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EVALUATION OF ISOLATED URINARY STRESS INCONTINENCE ACCORDING TO THE TYPE OF LESION ON THE LEVATOR ANI MUSCLE USING 3-4D TRANSPERINEAL ULTRASOUND 36 MONTHS POST-PARTUM.

--Manuscript Draft--

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Corresponding Author:	José Antonio García Mejido, Gynecologist Hospital Universitario de Valme Sevilla, Sevilla SPAIN
Corresponding Author Secondary Information:	
Corresponding Author's Institution:	Hospital Universitario de Valme
Corresponding Author's Secondary Institution:	
First Author:	José Antonio García Mejido, Gynecologist
First Author Secondary Information:	
Order of Authors:	José Antonio García Mejido, Gynecologist
	Pamela Valdivieso Mejias, Gynecologist
	Ana Fernández Palacin, Proffesor
	María José Bonomi Barby, Gynecologist
	Paloma De la Fuente Vaquero, Gynecologist
	José Antonio Sainz Bueno, Gynecologist
Order of Authors Secondary Information:	
Funding Information:	
Abstract:	Abstract: INTRODUCTION Vaginal delivery can lead to pelvic floor disorders. Many authors have described pelvic floor injuries which can predict future defects such as urinary incontinence and pelvic organ prolapse. We propose the assessment of urinary stress incontinence and its association with levator ani muscle(LAM) microtrauma(>20% in the levator hiatus area during Valsalva) and macrotraumas (avulsion) identified by 3/4D transperineal ultrasound(3D-TpUS) 36months post-partum. MATERIALS AND METHOD Prospective observational study including 168 nulliparous women. All patients included were nulliparous with singleton gestation in cephalic presentation, at≥37 weeks and were recruited on the first day after delivery. 36 months after delivery,3D-TpUS was carried out to identify LAM lesions (macro or micro). Clinical assessment of urinary stress incontinence (USI) was based on the ICIQ-UI-SF-test; a simple-stress-test and urodynamic-test were carried out in the same visit. RESULTS A total of 105nulliparous women were studied (51 spontaneous deliveries(SpD) and 54vacuum assisted deliveries (VD)). Microtraumas were identified in 35.3%of SpD and 20.4%of VD. Macrotraumas (avulsion) were identified in 9.8%of SpD and 35.2%of

	VD(p=0.006). No differences were found in USI between study groups or in relation to the identification of LAM defects (19.2% in the no lesion group, 25%in macrotrauma and 13.8% in microtrauma; P=not significant). Neither were significant differences found in the results from the different study groups in the ICIQ-UI-SF test(12.7±2.2 no lesion group, 12.5±4.2 in macrotrauma and 13.25±4.8 in microtrauma;p=NS). CONCLUSION No difference was observed in USI between patients with and without LAM lesions(microtrauma or macrotrauma) 36months post delivery.
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Autors

García Mejido, José Antonio 1 *(Autor de correspondencia)*
Valdivieso Mejias, Pamela 2
Fernández Palacín, Ana 3
Bonomi Barby, María José 1
De la Fuente Vaquero, Paloma 1
Sainz Bueno, José Antonio 1,3 *(Autor de correspondencia)*

1 Hospital Universitario de Valme, Obstetrica y Ginecología. Sevilla, ES
2 Hospital Ginemed, Obstetricia y Ginecología Sevilla, ES
3 Universidad de Sevilla, Sevilla, Andalucía, ES

Corresponding Authors:
García Mejido, José Antonio y Sainz Bueno, José Antonio
Hospital Universitario Virgen de Valme (Sevilla) CP:41014. España
e-mail:
jagmejido@hotmail.com and joseantoniosainz@hotmail.es

Teléfono: 955015385

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García Mejido, José Antonio	writing/conducting the study
Valdivieso Mejias, Pamela	writing/conducting the study
Fernéndez Palacín, Ana	writing/conducting the study
Bonomi Barby, María José	writing/conducting the study
De la Fuente Vaquero, Paloma	writing/conducting the study
Sainz Bueno, José Antonio	writing/conducting the study

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Abstract:

INTRODUCTION

Vaginal delivery can lead to pelvic floor disorders. Many authors have described pelvic floor injuries which can predict future defects such as urinary incontinence and pelvic organ prolapse. We propose the assessment of urinary stress incontinence and its association with levator ani muscle (LAM) microtrauma (>20% in the levator hiatus area during Valsalva) and macrotraumas (avulsion) identified by 3/4D transperineal ultrasound (3D-TpUS) 36 months post-partum.

MATERIALS AND METHOD

Prospective observational study including 168 nulliparous women. All patients included were nulliparous with singleton gestation in cephalic presentation, at ≥37 weeks and were recruited on the first day after delivery. 36 months after delivery, 3D-TpUS was carried out to identify LAM lesions (macro or micro). Clinical assessment of urinary stress incontinence (USI) was based on the ICIQ-UI-SF test; a simple stress test and urodynamic test were carried out in the same visit.

