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Association between sexual dysfunction and avulsion of the levator ani muscle after instrumental vaginal delivery

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Conflict of interest

None

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ABSTRACT:

Introduction: The effects of levator ani muscle (LAM) avulsion after instrumental delivery on the sexual function of patients are currently unknown. Therefore, the objective of our study was to use a validated questionnaire, namely, the Female Sexual Function Index (FSFI), to compare the sexual function in patients with and without LAM avulsion after instrumental vaginal delivery.
Material and methods: This was a prospective observational study of 112 primiparous women after instrumental (vacuum or forceps) vaginal delivery. The obstetric and general characteristics of the population were studied. At 6 months postpartum, the contraceptive method used and the occurrence of LAM avulsion (using 4D transperineal ultrasound) were determined, and the FSFI was administered. **Results**: A total of 100 patients (62 without avulsion and 38 with avulsion) completed the study. Thirty-eight (38%) were diagnosed with avulsion (42.1% after Kielland forceps delivery, 57.9% after Malmström vacuum delivery; p=0.837). Women with LAM avulsion had significantly lower scores for desire (2.9±1.2 vs 3.4±1.1; p=0.049), arousal (2.8±1.7 vs 3.6±1.4; p=0.014), lubrication (2.3±1.4 vs 3.0±1.2; p=0.011), orgasm (2.6±1.6 vs 3.3±1.2; p=0.006) and satisfaction (3.1±1.8 vs 3.9±1.5; p=0.051) than did women without LAM avulsion. The overall FSFI score was lower in patients with avulsion (16.7±8.9 vs 20.7±6.9, p=0.033). These results were obtained after controlling for confounders (delivery mode, induced labor, birth weight, perineal tears, avulsion degree, contraceptive method and group assignment for the parent study) in the multivariate analysis (F=4.974, p=0.001). **Conclusions**: Patients with LAM avulsion present a higher degree of sexual dysfunction than patients without avulsion at 6 months after instrumental vaginal delivery.

Keyword
sexual dysfunction, forceps delivery, levator ani muscle, 3D transperineal ultrasound, vacuum delivery

Abbreviations
LAM levator ani muscle
FSFI Female Sexual Function Index

Key message

Patients with levator ani muscle avulsion present a higher degree of sexual dysfunction than patients without avulsion at 6 months after instrumental vaginal delivery.

INTRODUCTION

During childbirth, the sexual health of women is often neglected by health professionals in the search for optimal obstetric outcomes[1]. Sexual dysfunction is a frequent problem after childbirth, with a prevalence ranging from 41% to 83% at 2-3 months[2,3] and up to 64% at 6 months postpartum[2]. However, the association between vaginal delivery and sexual dysfunction is not clear. Some studies have reported an association between vaginal delivery and sexual dysfunction[4-7], but others have not found such an association[8-11].

Avulsion of the LAM, defined as the discontinuity of hyperechogenic muscle fibers of the puborectalis muscle at its pubic insertion[12], can occur during vaginal delivery. Instrumental vaginal delivery is the factor that most influences the onset of avulsion. In fact, different rates of LAM injury have been described according to the type of delivery; an odds ratio of 6.94 (4.93-9.78) between forceps delivery and normal delivery was found, while an odds ratio of 4.57 (3.21-6.51) between forceps delivery and vacuum delivery was identified[13].

The importance of LAM avulsion lies in its association with an increase in the levator hiatus area[14]. Additionally, LAM avulsion leads to a reduction in the strength of the LAM[15,16]. The LAM plays an important role in sexual function[17,18]. Previous studies have shown that pregnancy can affect the function of the LAM[19], which can lead to dyspareunia[20]; however, strengthening the LAM can improve sexual function[17]. Based on these premises, it is suggested that a reduction in LAM strength due to avulsion affects the onset of sexual dysfunction after delivery. Therefore, the objective of our study was to compare sexual function using a validated questionnaire, the FSFI, in patients after instrumental delivery with and without LAM avulsion.

MATERIAL AND METHODS

A prospective observational study was conducted in 112 primiparous patients after instrumental delivery between January 2017 and January 2019.

