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RESEARCH ARTICLE

The Effects of Pushing Techniques During Second Stage of Labor on Mother and Newborn Health: A Randomized Controlled Trial

Evrim Bayraktar[1], Mürüvvet Başer[1], Gökhan Açmaz[2] Ebru Gözüyeşil[3]*, Figen Alp Yılmaz[4], Öznur Çetin[5], Erdem Şahin[2]

[1]Department of Nursing, Erciyes University Faculty of Health Sciences, Kayseri, Türkiye
[2]Department of Gynecology and Obstetrics, Erciyes University Faculty of Medicine, Kayseri, Türkiye
[3]Department of Nursing, Osmaniye University Faculty of Health Sciences, Osmaniye, Türkiye
[4]Department of Nursing, Alaattin Keykubat University Faculty of Health Sciences, Antalya, Türkiye
[5]Department of Nursing, Gaziosmanpaşa University Faculty of Health Sciences, Tokat, Türkiye

ABSTRACT

Objective: The Valsalva pushing technique is used routinely in the second stage of labor in many countries. The purpose of this study was to determine the effects of pushing techniques on mother and fetus in birth in this setting. This study evaluated the effects of pushing techniques on the second stage of labor duration and maternal and fetal outcomes. The pregnant women were divided randomly into Valsalva pushing (n=72) or spontaneous pushing (n=73) groups.

Materials and Methods: The data of the study are obtained by utilizing the Baseline Obstetric Data Form and Visual Analog Fatigue Scale. Demographic data, second stage period, perineal laceration rates, newborn gscores were evaluated in these cases. Postpartum tests were used for perineal tear, hemorrhagia, hemoglobin level, vital findings, blood pH, pO_2 and pCO_2, level for the mother while the neonatal tests of apgar score for 1st and 5th min, umbilical artery blood pH, pO_2 and pCO_2 levels are done for the newborn.

Results: Perineal laceration and episyotomy were seen less in the Valsalva pushing group. ($p<0.05$). The blood pH of the control group was 7.4 while pCO_2 was 29.0 and pO_2 was 55.9. While pH and pCO_2 levels of both groups were similar to each other, pO_2 levels were different ($p<0.05$). Neonatal pH, pCO_2, and pO_2 levels were similar as well ($p>0.05$). Valsalva pushing is effective in shorter second stages of labor.

Conclusion: The second stage of labor was significantly longer with spontaneous pushing.

Keywords: Pushing tecniques, second stage of labor, spontaneous pushing, Valsalva pushing

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INTRODUCTION

During labour, two different types of pushing techniques, spontaneous (open glottis) and Valsalva's manoeuvre (closed glottis), are utilized.[1–4] A common technique is to encourage women to use a closed-glottis pushing (holding breath while pushing) duration of 10 seconds or more, once the cervix has reached 10 cm dilation.[4–8] In this procedure, women are coached to take a deep breath at the beginning of a contraction, then hold the breath as long and hard as possible and bear down towards the vagina throughout the contraction.[4–8]

The process of taking a deep breath and holding it with a closed glottis is called the Valsalva Maneuver Valsalva's type pushing is a kind of approach that instructs the mother "Take a deep breath, hold it with lips and glottis closed until counting up to ten, and then push downwards". There are approach-

The current affiliation of the author: Department of Nursing, Çukurova University Faculty of Health Sciences, Adana, Türkiye

Address for Correspondence: Evrim Bayraktar, Department of Nursing, Erciyes University Faculty of Health Sciences, Kayseri, Türkiye
E-mail: ealbayrak@erciyes.edu.tr **ORCID ID:** 0000-0002-2914-197X

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es arguing that holding the deep breath for a long time and pushing with full strength makes the baby go down more easily.[3,5–9] Traditionally, when the cervix is fully open, women are expected to start pushing.[9] In this pushing technique, women are encouraged by nurses and health providers to hold their breath along contraction and push as long as they can . Use of Valsalva-style directed pushing during the second stage of labor still appears to be widespread in the World.[1–3]

There has been limited research exploring the use of the Valsalva technique, mainly quantitative, and results have been ambiguous.[4–7]

MATERIALS and METHODS

It was compared the duration of the second stage of labor between the different pushing techniques and fetal, neonatal, and maternal outcomes (perineal and cervical laceration rates, and blood pH). Written ethics committee approval for the study was obtained from Ethics Committee of the hospital. The study was carried out by randomized trial including a study group (spontaneous pushing group) and compared with a control group (Valsalva pushing group).