RESULTS

A total of 105 nulliparous women were studied (51 spontaneous deliveries (SpD) and 54 vacuum assisted deliveries (VD)). Microtraumas were identified in 35.3% of SpD and 20.4% of VD. Macrotraumas (avulsion) were identified in 9.8% of SpD and 35.2% of VD (p=0.006). No differences were found in USI between study groups or in relation to the identification of LAM defects (19.2% in the no lesion group, 25% in macrotrauma and 13.8% in microtrauma; *P*=not significant). Neither were significant differences found in the results from the different study groups in the ICIQ-UI SF test (12.7±2.2 no lesion group, 12.5±4.2 in macrotrauma and 13.25±4.8 in microtrauma; *P*=NS).

CONCLUSION

No difference was observed in USI between patients with and without LAM lesions (microtrauma or macrotrauma) 36 months post delivery.

Keywords: Urinary stress incontinence, levator ani muscle, transperineal ultrasound, pelvic floor, labor.

Brief Summary: No statistically significant differences were found between patients with and without USI and LAM lesion (macrotrauma or microtrauma) 36 months post delivery.

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INTRODUCTION

Pelvic floor disorders entail a very frequent group of pathologies which have a significant impact on women's quality of life. Their importance lies mainly in their high rate of incidence, which leads to the performance of 300,000 pelvic floor corrective surgeries (pelvic organ prolapse and USI) per year (USA, 2003).[1] Urinary incontinence comprises 12–38% of all pelvic floor dysfunctions, hence the importance of its study.[2]

The multifactorial aetiology of pelvic floor dysfunctions is currently well established, with pregnancy and vaginal delivery being described as the main factors determining the onset of urinary incontinence and pelvic organ prolapse.[3,4] During delivery, harm to different pelvic floor structures is common. Levator ani muscle (LAM) avulsion seems to be the most frequently identified lesion related to vaginal delivery.[5] However, this structure can suffer other kinds of lesions during delivery; these include traumatic damage to the connective tissue and fascia, which can lead to a decreased contractility of the LAM after delivery.[6,7] This kind of lesion can be the result of muscle stretching, direct trauma or pudendal nerve neuropraxia occurring during the delivery.[8]

Post-partum lesions of the pelvic floor may be categorised as macrotraumas and microtraumas.[9] Macrotrauma corresponds to LAM avulsion, defined as the discontinuity of LAM muscle fibres at their pubic insertion,[10] present in 13–36% of women after vaginal delivery.[9,11] On the other hand, microtrauma, defined as a 20% or higher urogenital hiatus increase during Valsalva in the absence of avulsion, was present in 30% of the women.[9] Several authors have identified these defects as early indicators for future USI and pelvic organ prolapse. [12–14]

Although these lesions may be diagnosed by clinical evaluation, imaging techniques are a more objective tool in establishing a correct diagnosis. Three-dimensional transperineal ultrasound (3D-TpUS) and magnetic resonance imaging (MRI) are the main imaging techniques used for the diagnosis of pelvic floor diseases.[5,14,15] 3D-TpUS has proved to be useful in evaluating the functional anatomy of the pelvic floor, offering an advanced space and time resolution through the capture of large numbers of images in a short time.[16-19] Moreover, 4D ultrasound assessment of the pelvic floor provides quantitative and qualitative information on levator ani muscle (LAM) function and lesions with higher sensitivity than digital exam.[20]

Our study group believes there may be an association between LAM defects and the future onset of USI. Therefore, we propose assessing the relationship between LAM lesions (macrotraumas and microtraumas) identified by 3/4D transperineal ultrasound and the presence of USI 36 months post (vaginal) delivery.

MATERIALS AND METHOD

Prospective observational study with 168 nulliparous women with vaginal deliveries recruited at the Valme Hospital (Seville, Spain) maternity unit between June 1 2012 and December 31 2012. Study population constituted of volunteer patients who met criteria and who were added consecutively (Figure 1) after being informed of the basis of the study and signing informed consent. The trial received the approval from the Andalusian regional government's biomedical research ethics committee under the code 3004/2012.

All recruited patients were nulliparous, at term gestation (37–42 weeks), without prior pelvic floor corrective surgery, with foetus in cephalic presentation and had either had a spontaneous vaginal delivery (SpD) or required instrumentation with vacuum to complete foetal extraction (VD). Patients who met study criteria were recruited during the first 24 horas post-partum.

Pregnancies with severe maternal (preeclampsia, uncontrolled gestational diabetes, grade 3–4 maternal cardiomyopathy, maternal endocrine or neurological disease, severe maternal infection, maternal respiratory or orthopedic disorder) or foetal pathology (structural malformation, chromosomopathy, foetal infection, isoimmunisation, intrauterine growth restriction, hydrops) were excluded. In order to carry out a specific evaluation of isolated USI, women complaining of symptoms of urinary urgency incontinence or pelvic organ prolapse in the 36 months prior to ultrasound evaluation were also excluded.

Deliveries were assisted by maternity unit staff with a minimum of five years experience in obstetric practice. In all VD cases, a metal vacuum (Malström 50mm.

80KPa) was used to complete foetal extraction.

The following obstetric parameters were registered: maternal age, body mass index, gestational age, epidural analgesia, cephalic circumference, duration of second stage of labour, type of vaginal delivery (operative/vacuum or spontaneous), episiotomy (restrictive, mediolateral episiotomy, according to Valme Hospital maternity unit's clinical practice guidelines), perineal tear (which, according to Valme Hospital maternity unit's clinical practice guidelines, were described according to the following classification: I: laceration exclusively of the vaginal epithelium or perineal skin, II: damage of perineal muscles and/or fascia but with no involvement of the anal sphincter, III: disruption of the vaginal epithelium, perineal skin, perineal body and anal sphincter muscles; IV: third-degree tear plus disruption of the anal/rectal epithelium) and weight at birth.