The patients were recruited after instrumental delivery during their hospital stay. Consecutive patients who met the inclusion criteria were invited to participate in the study until the necessary number of patients was completed. The inclusion criteria were primiparous status, full-term gestation, cephalic presentation, instrumental delivery with a Malmström vacuum extractor or Kielland forceps, and previous provision of written informed consent. The exclusion criteria were previous pelvic floor dysfunction (chronic pelvic pain, pelvic organ prolapse, urinary or fecal incontinence), delivery completed by cesarean section after failed instrumentation and severe maternal or fetal compromise.

All instrumentations were performed by qualified obstetricians with more than 5 years of experience. The instrumentations (vacuum or forceps extractions) were performed during uterine contraction and were combined with active maternal pushing, where 2-3 tractions were applied per contraction without the combined use of the Kristeller maneuver. Episiotomy was performed in a restrictive manner, and protection of the maternal perineum was performed in all cases at the time of fetal head crowning.

The general parameters studied were maternal age; gestational age; labor induction; epidural analgesia use; epidural duration; second labor stage duration; episiotomy and perineal tearing, according to the Sultan classification[21]; and fetal weight and head circumference.

The patients were evaluated 6 months after delivery, at which time they were asked about use of the following contraceptive methods during the previous 6 months: copper-bearing intrauterine device (CU-IUD), levonorgestrel-releasing intrauterine device (LNG-IUD), combined oral contraceptive (COC), depot medroxyprogesterone acetate (DMPA), condom, withdrawal or none. In addition, female sexual function was assessed using the FSFI[22].

The FSFI, a 19-item questionnaire, has been developed as a brief, multidimensional self-report instrument for assessing the key dimensions of sexual function in women[22]. A higher FSFI score implies a higher degree of sexual dysfunction. Instructions on how to complete the FSFI were provided, and the patients were given sufficient time to complete the questionnaire in a private space at the hospital. The questionnaire was used to evaluate sexual function during the last 4 weeks. The FSFI consists of 19 multiple-choice questions grouped into 6 domains: desire,

excitement, lubrication, orgasm, satisfaction and pain. Each domain is assigned a value, and the sum of the scores of all domains defines the final score.

After being administered the FSFI questionnaire, patients underwent a four-dimensional (4D) transperineal ultrasound; they did not know whether LAM avulsion had occurred when they responded to the FSFI questionnaire. This ultrasound was performed by a single examiner experienced in 4D pelvic floor ultrasound who was blinded to the obstetric data and the FSFI questionnaire data. The ultrasound evaluation was performed with a Toshiba® 500 Aplio ultrasound system (Toshiba Medical Systems Corp., Tokyo, Japan) using a 3D PVT-675 MV abdominal probe with a sterile cover. Volume acquisition was performed transperineally from the midsagittal plane, with the patient in the lithotomy position and with an empty bladder. During the exploration, dynamic 4D volumes were acquired at rest, at maximum contraction and during the Valsalva maneuver[23]. The hiatus was measured in the plane of minimal dimensions at the minimal distance between the hyperechogenic posterior aspect of the symphysis pubis and the hyperechogenic anterior border of the LAM just posterior to the anorectal muscle. The integrity of the LAM was evaluated under maximum contraction in the multislice mode, as previously described[24,25]. Complete avulsion was diagnosed when the LAM insertion was abnormal in the 3 central sections. In unclear cases, a levator-urethra gap >2.5 cm was used to define an abnormal insertion.

Associations between the questionnaire (FSFI) factor scores and the presence or absence of LAM avulsion were investigated using standard linear modeling methods. Univariate analyses were performed with significant associations subjected to a multivariate analysis, which adjusted for potential confounders, including delivery mode, induced labor, birth weight, perineal tears, avulsion degree, contraceptive method and group assignment for the parent study (with and without LAM avulsion). Nonparametric univariate analysis methods, including Kruskal–Wallis tests and Spearman's correlation, were applied in cases where the normality of the data was questionable (based on the Kolmogorov–Smirnov test and inspection of histograms). The statistical analysis was performed using the IBM SPSS Statistics program version 24 (IBM, Armonk, NY, USA). P values <0.05 were considered statistically significant.