Eligibility Criteria for Participants

Inclusion Criteria

Women are accepted in the study on condition that they are aged 18 and more, estimated fetal weight between 2500 and 3999gr, vertex position, in 38–42 gestation weeks nulliparous, gestation week: 38–40, expecting vaginal delivery, single and healthy fetüs.

Exclusion Criteria

Not volunteering for participation, any medical or obstetric complication affecting second-stage management, administered epidural analgesics, inability to comply with the group norms.

If the mother underwent cesarean section during labor or refused to participate in the study, she was excluded from the study. The participants were selected based on the inclusion criteria by studying records and interviewing the mothers. Then, by describing the study aims, the mothers were encouraged to participate in the study, and if willing to do so, written consent was obtained. All participating mothers received routine care in the maternity unit until the beginning of the second stage of labor.

Data Collection Tools and Forms

The data of the study are collected using Baseline Obstetric Data Form in which demographic, obstetric, and first and second stage features of labor with features of 2nd, 3rd, and 4th stages of pregnancy are registered, and Visual Analog Fatigue Scale.

The (VAS-F) tool consists of an 18-item scale (13 items concerning fatigue and 5 items on energy). The scale has been validated and tested for its validity and reliability Each analogue scale has bipolar end anchors related to descriptors of fatigue, with a high score indicating more of the attribute (fatigue or energy). This tool is easily understood, requires minimal reading skills and takes little time to complete (less than 2 minutes).

Data Collection Procedures and Ethical Considerations

The population of the study consists of primigravida hospitalized at Maternity Hospital. In line with data in the literature, the computations are done considering the fulfillment rate of Valsalva's maneuver pushing as 20% and 50% in spontaneous pushing for fewer interventions through the wellness of the newborn and the mother. Thus, sample volumes to represent the population are p1=0.20 (control group), p2=0.50 (experimental group), %95 confidence interval, α=0.05, ß= 0.20, power=0.80 (1-ß) for each group n=82 women, and in total 164 mothers.

During the study, 815 births took place in the hospital and the cases giving birth when the main investigator was in the hospital were examined. Cases not suitable for the study criteria and did not volunteer were excluded from the study. The investigation was completed with 145 cases.

Women in labor were randomized to the control group (Valsalva pushing) and study group (spontaneous pushing) (Fig. 1).

After receiving approval from their institutional review boards, the researchers visited target institutions and associated labor and delivery units to explain research purpose and methods to obstetricians, midwifes, and nurse clinicians before data collection. Potential participants who met study criteria were clearly briefed on research purposes, intervention benefits and risks, and procedures. Before participation, they were asked to sign a consent form. The researcher accompanied each participant from 8 cm dilation until birth. After each birth, the researcher collected birth outcome data from patient medical records.

Episiotomy if necessary performed by midwifes or obstetrician in labor. Minute 1 and 5 Apgar scores were recorded. Women were examined for perineal and cervical lacerations. Postpartum hemorrhage was determined with pad follow-up postpartum (24-h) Hb values, vital findings, blood pH, pO_2, and pCO_2 levels for the mother while the neonatal tests of, um-