Ultrasound evaluation was performed 36 months after delivery, by a single examiner with specific training in 3D pelvic floor ultrasound. Prior to and throughout the ultrasound assessment, the examiner was blinded to obstetric data relating to the delivery and clinical manifestations. A 500® Toshiba Aplio (Toshiba Medical Systems Corp., Tokyo, Japan) ultrasound with PVT-675MV 3D abdominal probe was used.

Images were obtained with patients in the dorsal lithotomy position on a gynaecological examination table, with empty bladder and rectum. The transducer was carefully placed on each patient's perineum, applying the minimal pressure possible. The transducer's position was corrected until the main axis was placed on the median sagittal plane on the vaginal introitus. Offline processing and analysis of the images acquired was carried out by the same expert who performed the captures. The volumes studied allowed access to the plane of minimal dimensions (PMD), as described in previous studies.[11,19]

Levator hiatus parameters studied on the PMD were: anteroposterior diameter at rest, under Valsalva and with maximum contraction; transverse diameter at rest, under Valsalva and with maximum contraction (image 1-A) and area at rest, under Valsalva and with maximum contraction (image 1-B). Moreover, LAM area at rest, under Valsalva and with maximum contraction (image 1-C) and the presence of muscle injury (microtrauma or macrotrauma) were recorded.

A multiplanar study was carried out in order to determine LAM avulsion, including images at 2.5mm from the PMD. Macrotrauma (avulsion) was defined as the discontinuity of LAM muscle fibres at their pubic insertion, identified in the three central slices of multiplanar assessment[11] ***(Image 2)***. Microtrauma was established as an increase of more than 20% in the levator hiatus area during Valsalva.[9]

Clinical evaluation was performed 36 months post-partum by a gynaecologist who was blinded to patients' data. Assessment was based on anamnesis focusing on pelvic floor pathology and a urogynaecological exploration determining the state of urinary continence (simple stress test). In those cases in which the patient reported USI symptoms, the ICIQ-UI SF[21] test was performed. ICIQ-UI SF is considered a validated test[22] and is based on three questions regarding urinary frequency (0–5 points), number of leaks (0–6 points) and patient discomfort (0–10 points). The total number of points gives a score between 0–21, with higher values indicating greater severity of incontinence symptoms. Those patients who reported isolated USI symptoms, as well as those whose cases were unclear, underwent a urodynamic test to confirm the diagnosis.

The data were reviewed prior to statistical analysis. Quantitative variables were expressed as means and standard deviations or, in case of asymmetrical distribution, as means and percentiles (p25 and p75); qualitative variables were expressed as percentages. Obstetric and delivery characteristics were assessed with a descriptive analysis of the type of lesion.

In order to evaluate quantitative variable means among subgroups, Student's t-test was applied for independent samples, and non-parametric Mann–Whitney U test was used in the event of abnormal distributions. Contingency tables with the Chi-square test or Monte Carlo methods were used in order to assess the relationship between quantitative variables. Statistical analysis was run using the SPSS 19.0 software for Windows.

RESULTS

168 pregnant women were initially included: 64.3 % SpD (108/168) and 35.7 % VD (60/168). Of these, 63 were excluded: 2 refused to sign written informed consent, 41 did not complete post-partum clinical evaluation (34 were pregnant when they were called to perform the evaluation, 4 underwent some kind of pelvic floor rehabilitation and 3 cases were lost after delivery) and 20 were diagnosed with urinary urgency incontinence (UUI) or pelvic organ prolapse within the first 36 months post-partum.

105 women completed the trial (51 SpD and 54 VD). ***Table 1*** shows

gestational/obstetric and intrapartum features according to study group (no lesion, macrotrauma, microtrauma). Statistically significant differences were found in age (in years) (29.29±5.17, 33.04±3.75, 29.14±5.46; P:.014) and episiotomy rate (67.31%, 91.67%, 51.72%; P=.007), with both parameters being higher in the 'macrotrauma' group. All patients who underwent the urodynamic test had isolated USI diagnosis confirmed and, therefore, none had to be reclassified.

Table 2 displays different study groups (no lesion, macrotrauma, microtrauma) according to the type of delivery (SpD and VD), levator hiatus dimensions and the presence of USI. Microtrauma was present in 35.3% (18/51) of SpD in contrast with 20.4% (11/54) in VD. LAM avulsion (macrotrauma) was revealed in 9.8% (5/51) of SpD and 35.3% (19/54) of VD. Statistically significant differences were detected in all levator hiatus measurements (anteroposterior and transverse diameters and area) for all captures: at rest, under Valsalva and with maximum contraction. Levator hiatus area was larger in cases of macrotrauma, at rest (17.16±2.91, 20.29±4.41, 15.60±2.69; P<.0005), under Valsalva (17.72±3.65, 23.79±4.41, 20.40±3.63; P<.0005) and with maximum contraction (16.28±3.35, 20.14±4.10, 15.65±2.87; P<.0005). However, USI was observed in 19.2% (10/52) of the 'no lesion' group, 20,7% (6/29) of the 'microtrauma' group and 16,7% (4/24) of the 'macrotrauma' group (p: no statistically significant difference). ICIQ-UI SF test scores by study group were 12.7±2.2, 12.5±4.2 and 13.2±4.8 respectively (P: no statistically significant difference).