To detect a difference between the FSFI scores of 5 maternity units between the patients with and

without LAM avulsion, considering an α=0.05 and a power 1-β=0.80, 38 patients per study group were required. With a rate of LAM avulsion of 40% in primiparous women[13] and an expected rate of lost cases of 10%, we initially needed to recruit 112 primiparous women with instrumented delivery.

Ethical approval

The study (0153-N-17) was approved by the local ethics and research committees on January 31, 2017.

RESULTS

In total, 6325 pregnancies were reviewed, of which 2.3% (150 cases) were twins. Cesarean sections accounted for 21.3% (1348) of the cases, while 14.2% (or 899 cases) were assisted births. Preterm births before 37 weeks accounted for 7.1%, and births before 32 weeks accounted for 1.2%. Overall, 112 patients were recruited, and of these, 12 were lost to follow-up because they did not attend the consultation 6 months after delivery. A total of 100 patients completed the study, of whom 56 (56%) had deliveries with vacuum extraction and 44 (44%) had deliveries with forceps extraction (figure 1). Thirty-eight (38%) patients were diagnosed with avulsion (42.1% after Kielland forceps delivery, 57.9% after Malmström vacuum delivery (p=0.837)). The general characteristics are listed in Table 1, which also shows the differences in maternal age between the patients without and with LAM avulsion (29.7±5.2 vs. 32.0±5.6; p=0.039). All patients received epidural anesthesia.

Table 2 shows the contraceptive method used most frequently during the 6 months after delivery. All women were sexually active. The contraceptive method most commonly used by the population was the copper intrauterine device (24/100; 24.0%); this was true for both patients without avulsion (14/62; 22.6%) and patients with avulsion (10/28; 26.5%). No differences were found between the groups according to the presence of avulsion.

The scores on the 6 FSFI domains for the overall population and for those with and without

avulsion are shown in Table 3. Significantly lower scores for desire (2.9±1.2 vs 3.4±1.1; p=0.049), arousal (2.8±1.7 vs 3.6±1.4; p=0.014), lubrication (2.3±1.4 vs 3.0±1.2; p=0.011), orgasm (2.6±1.6 vs 3.3±1.2; p=0.006) and satisfaction (3.1±1.8 vs 3.9±1.5; p=0.051) were found in women with avulsion than in women without avulsion. The overall score was lower in patients with avulsion (16.7±8.9 vs 20.7±6.9, p=0.034). The multivariate analysis controlled for confounders (delivery mode, induced labor, birth weight, perineal tears, avulsion degree, contraceptive method and group assignment for the parent study) (F=4.974, p=0.001).

DISCUSSION

Patients without avulsion scored higher on the FSFI than patients with avulsion (20.7±6.9 vs. 16.7±8.9, p=0.034). The domain with the greatest difference in score between the 2 groups was orgasm (3.3±1.2 vs. 2.6±1.6; p=0.006), as patients with avulsion had a lower score than patients without avulsion. In our study, all patients were sexually active, and after controlling for confounders (delivery mode, induced labor, birth weight, perineal tears, avulsion degree, contraceptive method and group assignment for the parent study), a multivariate analysis was performed (F=4.974, p=0.001). This finding has previously been questioned by certain authors, who reported that the effect of levator avulsion on more traditional dimensions of sexual function (i.e., desire, arousal, orgasm, satisfaction) seems to be largely negligible[26]. These differences may be explained by the different cohorts recruited in each study, since in our study, only patients who had instrumental delivery were recruited, of whom 38% presented avulsion compared with 14% in a previous study[26.] We believe that the underlying mechanism that may explain our results may be a weakening of the pelvic floor produced by the LAM avulsion[16], which may even influence vaginal laxity, since it is associated with levator ani hyperdistensibility[27].

Nonetheless, other authors have indicated that what is most affected in the postpartum period, although temporary, is sexual desire[28]. However, some factors, such as the type of delivery, do not influence sexual function[28-30]. Actually, it is recommended that the decision to perform a cesarean section not be based on fear of the risk of postpartum sexual dysfunction[31]. Additionally, studies have indicated that the presence of postpartum dysfunction does not differ according to whether the assessment was performed at 6 months[32] or one year[31,33] after delivery. For this reason, we chose to conduct our evaluation at 6 months postpartum.