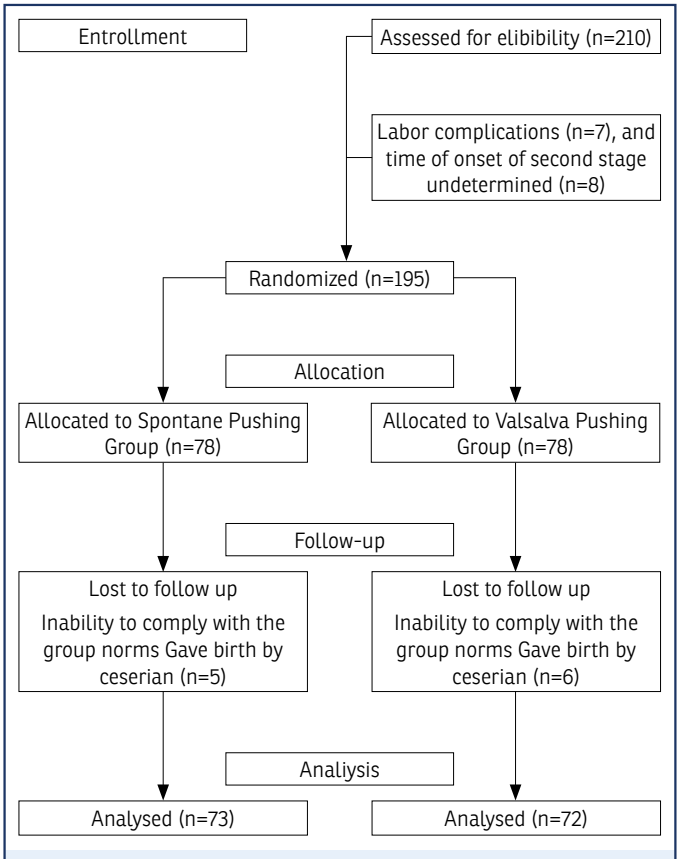

Figure 1. Flowchart

bilical artery blood pH, pO_2 and pCO_2 levels are done for the newborn. The visual scale is utilized for determination of first 24-hour fatigue and they are recorded in follow-up forms.

Data Assessment

The obtained data are assessed through 22.0 Statistical Package of Social Science. While assessing these data, along with descriptive statistical methods, tests that are appropriate for data distribution in comparison of quantitative data (mean, standard deviation, or median) are utilized. The results are assessed in 95% confidence interval and $p<0.05$ meaningful.

Data Analysis

Shapiro–Wilk's test was used, histograms and q-q plots were also assessed to test the data normality. The levene test was used to assess variance homogeneity. For comparisons, either two-sided independent samples t-test or Mann–Whitney U test was used for continuous variables and Chi-square analysis was used for categorical variables. Values are expressed n (%), mean±SD or median (25^{th}–75^{th} percentiles). All analyses were performed using R 3.2.1 software. A $p<5\%$ was considered as statistically significant.

RESULTS

Participants' age, height, perineal tear degree, APGAR score, weight gain in pregnancy are shown in Table 1. The mean age was at spontaneous group 25.9±5.87 and Valsalva group 24.25±5.98 years. All were married and had health insurance. No significant difference was found between the two groups in demographic characteristics of the women and newborn. The mean duration of the second stage of labor in the Valsalva pushing group was shorter than that in the spontaneous pushing group and the difference between groups was statistically significant ($p<0.001$).

Differences in infant birth weight, babies requiring pediatric help were not significant between two the groups. No significant difference was found between the two groups in vital findings.

Differences in the incidence of episiotomy and perineal-cervical lacerations were lower in the Valsalva pushing group than that in the spontaneous pushing group and the difference between groups was statistically significant ($p<0.001$). No statistically significant Apgar scores between the Valsalva pushing group and spontaneous pushing group (Table 1). In this study, maternal partial oxygen pressure and oxygen saturation values were statistically lower in the Valsalva group. However, these values did not affect the blood pH value. If these parameters are evaluated for baby, these results were not statistically different. This situation can be interpreted as pushing thecnique did not affect the baby. When we compared the baseline characteristics of the control and study groups, there was no statistically significant difference between the groups. In our study, while there was a significant difference between the Po_2 values of the mothers in the Valsalva and control groups, no statistically significant difference was found between the blood gas results of the infants (Tables 2, 3).

Differences in the incidence of fatigue levels were not significant between two the groups (Table 4).

