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The association between postpartum perineal laceration with anatomy and pelvic floor muscle strength

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ABSTRACT

Background: Perineal lacerations damage the tissues around the vagina and rectum and can cause disruption of the anatomy and function of the pelvic floor. The incidence of perineal lacerations after vaginal delivery ranges from 53-89%. This anatomical damage and muscle dysfunction can cause urinary incontinence, anal incontinence, and uterovaginal prolapse. This study aims to evaluate the effects of postpartum perineal lacerations on the anatomy and strength of the pelvic floor muscles.

Methods: The sample of this study is primiparous women who experienced perineal lacerations. Sampling was carried out prospectively using the consecutive sampling method. Pelvic floor anatomy and strength were measured using a POP-Q system and a perineometer. The 1st and 2nd degree laceration group measurements will be compared using the chi-square, and Mann-Whitney tests will be carried out.

Results: Of the 123 research samples that met the criteria, a significant difference was found in the strength of the pelvic floor muscles in the first-degree perineal laceration and second-degree perineal laceration groups at 1st day and 12 weeks postpartum ($p = 0.000$ and $p = 0.042$). The only significant difference found for pelvic floor muscle anatomy is in perineal body length at 12 weeks postpartum.

Conclusion: The degree of perineal laceration is related to the strength of the pelvic floor muscles after delivery and the length of the perineal body 12 weeks postpartum.

Keywords: Perineal laceration, Pelvic anatomy, Pelvic floor muscle strength.
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INTRODUCTION

Childbirth is a natural thing for women to experience, but some problems can accompany this process. One of them is damage to the tissue around the vagina and rectum or also known as perineal lacerations. The incidence of perineal lacerations in vaginal delivery is 53-89%. The complications of perineal lacerations include bleeding, infection, pelvic pain, urinary or bowel incontinence, dyspareunia, and sexual dysfunction, thereby reducing quality of life.[1,2]

Perineal laceration is a risk factor for anatomic changes and pelvic floor muscle dysfunction.[3,4] Pelvic floor muscle tears occur as a result of the delivery process.[5] The pelvic floor muscles play an important role in supporting the function of urination and defecation and supporting the obstetrical organs. Thus, damage to this muscle will disrupt these functions, such as urinary incontinence, anal incontinence, and pelvic organ prolapse.[6]

Pelvic Organ Prolapse-Quantification (POP-Q) is an objective measurement system for assessing the degree of pelvic organ prolapse.[7] POP-Q has been used in postpartum cases, in which urogenital prolapse was found in up to 81%. Other components, such as total vaginal length, perineal body length, and genital hiatus length, also correlate with the function of the pelvic floor muscles.[6,8] The perineometer is also the gold standard for measuring the strength of contractions and has been used to assess the strength of the pelvic floor muscles in postpartum women.[6]

The primary aim of this study was to determine the effect of perineal lacerations on postpartum pelvic floor anatomy and strength using the POP-Q staging system and perineometer. The need for standardized and reliable tools has become more obvious in the last decades since POP-Q was introduced. We believe it is important to determine the impact of perineal lacerations on the quality of life of women after childbirth.

METHODS

This study is a paired comparative analytic study with a prospective cohort design. The study sample is all primiparous women giving birth at the study site who experienced perineal lacerations over 15 years, gestational age above 37 weeks, and deliveries assisted by a midwife, general practitioner or obstetricians. Samples will be excluded if they have previous pelvic

organ anatomy abnormalities due to trauma and have fetal malpresentation or malposition.

Sampling was done by consecutive sampling. Subjects underwent labor according to standard protocols at the hospital. All data needed for research is recorded in the research observation sheet. After 24 hours postpartum, POP-Q and pelvic muscle strength were examined with a perineometer. Research subjects were asked to make a return visit 12 weeks after delivery to undergo a POP-Q score and perineometer examination. The collected and analyzed data were processed by a computer using SPSS (Statistical Package for the Social Sciences) version 20.0. The Kruskal-Wallis test compares POP-Q scores and perineometer results between groups with different degrees of perineal laceration. Furthermore, the Mann-Whitney U test can be performed to compare the 2 groups of varying laceration degrees directly.