It was previously believed that sexual function is not associated with differences in pelvic floor muscle tone but rather with pelvic floor muscle strength[34]. In fact, studies have reported that the hiatal area and diameter at rest are not related to sexual function[35]. However, LAM weakness has been associated with changes in desire, arousal and orgasm[35], and in menopausal women, a direct relationship was observed between decreased LAM strength and sexual dysfunction[36]. Delivery, especially instrumental delivery, injures the pelvic floor musculature[37]. Therefore, it is possible that patients who have undergone instrumental delivery and have LAM injury have a higher rate of sexual dysfunction than those without LAM injury, which we observed in our study.

Studies on postpartum sexual dysfunction are heterogeneous in terms of design, evaluation of the results and time period[38]. Nevertheless, it has been reported that patients with maternal morbidity (mainly high-grade perineal tears) have dyspareunia more frequently and resume sexual activity later than patients without such injuries[38], but these differences were not found at 12 months after delivery[33]. However, patients with anal incontinence presented worse sexual function than asymptomatic patients[39]. Therefore, it is advised that sexuality management be routinely included in couples counseling after delivery[40]. In our population, we did not observe differences in the rates of high-grade perineal tears or in obstetric characteristics that could affect sexual activity after delivery between patients with and without LAM avulsion.

The main strength of our study is that it is the first investigation designed to compare sexual activity after instrumental delivery in terms of the presence or absence of LAM avulsion. However, a limitation of this study is that it was performed at a single hospital. In addition, all patients were Caucasian, and the number of instrumented births was limited. This limitation should inspire future studies. Another limitation is that the clinical conditions after delivery, such as urinary or fecal incontinence, pelvic organ prolapse, chronic pelvic pain or the psychological state of the patient (associated with LAM avulsion), that could affect sexual activity were not explored during the consultation[41]. However, during the interview, none of the patients expressed that they experienced any of these pathologies or that they used local estrogen or lubricants.

CONCLUSION

Patients with LAM avulsion had a higher degree of sexual dysfunction than patients without avulsion at 6 months after instrumental delivery.

References

1 Glazener CM. Sexual function after childbirth: women's experiences, persistent morbidity and lack of professional recognition. Br J Obstet Gynaecol 1997;104:330–5.

2 Barrett G, Pendry E, Peacock J, Victor C, Thakar R, Manyonda I. Women's sexual health after childbirth. BJOG 2000;107:186–95.

3 Signorello LB, Harlow BL, Chekos AK, Repke JT. Postpartum sexual functioning and its relationship to perineal trauma: a retrospective cohort study of primiparous women. Am J Obstet Gynecol 2001;184:881–8

4 Klein K, Worda C, Leipold H, Gruber C, Husslein P, Wenzl R. Does the mode of delivery influence sexual function after childbirth? J Womens Health (Larchmt) 2009;18:1227–31.

5 Chang SR, Chen KH, Lin HH, Chao YM, Lai YH. Comparison of the effects of episiotomy and no episiotomy on pain, urinary incontinence, and sexual function 3 months postpartum: a prospective follow-up study. Int J Nurs Stud 2011;48:409–18.

6 van Brummen HJ, Bruinse HW, van de Pol G, Heintz AP, van der Vaart CH. Which factors determine the sexual function 1 year after childbirth? BJOG 2006;113:914–8.

7 Griffiths A, Watermeyer S, Sidhu K, Amso NN, Nix B. Female genital tract morbidity and sexual function following vaginal delivery or lower segment caesarean section. J Obstet Gynaecol 2006;26: 645–9.

8 Baksu B, Davas I, Agar E, Akyol A, Varolan A. The effect of mode of delivery on postpartum sexual functioning in primiparous women. Int Urogynecol J Pelvic Floor Dysfunct. 2007;18:401–6.

9 Pauls RN, Occhino JA, Dryfhout VL. Effects of pregnancy on female sexual function and body image: a prospective study. J Sex Med. 2008;5:1915–22.