Midwives who participated in our study; stated that they were not sure which technique was actually necessary and that it was difficult to explain the open glottis technique to women. As a result, Valsalva pushing of women into the second stage of labor and the nursing support given to women in this regard; It is effective in completing the second phase in a shorter time, without intervention, and with positive experiences.

DISCUSSION

In this analysis, the average duration of the second stage of labor in the Valsalva pushing group was shorter than that in the spontaneous pushing group. The present study reported that there was a significant reduction among Valsalva push-

Table 1. Demographic characteristics of women and newborns, obstetric problems, management of the stages of labor and apgar score

Variables	Groups				p
	Spontaneous pushing (n=73)		Valsalva's pushing (n=72)		
	n	%	n	%	
Age (years)	25.9±5.87		24.25±5.98		0.095
Weight (kg)	69 (65–80)		74 (65–85)		0.096
Height (cm)					
160–164 cm	163 (160–180)		160 (160–175)		0.937
Hemoglobin	12.1±1.3		11.8±1.5		0.281
Postpartum hemoglobin	11.3±1.6		11.2±1.6		0.949
Obstetric problem					
Yes	5	6.8	4	5.6	0.747
No	68	93.2	68	94.4	
Length of 2nd stage (min)	15 (10–15)		10 (5–15)		<0.001
Perineal tear					
None	18	24.7	25	34.7	0.023
Grade I	11	15.1	14	19.4	
Episiotomy	42	57.5	28	38.9	<0.005
Extended episiotomy	2	2.7	0	0.0	
Grade II and above	0	0.0	5	6.9	
Cervical tear					
Yes	65	89.0	63	87.5	0.191
No	8	11.0	9	12.5	
Postpartum hemorrhagia					
Very little	9	12.3	12	16.7	0.332
Mild	36	49.3	40	55.6	
Medium	26	35.6	20	27.8	
Severe	2	2.7	0	0.0	
Baby weight (kg)	3.2±0.4		3.3±0.4		0.438
Baby height (cm)	50.3±1.4		50.8±1.6		0.052
Apgar score (1 min)	8 (8–8)		8 (8–8)		0.116
Apgar score (5 min)	10 (10–10)		10 (10–10)		0.239
Respiration	20 (18–20)		20 (20–20.5)		0.660
Systolic blood pressure	110 (100–110)		110 (100–110)		0.990
Diastolic blood pressure	70 (60–70)		70 (60–70)		0.167
Pulse	84 (80–90)		88 (81–88)		0.767

Values are expressed as n, %, mean±SD or median (25th–75th percentiles). SD: Standard deviation

ing group mothers regarding the rate of perineal laceration as compared with the spontaneous pushing group. These findings came in the line with Koyucu and Demirci assessed the effect of pushing techniques on the mother and fetus and showed the mean duration of the second stage of labor was significantly shorter in the Valsalva pushing group than the spontaneous pushing group.[2] Prins et al.[6,9] which assessed 425 women, found the duration of the second stage of labor was shorter in the Valsalva pushing group. Vaziri et al.[10] found the labor duration of pregnant women in the spontaneous pushing group was

Table 2. Postpartum maternal blood gas findings

Variables	Spontaneous pushing (n=73)	Valsalva's pushing (n=72)	p
ph	7.36±0.09	7.38±0.05	0.164
pCO_2	28.96±5.95	28±5.38	0.308
pO_2	55.9±18.58	63.97±20.88	0.015
sO_2	82.2 (73.2–92.4)	92.8 (80.55–94.6)	0.020
Ck	3.2 (3–3.4)	3.3 (3.1–3.4)	0.331
pCO_2t	29.71±6.38	28±5.38	0.083
pO_2t	55.09±20.22	64.11±21.1	0.009
cBaseefc	8.4 (6.4–10.1)	8.1 (6.45–8.85)	0.337
$cHco_3$	16.35±2.65	16.07±1.98	0.474

Values are expressed mean±SD or median (25^{th}–75^{th} percentiles). SD: Standard deviation; pCO_2: Partial carbon dioxide pressure 2; pO_2: Partial pressure of oxygen 2; sO_2: O_2 saturation; Ck: Creatine kinase; $cHco_3$: Bicarbonate