Table 3 shows LAM measurements taken by ultrasound compared to the presence or otherwise of USI. The presence of USI is significantly higher in the VD group compared to SpD group. However, when the 4 outcomes are analysed, no significant differences are found. Moreover, no statistically significant differences were observed in levator hiatus measurements (anteroposterior and transverse diameters) at rest, under Valsalva or with maximum contraction according to the presence of USI. Levator hiatus area was similar between groups with and without USI, at rest (17.5±3.7 vs. 17.3±3.4; *P*: NS), under Valsalva (19.9±4.5 vs. 19.8±4.5; *P*: NS) and with maximum contraction (17.1±3.7 vs. 16.4±4.1; *P*: NS). Similarly, no statistically significant difference was found in LAM area (12.5±3.0, 13.7±2.5 *P*: NS) in patients with and without USI.

DISCUSSION

According to our work, no statistically significant differences were found in patients with or without LAM injury (macrotrauma or microtrauma) and isolated USI symptoms

To date, an association has classically been drawn between urinary stress incontinence and vaginal delivery and between urinary urgency incontinence (UUI) and caesarean section.[23] More recent studies have established a relationship between urethral displacement during vaginal delivery and pelvic floor dysfunction after first vaginal delivery.[24] Moreover, Falkert et al. demonstrated that 3D ultrasound after delivery could help in the identification of women at high risk of pelvic floor disorders.[25] He observed that women with an increased LAM hiatus area during Valsalva presented USI symptoms within the first 2 years after delivery.[25] However, subsequent studies have not proven a clear relationship between ultrasound findings and urinary incontinence symptoms. Similarly, our study has not been able to find an association between levator hiatus area and the presence of USI symptoms.[26] These results are consistent with those described previously by Oversand et al.[26] Furthermore, we did not find any association between the different kinds of LAM lesions and isolated USI, as proposed by Falkert.[25]

The main objective of our study was to identify isolated USI, for which reason we ruled out any patient with a diagnosis of pelvic organ prolapse or UUI. The reason for excluding these patients was that previous studies have associated USI to the presence of cystourethrocele as a possible cause of the symptoms, without levator ani muscle avulsion being involved in the aethiology.[27] Moreover, the presence of cystourethrocele in patients with USI symptoms has been associated to a lesion of the paravaginal support tissue, while isolated cystocele with urinary dysfunction would probably be caused by LAM avulsion.[28] As the initial objective of our study was to evaluate the association between isolated USI and LAM lesions, patients with pelvic organ prolapse and UUI were excluded in order to avoid confounding factors.

We found no statistically significant difference in LAM hiatus measurements between patients with and without incontinence (15.5±3.0 vs. 13.7±2.5). However, previous studies in pregnant women have described increased LAM hiatus diameters and decreased width of the pubovisceral muscle as favouring the clinical symptoms of USI.[29] Stachowicz et al. describe differences in LAM thickness in women with and without urinary stress incontinence.[30]

We found no difference in LAM area between patients with and without isolated USI. Previous studies have described how the RR of USI increases progressively during the first 12 months following delivery.[31] Because of this, we decided to perform the clinical evaluation of patients at 36 months after delivery, in order to ensure that the RR of USI was the highest possible with the minimum number of patient losses.

This might contradict previous studies that doubted whether macrotrauma or microtrauma impact the presence of isolated USI post-partum.[24–26] However, we consider a significant limitation to our study to be the low number of patients with USI symptoms, which we believe may explain the lack of statistically significant differences between study groups (no lesion, macrotrauma, microtrauma) according to the presence or absence of USI. Because of this, we believe this study could trigger future investigation in this area involving studies with larger number of patients. We also consider a limitation to our study the fact of having lost such a high number of patients due to the delay of the evaluation (36 months postpartum), reason why we believe that carrying out the evaluation at 24 months postpartum would be more adequate. Furthermore, another drawback of our study is excluding other pelvic floor pathologies other than USI, as we consider that the inclusion of these kind of patients in our study would reinforce our results.

In conclusion, we observed no differences in the presence of USI symptoms at 36 months post-partum in patients with and without LAM lesions (microtrauma or macrotrauma).

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Figure 1: shows the process of capturing patients.