10 Hannah ME, Hannah WJ, Hodnett ED, et al. Outcomes at 3 months after planned cesarean vs planned vaginal delivery for breech presentation at term: the international randomized Term Breech Trial. JAMA. 2002;287:1822–31.

11 Hosseini L, Iran-Pour E, Safarinejad MR. Sexual function of primiparous women after elective cesarean section and normal vaginal delivery. Urol J 2012 Spring;9:498–504.

12 Dietz HP, Shek KL. Levator defects can be detected by 2D translabial ultrasound. Int Urogynecol J Pelvic Floor Dysfunct. 2009;20:807–11.

13 Friedman T, Eslick G, Dietz HP. Delivery mode and the risk of levator muscle avulsion: a meta- analysis. Int Urogynecol J 2019; 30(6), 901-907.

14 Dietz HP, Franco AV, Shek KL, Kirby A. Avulsion injury and levator hiatal ballooning: two independent risk factors for prolapse? An observational study. Acta Obstet Gynecol Scand, 2012. 91(2): 211-214.

15 DeLancey JO, Morgan DM, Fenner DE, Kaerney R, Guire K, Miller JM, et al. Comparison of levator ani muscle defects and function in women with and without pelvic organ prolapse. Obstet Gynecol 2007. 109(2): 295-302.

16 Dietz, HP, Shek C. Levator Avulsion and Grading of Pelvic Floor Muscle Strength. Int Urogynecol J, 2008. 19(5): 633-636.

17 Ferreira CH, Dwyer PL, Davidson M, De Souza A, UgarteJ A, Frawley HC. Does pelvic floor muscle training improve female sexual function? A systematic review. Int Urogynecol J. 2015;26:1735–1750.

18 Martinez CS, Ferreira FV, Castro AAM, Gomide LB. Womenwith greater pelvic floor muscle strength have better sexual function. Acta Obstet Gynecol Scand. 2014;93:497–502.

19 Franceschet J, Sacomori C, Cardoso FL. Força dos músculos do assoalho pélvico e função sexual em gestantes. RevBras fisioter. 2009;13:383–389.

20 Caroci AS, Riesco MLG, Rocha BMC, Ventura LJ, Oliveira SG. Avaliação da força muscular perineal no primeiro trimestre da gestação. Rev Latino-Am Enfermagem. 2014;22:893–901.

21 Sultan AH. Editorial: Obstetric perineal injury and anal incontinence. Clin Risk 1999; 5:193–6.

22 Rosen R, Brown C, Heiman J, Leiblum S, Meston C, Shabsigh R, et al. The Female Sexual

Function Index (FSFI): a multidimen- sional self-report instrument for the assessment of female sexual function. J Sex Marital Ther. 2000;26:191–208.

23 Orejuela FJ, Shek KL, Dietz HP. The time factor in the assessment of prolapse and levator ballooning. Int Urogynecol J 2012; 23: 175–178.

24 Dietz HP, Bernardo MJ, Kirby A, Shek KL. Minimal criteria for the diagnosis of avulsion of the puborectalis muscle by tomographic ultrasound. Int Urogynecol J 2011; 22: 699–704.

25 Dietz HP, Pattillo Garnham A, Guzmán Rojas R. Is it necessary to diagnose levator avulsion on pelvic floor muscle contraction?. Ultrasound Obstet Gynecol. 2017;49(2):252-256.

26 Thibault- Gagnon S, Yusuf S, Langer S, Wong V, Shek KL, Dietz HP. Do women notice the impact of childbirth–related levator trauma on pelvic floor and sexual function? Results of an observational ultrasound study. Int Urogynecol J. 2014;25:1389–1398.

27 Dietz HP, Stankiewicz M, Kamisan Atan I, Ferreira CWS, Socha M. Vaginal Laxity: What does this symptom mean? Int Urogynecol J 2018;29:723-728.

28 Eid MA, Sayed A, Abdel-Rehim R, Mostafa T. Impact of the mode of delivery on female sexual function after childbirth. Int J Impot Res. 2015; 27:118-20.