Table 3. Newborn blood gas findings

Variables	Groups		p
	Spontaneous pushing (n=73)	Spontaneous pushing (n=73)	
ph	7.47±1.1	7.36±0.06	0.388
pCO_2	39.48±9.36	38.1±7.25	0.322
pO_2	23.22±8.94	25.08±6.25	0.148
sO_2	43.9 (28.2–55.6)	52.1 (36.85–59.8)	0.052
Ck	3.8 (3.6–4.1)	3.8 (3.5–3.9)	0.111
pCO_2t	40.17±8.48	38.13±7.25	0.121
pO_2t	23.21±8.93	24.93±6.06	0.176
cBaseefc	3.5 (2.3–4.8)	3.2 (2.7–4.8)	0.629
$cHco_3$	21.08±2.16	20.6±1.91	0.153

Values are expressed mean±SD or median (25^{th}–75^{th} percentiles). SD: Standard deviation; pCO_2: Partial carbon dioxide pressure 2; pO_2: Partial pressure of oxygen 2; sO_2: O_2 saturation; Ck: Creatine kinase; $cHco_3$: Bicarbonate

significantly higher than in the Valsalva pushing group. However, other studies showed that spontaneous pushing shortened the second stage of labor.[11,12] Bloom et al.[11] conducted a study on 320 women and found that the duration of the second stage of labor was approximately 13 min shorter in the spontaneous pushing group. But in our study, the second-stage periods of women who were spontaneous group determined to be longer compared to women who were actively encouraged to push with Valsalva maneuver. The fact that no prolongation was observed in the second stage suggests that labor can be performed within normal time limits with Valsalva pushing.

Table 4. Postpartum maternal fatigue and energy level findings

Variables	Spontaneous pushing (n=73)	Valsalva's pushing (n=72)	p
Fatigue level	73.4±18.7	71.5±22.7	0.587
Energy level	28.1±9.8	27.1±10.3	0.544

Values are expressed mean±SD. SD: Standard deviation

Literature review showed that excessive exertion in the second stage of labor places greater physical demands on the mother. Hence, fatigue increases and there is an increase in the cesarean section rate. Overexertion can also overstretch vaginal and pelvic structures, contributing to future bladder control problems, unnecessary perineal tearing and increase in episiotomies rate.[13] Spontaneous pushing may cause unnecessary straining, excessive fatigue, and uncontrolled tears. In this study, the rate of perineal laceration and episiotomy opening was found to be lower in women in the Valsalva group. In this study, maternal partial oxygen pressure and oxygen saturation values were statistically lower in the Valsalva group. However, these values did not affect the blood pH value. If these parameters are evaluated for babies, these results were not statistically different. This situation can be interpreted as pushing thecnique did not affect baby. In our study, while there was a significant difference between the PO_2 values of the mothers in the Valsalva and control groups, no significant difference was found between the blood gas results of the infants.

Differences in the incidence of fatigue levels were not significant between two the groups.

Flynn et al.[14,15–17] have shown that less aggressive pushing is associated with better perineal results in second-stage management. As a result, Valsalva pushing of women into the second stage of labor, and the nursing support given to women in this regard; It is effective in completing the second phase in a shorter time, without intervention and with positive experiences.

CONCLUSION

According to the study results, Valsalva pushing shortens the second stage of labor and this the rate of perineal laceration and episiotomy opening was found to be lower in women in the Valsalva group. Health professionals can use Valsalva, which is controlled pushing, in labor. We suggest Valsalva pushing for the following reasons;

- Spontaneous pushing may cause prolongation in the second stage of labor
- The rate of perineal laceration and episiotomy opening can be lower in women in the Valsalva group.

Disclosures

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Ethics Committee Approval: The study was approved by the Erciyes University Clinical Research Ethics Committee (No: 2016/624, Date: 02/12/2016).

Informed Consent: Written informed consent was obtained from all patients.

Peer-review: Externally peer reviewed.

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