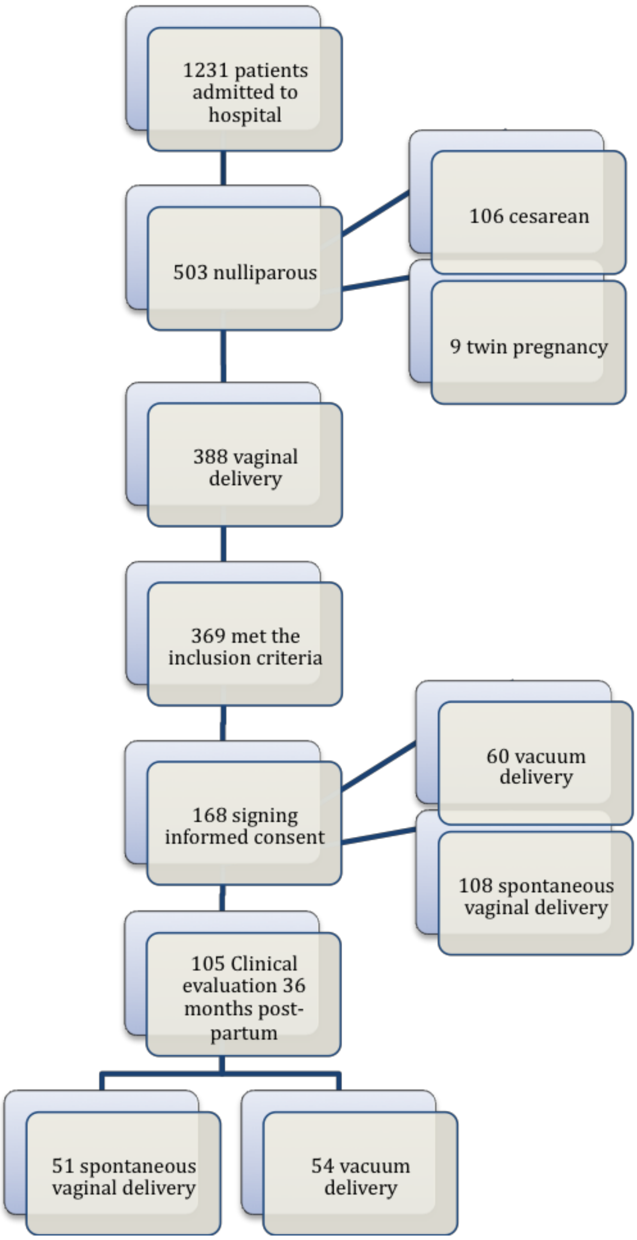


Image 1. Represents measures obtained at minimal dimension plane. **A.** Shows antero posterior diameters of levator hiatus area (1), define as the distance between the posterior region of pubic symphysis and LAM's anterior region; and the transverse diameters of levator hiatus area (2), which is the distance between the inner borders of LAM at its pubic insertion. B. Measurement of levator hiatus area (3), describe as the area that limits the anterior section with the posterior area of pelvic bones' inferior branches. C. LAM's area (4) at the minimal dimension plane.

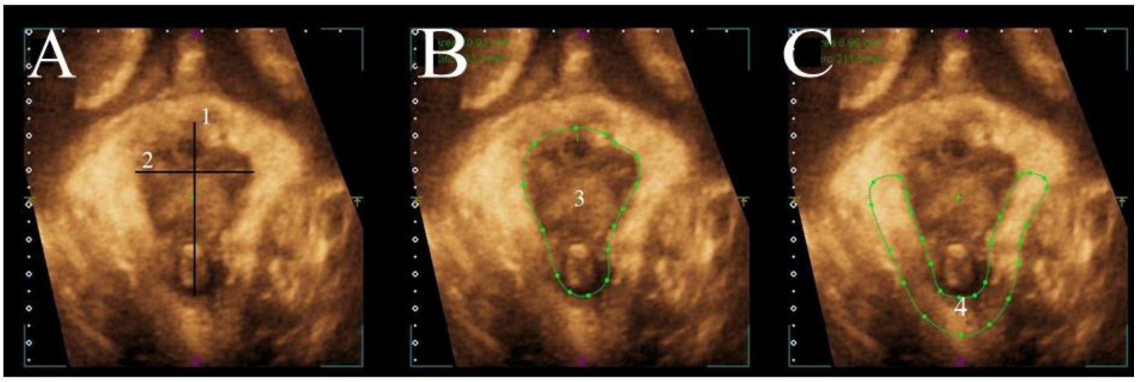


Image 2. Bilateral avulsion showing a defect at the insertion on three central planes (red arrows).

