of physiological phenomena whose purpose is the expulsion of the fetus and placenta¹. Pregnant women are exposed to stressors during childbirth, which generate anxiety. This can generate an increase in sympathetic autonomous activity, negative effects on the mother-child relationship and the possibility of complications during pregnancy and postpartum period².

Previously, it was common for pregnant women to be restricted to physical activity; now it is advisable to carry it out³. An increase in its use as a non-pharmacological method for pain management during childbirth has been observed⁴.

Spherodynamics is defined as the use of the Swiss ball to do different exercises, which are done with a specialized physiotherapist who guarantees its benefits by using the body actively and effectively, facilitating childbirth^{5,6}.



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Terapia de balón para manejo del dolor y sus efectos en el parto

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The authors declare there are no conflicts of interest.

This revision describes the effects of ball therapy on labor progress and its application as a non-pharmacological measure for pain management.

Discussion

Overview of spherodynamics

Spherodynamics is a physical exercise that uses the birth ball, also called the Swiss ball, which usually has a diameter of either 55 cm or 65 cm and provides a soft surface for women to sit or lean on, while doing simple exercises⁷.

It was introduced for the first time for neurodevelopmental treatment purposes⁸ in 1963. It was extended to the field of obstetrics in 1980. Simkin (1995) and Pérez (2000) were the first ones to spread knowledge of its use among midwives, nurses and other health care providers, about its advantages for positioning and pain relief during the birth process^{9,10}.

As published by Shirazi *et al.* in 2019, the first scientists justified that the birth ball improved the mother's control and confidence over her body. It was observed that postural correction, relaxation, stretching and strengthening of pelvic floor muscles were promoted by the birth ball during pregnancy and labor¹¹.

Meanwhile, in 2018, Gallo *et al.* and Makvandi *et al.* in 2019, mention its usefulness to reduce pain, stress and cesarean section rates in both public and private health network. Besides, postural correction, relaxation, stretching and strengthening of the pelvic floor muscles are promoted^{12,13}. In 2019, Delgado *et al.* and Apriani *et al.* in 2020, show their usefulness to shorten the duration of labor, help the comfort of the mother, facilitate the descent of the fetal head and reduce pain during childbirth. It has also been shown that women who practice this therapy need lower doses of epidural anesthesia and have less need for cesarean sections^{14,15}.

Nowadays, this non-pharmacological technique has demonstrated benefits in: pain management, anxiety, maternal experience and obstetric parameters, which will be detailed in the following sections¹⁶.

Technique

Spherodynamics is performed in five different positions during labor, which can be seen in Figure 1.

Benefits

There is an incentive to use non-pharmacological methods that reduce the complications that occur in standardized management and allow pregnant women to have an active participation in labor¹⁷. A study of series of cases found strong acceptability and high satisfaction (more than 90%) among Chinese women in public hospitals in Hong Kong, where balloon therapy was used during childbirth¹⁸.

In 2015, Tussey *et al.* described that women who used the birth ball ($n = 107$) against those who did not ($n = 91$) showed shorter labor: 29 minutes in the first stage ($p = 0,053$) and 11 minutes in the second stage of ($p < 0,001$). The intervention was associated with a significantly lower incidence of caesarean sections (OR = 0,41, $p = 0,04$)¹⁹. In the same way, in 2019 Hickey *et al.* in their quasi-experimental study, described that women in the group that used spherodynamics had 50 % fewer possibilities to have a cesarean delivery. Also, the change of position was frequently associated with a reduced duration of the first and second stage of labor²⁰.


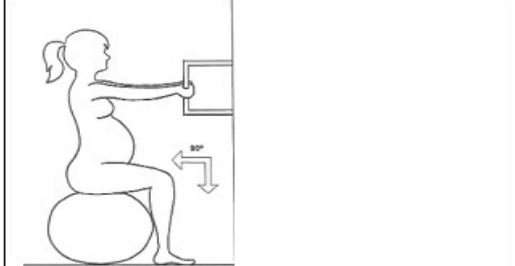
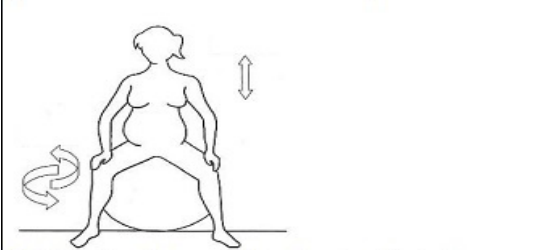