RESULTS

The research subjects were postpartum primiparous women with 1st-degree and 2nd-degree perineal lacerations. Data was collected from November 2021 until the number of samples was fulfilled. During the study period, 123 research subjects were obtained that met the inclusion and exclusion criteria; 34 (27.6%) samples had 1st-degree perineal lacerations, and 89 (72.3%) samples had 2nd-degree perineal lacerations, as seen in Table 1.

Based on Table 1. Several characteristics of the sample population are homogenous. The mean age of the group with grade I perineal laceration (23.4 ± 4.5) and grade II (23.5 ± 3.9) did not show a significant difference (p=0.779). Occupation, education, BMI, and assisted delivery were also not significantly different, although 4 (4.3%) samples in the group with 2nd-degree perineal laceration required a vacuum-assisted delivery device.

Based on Table 2, the newborn weight in the 1st-degree perineal laceration and 2nd-degree perineal laceration groups differed significantly (p=0.000), where the group with 1st-degree perineal laceration had newborn weight <2500g higher than 2nd-degree perineal laceration (64, 7% vs. 4.4%). This shows that the group that gave birth to a baby with a heavier weight tends to experience a higher degree of perineal laceration than the group that gave birth to a baby with a lower weight.

This study found the group that received episiotomy had a significantly

Table 1. Characteristics of the sample population

Variable	1st-degree laceration n= 34 (%)	2nd-degree laceration n=89 (%)	p-value
Age (Mean±SD)	23.4 ± 4.5	23.5 ± 3.9	0.779[a]
Occupation			0.987[b]
Housewife	27 (79.40)	72 (80.80)	
Private sector employee	4 (11.70)	6 (6.70)	
Self-employed	0 (0.00)	3 (3.30)	
Others	3 (8.80)	8 (8.90)	
Education			0.544[b]
Higher (>9 tahun)	27 (79.50)	66 (74.10)	
Lower (<9 tahun)	7 (20.50)	23 (25.80)	
BMI (kg/m^2)			0.078[b]
Underweight	8 (23.50)	10 (11.20)	
Normal	20 (58.80)	55 (61.70)	
Overweight	4 (11.70)	12 (13.40)	
Obese	2 (5.80)	12 (13.40)	
Childbirth assistant			0.616[b]
Nurse	2 (5.80)	3 (3.40)	
Doctor	32 (94.10)	86 (96.60)	
Delivery device			0.575[b]
None	34 (100.00)	85 (95.50)	
Vacuum	0 (0.00)	4 (4.40)	

[a]Mann Whitney; [b]Chi-Square; *Statistically significant if p-value <0.05

Table 2. Risk factors

Variable	1st-degree laceration n= 34 (%)	2nd-degree laceration n=89 (%)	p
Birth Weight (gram)			0.000*
Low (<2500)	22 (64.7)	4 (4.4)	
Normal (2500-4000)	12 (35.3)	85 (95.6)	
Episiotomy			0.008*
Yes	4 (11.7)	32 (36.0)	
No	30 (88.3)	57 (64.0)	

*Chi-Square test for categorical data: significant if p-value <0.05;

Table 3. Association between basic pelvic anatomy and degrees of perineal laceration 1 day and 12 weeks postpartum

POP-Q (cm)	1st-degree laceration n= 34 (%)	2nd-degree laceration n=89 (%)	p
First day postpartum			
Aa	-2.94 ± 0.23	-2.98 ± 0.10	0.128
Ba	-3.11 ± 0.72	-3.06 ± 0.70	0.716
Ap	-3.00	-2.98 ± 0.10	0.537
Bp	-3.76 ± 0.49	-3.79 ± 0.43	0.821
C	-6.05 ± 0.85	-6.05 ± 0.72	0.789
D	-7.14 ± 0.82	-7.15 ± 0.75	0.867
Gh	3.83 ± 0.63	3.76 ± 0.62	0.483
TVL	8.35 ± 0.73	8.37 ± 0.90	0.964
PB	1,36 ± 0.49	3.42 ± 0.49	0.527
12 weeks postpartum			
Aa	-2.97 ± 0.17	-2.98 ± 0.10	0.478
Ba	-3.14 ± 0.65	-3.02 ± 0.70	0.382
Ap	-3.00	-3.00	1.000
Bp	-3.64 ± 0.54	-3.62 ± 0.57	0.855
C	-6.08 ± 0.75	-6.01 ± 0.74	0.547
D	-7.23 ± 0.60	6.91 ± 2.23	0.950
Gh	3.41 ± 0.54	3.32 ± 0.50	0.413
TVL	8.35 ± 0.73	8.37 ± 0.90	0.964
PB	3.14 ± 0.35	3.38 ± 0.48	0.012*