29 Cai L, Zhang B, Lin H, Xing W, Chen J. Does vaginal delivery affect postnatal coitus? Int J Impot Res. 2014;26:24-7.

30 Lurie S, Aizenberg M, Sulema V, Boaz M, Kovo M, Golan A, et al. Sexual function after childbirth by the mode of delivery: a prospective study. Arch Gynecol Obstet. 2013;288:785-92.

31 Saleh DM, Hosam F, Mohamed TM. Effect of mode of delivery on female sexual function: A cross-sectional study. J Obstet Gynaecol Res. 2019; 45:1143-1147.

32 Kahramanoglu I, Baktiroglu M, Hamzaoglu K, Kahramanoglu O, Verit FF, Yucel O. The impact of mode of delivery on the sexual function of primiparous women: a prospective study. Arch Gynecol Obstet. 2017; 295:907-916.

33 De Souza A, Dwyer PL, Charity M, Thomas E, Ferreira CH, Schierlitz L.
The effects of mode delivery on postpartum sexual function: a prospective study. BJOG. 2015; 122(10):1410-8.

34 Kanter G, Rogers RG, Pauls RN, Kammerer-Doak D, Thakar R. A strong pelvic floor is associated with higher rates of sexual activity in women with pelvic floor disorder. Int Urogynecol J. 2015; 26(7):991-6.

35 Aydin S, Bakar RZ, Arioğlu Aydin Ç, Ateş S. Correlation Between Transperineal 3-Dimensional Ultrasound Measurements of Levator Hiatus and Female Sexual Function Female Pelvic Med Reconstr Surg. 2017;23(6):433-437.

36 de Menezes Franco M, Driusso P, Bø K, Carvalho de Abreu DC, da Silva Lara LA, de Sá Rosa E Silva ACJ, et al. Relationship between pelvic floor muscle strength and sexual dysfunction in postmenopausal women: a cross-sectional study. Int Urogynecol J. 2017;28(6):931-936.

37 García-Mejido JA, Martín-Martínez A, González-Diaz E, Fernández-Fernández C, Ortega I, Medina M, Fernández-Corona A, Fernández-Palacín A, Sainz JA. Malmström's vacuum or Kielland's forceps: what causes more damage to the pelvic floor?Ultrasound Obstet Gynecol. 2019; 23. doi: 10.1002/uog.20404.

38 Andreucci CB, Bussadori JC, Pacagnella RC, Chou D, Filippi V, Say L, et al. Sexual life and dysfunction after maternal morbidity: a systematic review. BMC Pregnancy Childbirth. 2015 Nov 23;15:307.

39 Pauls RN, Rogers RG, Parekh M, Pitkin J, Kammerer-Doak D, Sand P. Sexual function in women with anal incontinence using a new instrument: the PISQ-IR. Int Urogynecol J. 2015 May;26(5):657-63.

40 Wallwiener S, Müller M, Doster A, Kuon RJ, Plewniok K, Feller S, et al. Sexual activity and sexual dysfunction of women in the perinatal period: a longitudinal study. Arch Gynecol Obstet. 2017; 295(4):873-883.

41 Skinner E, Barnett B, Dietz H. Psychological consequences of pelvic floor trauma following vaginal birth: a qualitative study from two Australian tertiary maternity units. Archives of Women's Mental Health, 2018; 21:341-351.

Legends

Table 1. Obstetric and general characteristics of the population without avulsion and avulsion.

Table 2. Contraceptive method used by the study population.

Table 3. Determine the Female Sexual Function Index (FSFI) score according to the existence or not of levator ani muscle (LAM) avulsion.

Figure 1: Patient recruitment.

Table 1. Obstetric and general characteristics of the population without avulsion and avulsion.