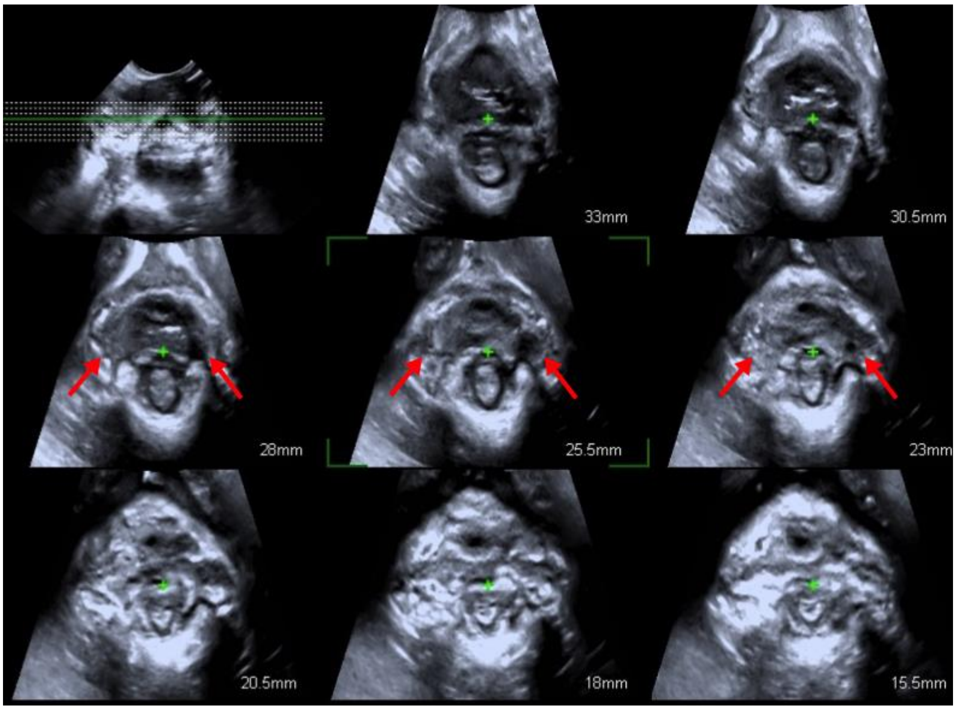
447 

Table 1. Gestational and intrapartum features of the study group.

	Media (± DT) o %			
	No lesion (n=52)	**Macrotrauma (n=24)**	**Microtraumas (n=29)**	**p**
Age	29.29 (±5.17)	33.04 (±3.75)	29.14 (±5.46)	P=0.014
Gestational age	39.40 (±1.11)	38.33 (±1.20)	39.10 (±1.21)	NS
BMI	23.28 (±3.49)	24.10 (±3.10)	25.03 (±4.41)	NS
Epidural	94.23% (49/52)	91.67% (22/24)	82.76% (24/29)	NS
Epidural period (min)	368.82 (±165.19)	383.18 (±150.26)	364.25 (±209.13)	NS
Period of 2nd stage of labour (min)	102.56 (±70.76)	120.42 (±107.95)	102.48 (±57.69)	NS
Episiotomy	67.31% (35/52)	91.67% (22/24)	51.72% (15/29)	P=0.007
Perineal tear	40.38% (21/52)	54.17% (13/24)	34.48% (10/29)	NS
Grade I	15.38% (8/52)	12.5% (3/24)	24.13% (7/29)	
Grade II	15.38% (8/52)	25% (6/24)	6.9% (2/29)	NS
Grade III	9.62% (5/52)	16.67% (4/24)	3.45% (1/29)	
Newborn weight (kg)	3241.7 (±409.59)	3409.79 (±408.55)	3185.69 (±357.11)	NS

NS: No statistical significance.

Table 2. Type of lesion according to delivery, hiatus measures and clinical incontinence.

		Media (± DT) o %		
	No lesion (n=52)	**Macrotauma (n=24)**	**Microtraumas (n=29)**	**P**
Delivery				
Vaginal	54.9%(28/51)	9.8%(5/51)	35.3%(18/51)	P=0.006
Vacuum	44.4%(24/54)	35.2%(19/54)	20.4%(11/54)	
APD LAM's hiatus at rest (mm)	64.56±7.41	68.28±7.83	61.79±6.50	P=0.007
APD LAM's hiatus on Valsalva (mm)	65.19±8.01	72.88±7.22	68.84±7.93	P=0.001
APD LAM's hiatus in contraction (mm)	61.46±6.96	65.59±7.80	58.97±7.35	P=0.005
TD LAM's hiatus at rest (mm)	38.74±5.23	51.23±10.62	37.27±4.67	P<0.0005
TD LAM's hiatus Valsalva (mm)	39.27±5.42	54.71±10.23	41.83±4.00	P<0.0005
TD LAM's hiatus in contraction (mm)	38.54±5.87	51.77±9.17	37.89±4.53	P<0.0005
Area of LAM's hiatus at rest (cm$^{2)}$	17.16±2.91	20.29±4.41	15.60±2.69	P<0.0005
Area of LAM's hiatus on Valsalva (cm$^{2)}$	17.72±3.65	23.79±4.41	20.40±3.63	P<0.0005
Area of LAM's hiatus in contraction (cm$^{2)}$	16.28±3.35	20.14±4.10	15.65±2.87	P<0.0005
LAM's área (cm$^{2)}$	12.68±3.06	13.30±2.90	12.44±2.78	NS
Urinary incontinence	19.2%(10/52)	16,7%(4/24)	20,7%(6/29)	NS
ICIQ-UI SF	12.7±2.2	12.5±4.2	13.2±4.8	NS

APD: Antero posterior diameter; TD: transverse diameter; LAM: levator ani muscle;

NS: No statistical significance.

Table 3: Biometric parameters of the levator´s hiatus according absent or present the stress urinary incontinence.

	Media (± DT) o %		
	Stress urinary incontinence. Absent (n:85)	**Stress urinary incontinence. Present (n:20)**	**p**
Delivery			
Vaginal	88.2%(45/51)	11.8%(6/51)	NS
Vacuum	74.1%(40/54)	25.9%(14/54)	
APD LAM's hiatus at rest (mm)	64.2±7.36	66.6±8.3	NS
APD LAM's hiatus on Valsalva (mm)	67.5±8.2	69.8±8.9	NS
APD LAM's hiatus in contraction (mm)	61.7±7.4	61.9±8.5	NS
TD LAM's hiatus at rest (mm)	41.7±8.5	39.2±9.1	NS
TD LAM's hiatus on Valsalva (mm)	44.0±8.9	41.3 ±8.9	NS
TD LAM's hiatus in contraction (mm)	41.9±8.6	38.9 ±8.3	NS
Area of LAM's hiatus at rest (cm^2)	17.5±3.7	17.3±3.4	NS
Area of LAM's hiatus on Valsalva (cm^2)	19.9±4.5	19.8±4.5	NS
Area of LAM's hiatus in contraction (cm^2)	17.1±3.7	16.4±4.1	NS
LAM's area (cm^2)	12.5±3.0	13.7±2.5	NS

APD: Antero posterior diameter; TD: transverse diameter; LAM: levator ani muscle; NS: No statistical significance.