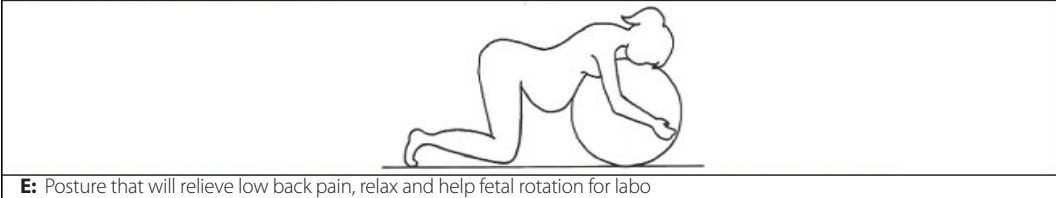
In 2018, Henrique *et al.* evaluated the effects of perineal exercises with birth ball on the parameters of pain, anxiety and stress, performed on 128 pregnant women admitted to a hospital in São Paulo, Brazil in 2018. Pain and anxiety decreased in the intervened group. Levels of β -endorphin increased in this group after the intervention and a significant difference in the ability to cause this effect was shown ($p = 0,007$). No significant differences were observed in the levels of epinephrine, norepinephrine and cortisol²¹.

In 2015, according to Mirzakhani *et al.*, ball therapy in primiparous women reduces the incidence of cesarean sections and increases vaginal deliveries, decreasing the risk of complications during childbirth²². In 2011, Silva *et al.* describe in their observational study that the use of Swiss ball produces relaxation and pain relief during labor¹⁶.

An inadequate fetal presentation increases the risk of dystocia. In 2019 Supriatiningsih *et al.* observed that in the group in which spherodynamics was used, 98 % of the newborns had a cephalic presentation while only 78 % had a cephalic presentation in the control group. The study suggests that spherodynamics contributes to the normalization of fetal presentations²³.

The type of ball used is also important for the comfort of women, there are some studies

Figure 1. Positions for proper spherodynamics technique

	
<p>A: This position promotes relaxation and stretching and also allows to increase the diameter of the pelvis</p>	<p>B: Promote upright position by facilitating maternal-fetal alignment</p>
	
<p>C: Propulsion and/or rotation exercises (rolling on the ball) which promote effective and less painful contractions, facilitate fetal descent and increase pelvic opening</p>	<p>D: Position that allows the comfort of the laboring woman during contractions and also promotes upright posture</p>
	
<p>E: Posture that will relieve low back pain, relax and help fetal rotation for labor</p>	

Source: Abreu SJ, Nolasco RJ, Da Palma C. Swiss ball in labor: literature review. *BJD*;12.2019

that determined the benefit of this technique using a peanut-shaped ball, compared to the traditional Swiss ball or labor without any type of ball. In 2016 Roth *et al.* evaluated the efficacy of using the peanut-shaped birth ball during the first stage of labor in women who were scheduled for elective induction at 39 weeks' gestation. It was found that its use was significantly reduced the duration of the first stage of labor in the primiparous ($p = 0,018$) more than in the multiparous, not finding significant difference in the last ones ($p = 0,057$)²⁴.

In 2019, Makvandi *et al.* showed that the pain, the level of anxiety and the use of pethidine is reduced by the use of the Swiss ball. At the same time, it helps in the descent and rotation of the fetal head, reducing the duration of the first stage of labor¹³.

In general, the benefits of the Swiss ball are: postural correction, relaxation, stretching and muscle strengthening; the pelvic floor muscles are trained in the upright position (sitting), especially the ani elevator muscle, pubococcygeus and the pelvic fascia. It provides freedom to change position, which contributes to the active participation of the mother in the birth process. Light pelvic movements improve muscle relaxation, which are associated with pelvic expansion, help with the descent of

fetal presentation through the birth canal and lead to psychological benefits. Finally, it is worth mentioning it is cheap.

Limitations on the use of ball therapy

Published scientific literature on the use of birth ball is considered scarce⁹. This is because ball therapy has limitations in its use, among which obstetric problems that need close and frequent monitoring, inconvenience due to motion restrictions or physical limitations are described; some patients have cardiotocography traces with a suspicious or abnormal category 3 fetal heart rate tracing and pregnant women with mental disorders are excluded from its use^{1,11,13,25}.

Influence of balloon therapy on pain relief

Pain during labor is a subjective experience caused by uterine contractions, dilation and thinning of the cervix. It is also produced by the transmission of impulses through the iliosacral nerves and it is both visceral and somatic pain. Its severity is associated with the duration, frequency and intensity of uterine contractions and increases cervical dilation. Ineffective uterine contractions

could affect the mother's condition through fear, stress and fatigue. The perception of pain is influenced by factors such as anxiety, cultural ideas about childbirth and previous birth experiences²⁶.

Since the severity of labor pain is variable, it is essential to provide the pregnant woman a non-invasive analgesic method that is not associated with complications. Analgesic non-pharmacological methods are techniques that provide greater autonomy to women and reduce pain by increasing uterine contractions and allowing the adoption of different positions²⁷.