	All (n=100)	Mean (±) or % Without avulsion (n=62)	With avulsion (n=38)	*P*	95% confidence interval
Maternal age	30.6±5.4	29.7±5.2	32.0±5.6	0.039	-4.5 to -0.12
Gestational age	39.8±1.2	39.9±1.1	39.5±1.3	0.135	0 to 1
Induced labor	26/100 (26%)	18/62 (29.0%)	8/38 (21.1%)	0.483	-9.3% to 25.1%
Epidural anesthesia duration (min)	420.5±188.2	427.4±203.6	410.5±168.0	0.863	-100.0 to 115.0
Second stage of labor duration (min)	91.8±57.1	94.0±61.6	88.3±49.5	0.966	-20.0 to 20.0
Episiotomy	66/67 (98.5%)	42/43(97.7 %)	24/24(100 %)	1	-6,7% to 2.18%
Perineal tears	44/67(65.7%)	29/43(67.4 %)	15/24(62.5 %)	0.790	-19.0% to 28.8%
Grade I	9/61(14.8 %)	6/39(15.4 %)	3/22(13.6%)	0.695	-16.5% to 20.0%
Grade II	44/61(72.1 %)	29/39(74.4 %)	15/22(68.2 %)		-17.6% to 29.9%
Grade III	8/61(13.1 %)	4/39(10.3 %)	4/22(18.2 %)		-26.6% to 10,8%
Grade IV	0/61(0 %)	0/39(0 %)	0/22(0 %)		---
Kielland's forceps	44/100(44 %)	28/62(45.2 %)	16/38(42.1 %)	0.837	-16.9% to 23.1%
Malmström vacuum extractor	56/100(56 %)	34/62(54.8 %)	22/38(57.9 %)		-23.1% to 16.9%
Fetal head circumference (cm)	34.5±1.3	34.6±1.1	34.5±1.5	0.430	0 to 1
Fetal weight at birth (g)	3334.3±325.0	3339.5±303.7	3325.9±361.4	0.841	-120.0 to 147.1
Lactation	53/100(53.0 %)	32/62(51.6 %)	21/38(55.3 %)	0.837	-23.8% to 16.4%

Table 2. Contraceptive method used by the study population.