*Mann Whitney test: significant if p-value <0,05

Table 4. Association between Pelvic Floor Muscle Strength and Degree of Perineal Laceration

Pelvic floor muscle strength	1st-degree laceration n= 34 (%)	2nd-degree laceration n=89 (%)	p
First Day postpartum			0.000*
Weak	0 (0.00)	16 (18.00)	
Moderate	14 (41.10)	59 (66.30)	
Strong	18 (52.90)	14 (15.70)	
Very strong	2 (5.80)	0 (0.00)	
12 weeks postpartum			0.047*
Strong	11 (32.30)	45 (50.50)	
Very strong	23 (67.60)	44 (49.50)	

*Chi-Square test: significant if p-value <0.05

higher degree of perineal laceration (p=0.008) than the group that did not. Calculation of the odds ratio (OR) from the results of this analysis also showed that the group that received episiotomy had a 4.21-fold risk of experiencing 2nd-degree perineal lacerations compared to the group that did not.

On POP-Q examination 1 day postpartum, no significant differences were found on the anterior wall (Aa, Ba), cervix (C), genital hiatus (Gh), perineal body (PB), total vaginal length (TVL), posterior wall (Ap, Bp), and posterior fornix (D) as measured using POP-Q scoring in both groups (Table 2). On POP-Q examination 12 weeks postpartum, there were also no significant differences in the anterior wall, cervix, genital hiatus, total vaginal length, posterior wall, and posterior fornix as measured using POP-Q scoring, with the posterior walls of all samples being the same (-3.00 cm) in both groups (table 3). However, a significant difference was found in perineal body length, where second-degree perineal lacerations had a higher mean perineal body length (3.14 cm ± 0.35 vs 3.38 cm ± 0.48) than first-degree perineal lacerations (p=0.012).

In examining the strength of the pelvic floor muscles on the first day and 12 weeks postpartum, a significant difference was found in the two groups as measured using a perineometer (Table 4). Examination on the first day postpartum showed that the group with 2nd-degree perineal laceration tended to have lower pelvic floor muscle strength than the group with 1st-degree perineal laceration (p=0.000), where the 2nd-degree perineal laceration group had higher weak (0.0% vs. 18.0%) and moderate (41.1% vs. 66.3%) pelvic floor muscle strength, and lower strong (52.9% vs. 15.7%) and very strong (5.8% vs. 0.0%) pelvic floor muscle strength than the group with 1st-degree perineal laceration. Perineometer examination at 12 weeks postpartum also showed the same results, with the 1st-degree perineal laceration group having pelvic floor muscle strength which tended to be stronger than the 2nd-degree perineal laceration group (p=0.047), where the 1st-degree perineal laceration had strongest pelvic floor

muscle strength than the 2nd degree perineal laceration (67.6% vs. 49.5%).

DISCUSSION

This study aims to obtain data on anatomical measurements and pelvic floor muscle strength in postpartum primiparous women resulting from perineal lacerations, one factor in labor complications and anatomical changes that occur after delivery. Various things can affect the function of the pelvic floor muscles. Aging has been associated with decreased pelvic floor muscle function. Previous studies found that increasing age was associated with reduced maximum force of urethral closure in nulliparous patients.[9,10] Aging can also affect the structure of the pelvic floor muscles. Research by Priyatini T et al. found that increasing age can decrease the ratio of muscle tissue and connective tissue in the pelvic floor.[11]