Among the non-pharmacological techniques for pain relief is spherodynamics, which allows freedom of movement and changing positions during labor. This has a significant effect on the perception of pain and promotes a positive experience of childbirth, contributing to obtain either maternal or fetal good results²⁸.

Mobilizing during labor has been shown to promote more effective uterine contractions. At the same time, the frequent change of positions mobilizes the pelvic bones and allows the fetus to fit easier. Besides, the vertical position allows gravity to contribute to the decrease in fetal presentation and the increase in pelvic diameter²⁹. Meanwhile, in 2020, Wang *et al.* described that using the birth ball can help the primipara to relieve pain, improve the degree of comfort, reduce the amount of postpartum hemorrhage and shorten the duration of the stages of labor, thus obtaining better results³⁰.

Nowadays some physiological mechanisms are known that explain how spherodynamics reduce labor pain. One of these is the gate control theory, which involves applying non-painful stimuli to areas of pain to block nociceptive stimuli to the spinal cord. Also, it is suggested that sitting upright decreases pressure on the nerves surrounding the iliosacra joint, generating less pain. Besides, this exercise promotes comfort and relaxation, allowing the patient to develop confidence to manage pain and perceive the birth experience in a positive way³¹.

In 2020, Sari *et al.* proposed a new theory on the analgesic effect of spherodynamics, which is based on the relationship that exercise itself has with endorphin. It was found that spherodynamics stimulates the production of β -endorphin, a hormone that creates a relaxation effect, helping to decrease labor pain. Also, the release of β -endorphin can inhibit the production of adrenaline, decreasing the anxiety stimuli transmitted to the brain³².

In 2020, Suryani *et al.* determined a positive effect on pain intensity in primigravidae when using the birth ball (OR = 7,57; 95 % CI; 1.53 to 37,3; p =0,013), which was statistically significant. It was shown that the use of a birth ball is effective in shortening the first stage of labor and reducing pain intensity³³.

The effects of pelvic position and movement during labor are related to increased intensity of contractions, reduced maternal discomfort and increased uterine circulation, which can decrease the duration of labor, facilitate fetal descent in the birth canal, reduce the possibility of perineal trauma and the need for episiotomy²⁹.

In 2017, Kurniawati *et al.* described significant differences in pain intensity in the active phase of the first stage of labor, among primigravid women who practiced exercise with a birth ball and those who did not. The mean intensity of labor pain in the operated group was <4,5 and in the control group 5,4 (p =0,01)³⁴.

In 2016, Taavoni *et al.* conducted a randomized controlled study with 120 volunteer primiparous, with gestational age of 38 to 40 weeks, in one of the hospitals of the University of Medical Sciences of Iran. They were divided into four groups: use of birth ball, sacroperineal heat therapy, combined use of the two methods mentioned and the control group. It was observed that all three interventions had a significant effect, decreasing labor pain during the active phase. The greatest reduction in pain was in the birth ball group; its effect was observed after 30-minute intervention³⁵.

Difference in obstetric parameters in the active phase of labor and expulsion after the use of ball therapy

Active phase

The active phase is considered from a cervical dilation from 3 to 6 cm in the presence of uterine contractions. The descent begins in the subsequent stage of active dilatation and accelerates after 8 cm of dilation³⁶.

In 2015, Mirzakhani *et al.* conducted a study in 54 Iranian women in which it was evaluated if spherodynamics reduced the number of caesarean sections in contrast to vaginal delivery. It was found a significant reduction in the rate of caesarean sections in the intervention group. It was also observed a significant difference when this therapy was used, as the descent and rotation of the head of the fetus was enhanced at the beginning of the active phase and during the

second stage of labor³⁷. Ball therapy makes the ligaments more flexible and increases the diameter of the opening of the cervix, thus facilitating a natural birth³⁸.

Deportation stage

It begins when the exit of the fetus has been completed and concludes with the delivery of the placenta. In 2020, Mutoharoh *et al.* observed that the birth ball accelerates the second stage of labor by increasing the pelvic area by 30 % while increasing the elasticity of the muscles around the pelvis³⁹. Besides, in 2016, Henrique *et al.* determined in a study that the combination of a hot bath and the Swiss ball was more effective for the progression of labor compared to the isolated use of the ball⁴⁰.

Specialized physiotherapists are aware of the existence of the dose-response relationship between the total hours of training with the Swiss ball and the results in labor, observing that women who train more hours (5–81 hours) obtained a shorter duration from both the first and second stage of labor⁴¹.

Conclusions

Ball therapy is an effective non-pharmacological measure for the management of pain and anxiety during labor. This therapy reduces the time of delivery and helps correct fetal presentation through stretching and relaxation of pelvic muscles, thus avoiding obstetric procedures such as cesarean section and episiotomy.

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