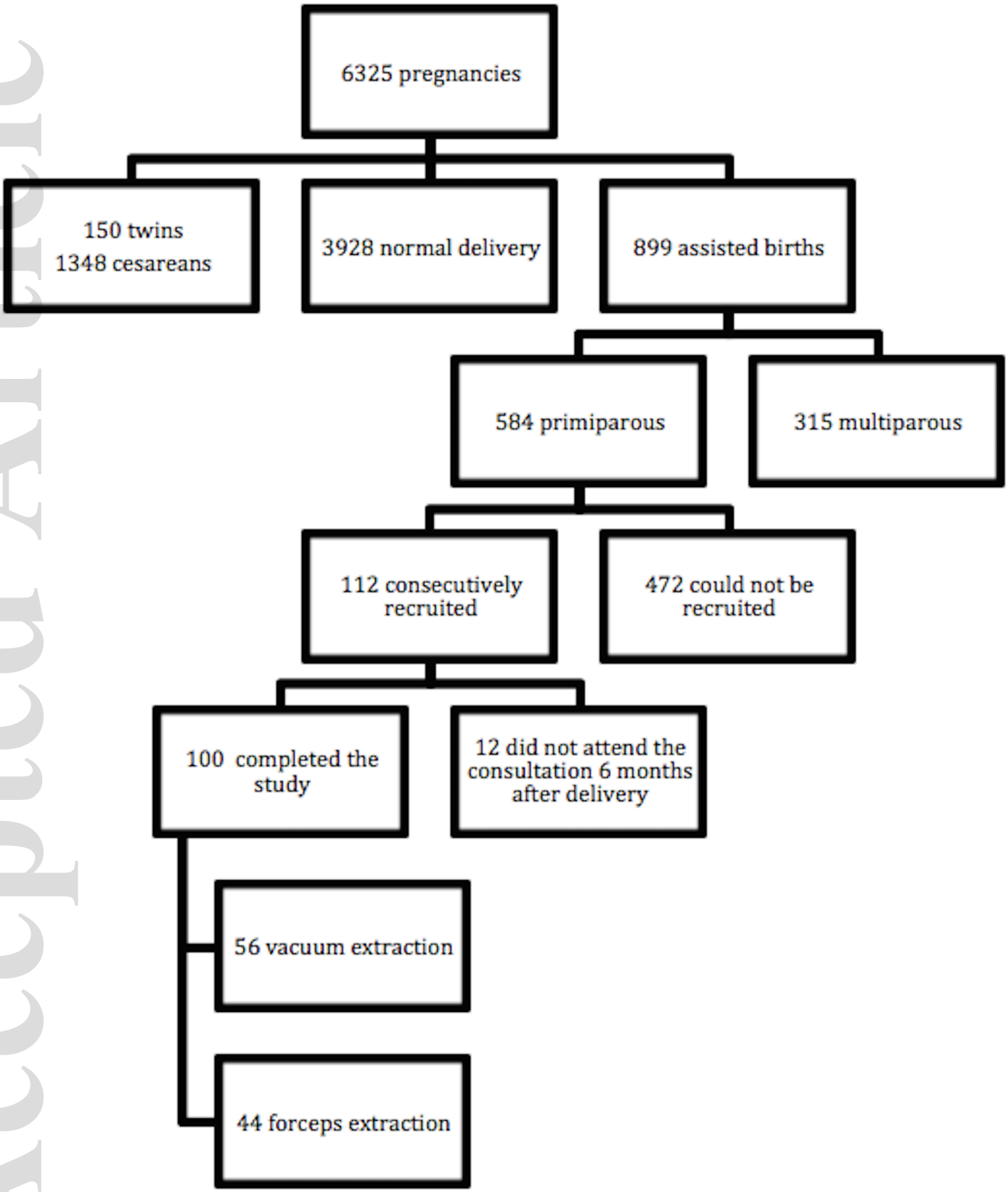
	Mean (±) or % All (n=100)	Without avulsion (n=62)	With avulsion (n= 38)	p	95% confidence interval
CU-IUD	24/100(24.0 %)	14/62(22.6 %)	10/38(26.3 %)	0.930	-21.1% to 13.7%
LNG-IUD	7/100(7.0 %)	4/62(6.5 %)	3/38(7.9 %)		-11.9% to 9.1%
COC	13/100(13.0%)	10/62(16.1 %)	3/38(7.9 %)		-4.3% to 20.7%
DMPA	4/100(4.0 %)	2/62(3.2 %)	2/38(5.3 %)		-10.5% to 6.2%
Condom	17/100(17.0 %)	10/62(16.1 %)	7/38(18.4 %)		-17.6% to 13.0%
Withdrawal	15/100(15 %)	10/62(16.1 %)	5/38(13.2 %)		-11.2% to 17.0%
None	20/100(20 %)	12/62(19.4 %)	8/38(21.1 %)		-17.9% to 14.6%

CU-IUD, copper intrauterine device; LNG-IUD, levonorgestrel intrauterine device; COC, combined oral contraceptive; DMPA, depot medroxyprogesterone acetate.

Table 3. Determine the Female Sexual Function Index (FSFI) score according to the existence or not of levator ani muscle (LAM) avulsion.

Items FSFI		Mean (±) All (n=100)	Without avulsion (n=62)	With avulsion (n=38)	*P*	95% confidence interval
Desire		3.2±1.2	3.4±1.1	2.9±1.2	0.049	3/38(7.9 %)
Arousal		3.3±1.5	3.6±1.4	2.8±1.7	0.014	3/38(7.9 %)
Lubrication		2.8±1.3	3.0±1.2	2.3±1.4	0.011	0.001 to 0.7
Orgasm		3.1±1.4	3.3±1.2	2.6±1.6	0.006	0.001 to 1
Satisfaction		3.6±1.7	3.9±1.5	3.1±1.8	0.051	0 to 1
Pain		3.3±1.8	3.4±1.6	2.9±2.0	0.541	-0.33 to 1
	Total	19.2±7.9	20.7±6.9	16.7±8.9	0.034[a]	0.17 to 4.3

[a]The effect of the presence of LAM avulsion on mean domain scores for the sexual activity domain remained significant after controlling for confounders (delivery mode, induced labor, birth weight, perineal tears, avulsion degree, contraceptive method, and group assignment for the parent study) on multivariate analysis (F=4.974, p=0.001)



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