This study found BMI is not associated with the degree of perineal laceration. This is supported by research conducted by MacLennan AH et al., who studied risk factors for the severity of perineal lacerations.[12] However, BMI has also been studied and associated with impaired pelvic floor muscle function because BMI can affect waist circumference. Research by Mendes E et al., who compared women with BMI obese (BMI > 35 kg/m2) with thin women (BMI 21-22.9 kg/m2), also found a significant association between BMI obese and urinary incontinence with OR of 2.11.[13]

Birth weight is a risk factor for pelvic floor muscle disorders. This study found that the degree of laceration was affected by the newborn weight. The newborn weight in the 1st-degree perineal laceration and 2nd-degree perineal laceration groups differed significantly (p=0.000), where the group with 1st-degree perineal laceration had a presentation of babies weighing <2500 g higher than 2nd perineal laceration (64, 7% vs. 4.4%). Research by Urbankova I et al. confirmed this finding that birth weight is a risk factor for impaired pelvic floor muscle function in postpartum patients.[14]

Vaginal delivery is one of the most common risk factors for pelvic floor muscle dysfunction, such as pelvic organ prolapse. Apart from the effects of pregnancy, vaginal delivery also directly disrupts all pelvic floor structures and tissues.[14] This study found no significant relationship between the degree of laceration and pelvic floor anatomy at 1 day and 12 weeks postpartum. Previous research by Lawrence L et al. confirmed that there was no difference in total vaginal length and genital hiatus in the minor lacerations and 2nd-degree lacerations or above.[15]

This study found statistically significant differences in perineal body length in both groups 12 weeks postpartum. However, this finding differs from a study by Lawrence L et al., who found no difference in perineal body length in the 1st-degree and 2nd-degree perineal laceration groups and above. This could be due to previous studies that included patients with 3rd and 4th-degree perineal lacerations and performed perineal body length analysis until 6 months postpartum.[15,16] Pelvic floor muscle function is an important birth outcome because the weakness of these muscles can be associated with pelvic floor disorders. Friedman S et al. 2012 confirmed the effect of delivery on pelvic floor muscle strength and found that vaginal delivery significantly reduced pelvic floor muscle strength compared to cesarean delivery.[17] This study also found that the group with episiotomy treatment at delivery of primiparous patients had a 4-fold higher risk of experiencing grade II lacerations than the group that did not receive episiotomy.

This study found a significant relationship between the degree of laceration and pelvic floor muscle strength at 1st day (p=0.000) and 12 weeks (p=0.042) postpartum. Although the relationship between these two variables at 1st day and 12 weeks postpartum has not been studied before, Lawrence L et al., who examined the relationship between the effect of the degree of perineal laceration on pelvic floor outcomes at 6 months postpartum, did not find a significant relationship.[15] This could indicate that in the short-term postpartum observation and examination (1st day and 12 weeks), the strength of the pelvic floor muscles differed significantly in the two groups. In contrast, in the long term postpartum (6 months), there would be no difference in the strength of the pelvic floor muscles in the two groups. The limitations of the study we reported did not include urinary and anal incontinence, sexual function, and perineal pain, especially in minor perineal lacerations; the duration of this study should be extended to obtain better results.

CONCLUSION

This study shows no association between the degree of perineal laceration after delivery to the pelvic floor anatomy in primiparous women 1st day postpartum in anterior, apical, and posterior aspects using the POP-Q scoring system. However, an association was found between the degree of perineal laceration after delivery to the pelvic floor anatomy in primiparous women and the aspect of perineal body length at 12 weeks postpartum. There was also a significant relationship between the degree of perineal laceration after delivery and the strength of the pelvic floor muscles in primiparous patients 1st day and 12 weeks postpartum.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICAL CONSIDERATIONS

The Ethics Committee for Health Research, Faculty of Medicine, Universitas Hasanuddin (No: 692/UN4.6.4.5.31/PP36/2021) has examined and approved all research designs.

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AUTHOR CONTRIBUTION

Gledies Theresye Gosal conceived and designed the analysis, collected the data, contributed data or analysis tools, and wrote the original paper. Trika Irianta and David Lotisna conceived and designed the analysis, contributed data or analysis tools, and validated the final paper. Isharyah Sunarno contributed data or analysis tools and performed the analysis.

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