Image 1

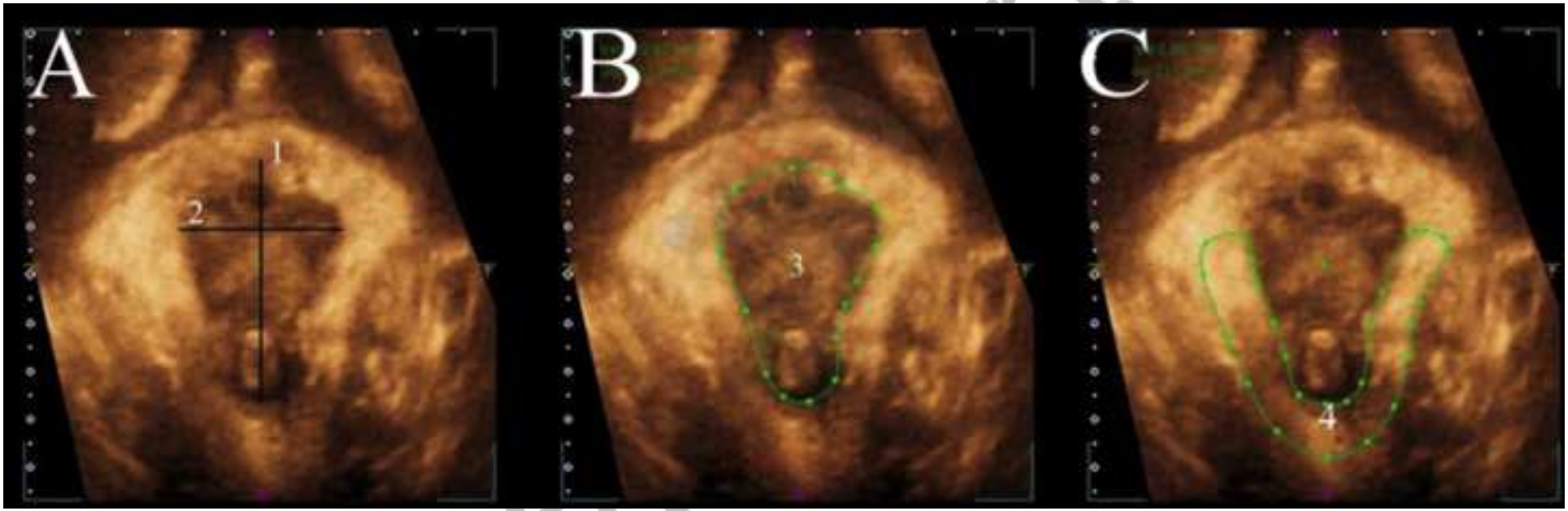


Image 2

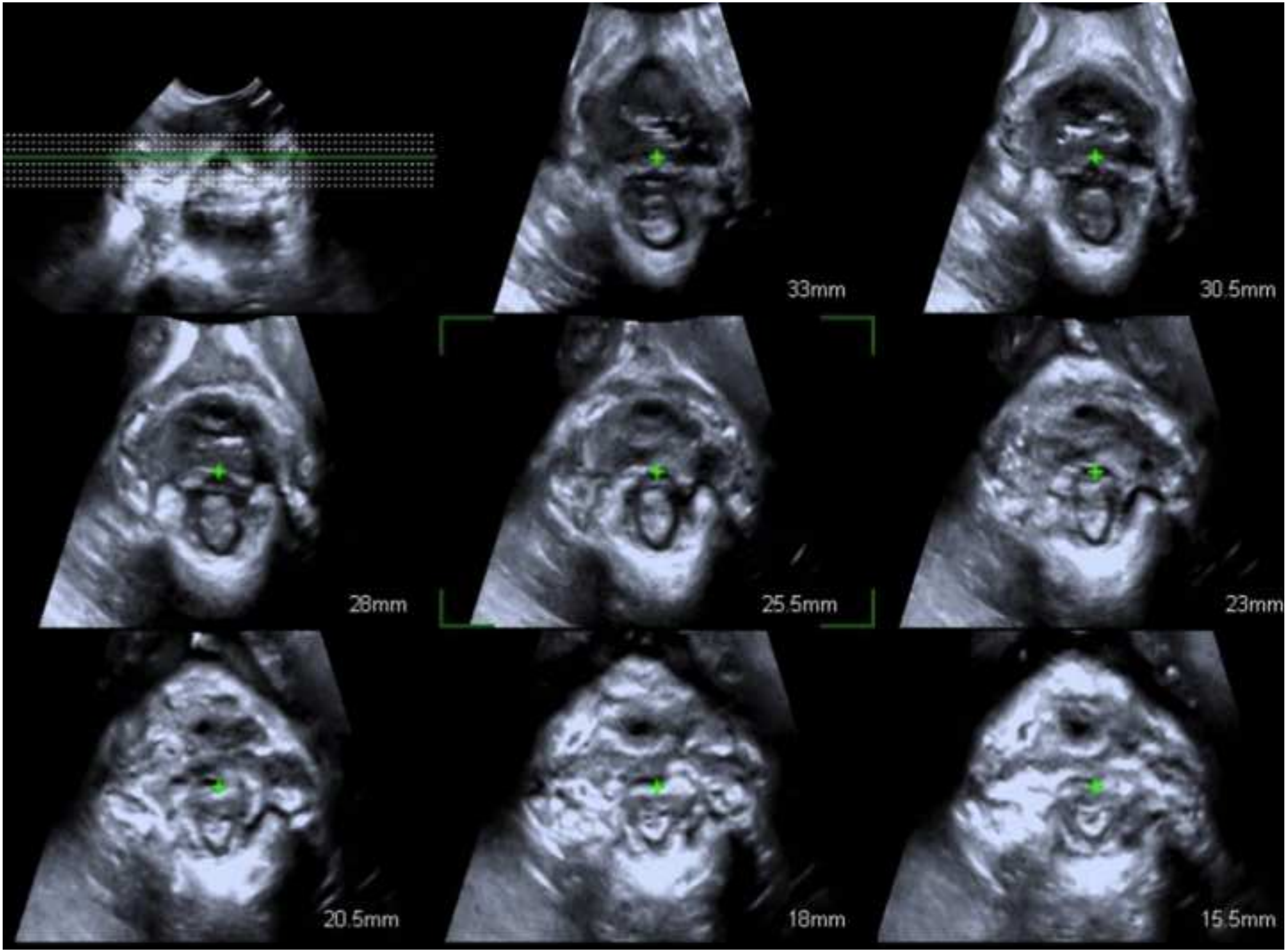


Figure 1

Figure 1: Shows the process of capturing patients.

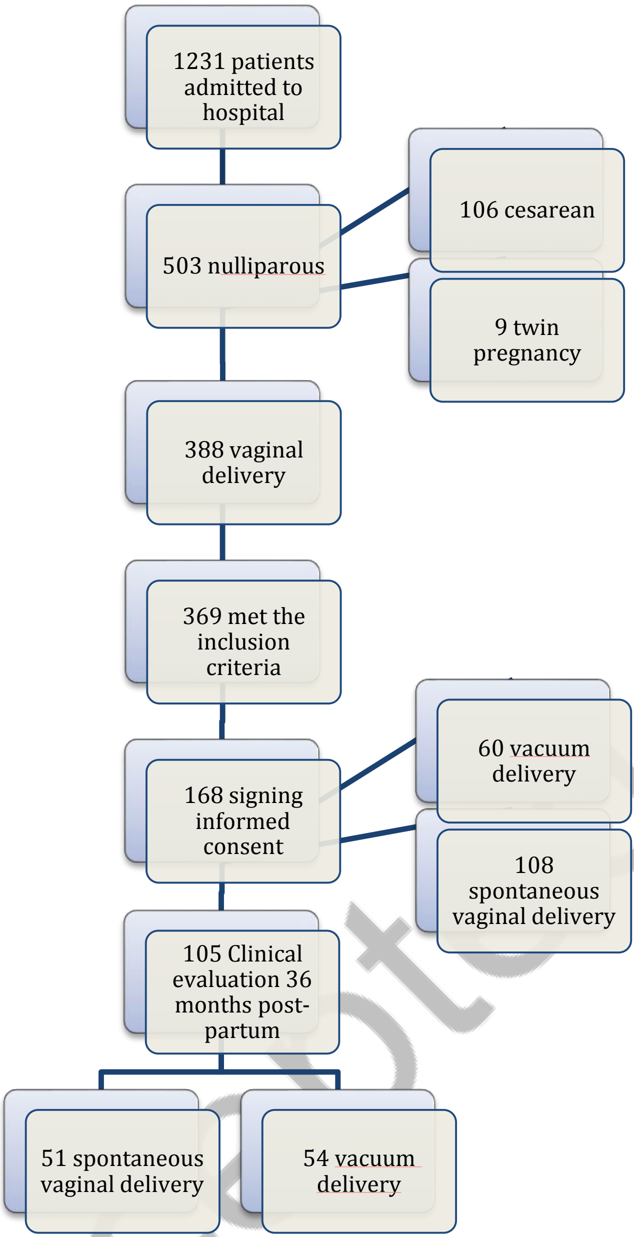


Table 1

Table 1. Gestational and intrapartum features of the study group.

	Media (± DT) o %			
	No lesion (n=52)	**Macrotrauma (n=24)**	**Microtraumas (n=29)**	**p**
Age	29.29 (±5.17)	33.04 (±3.75)	29.14 (±5.46)	P=0.014
Gestational age	39.40 (±1.11)	38.33 (±1.20)	39.10 (±1.21)	NS
BMI	23.28 (±3.49)	24.10 (±3.10)	25.03 (±4.41)	NS
Epidural	94.23% (49/52)	91.67% (22/24)	82.76% (24/29)	NS
Epidural period (min)	368.82 (±165.19)	383.18 (±150.26)	364.25 (±209.13)	NS
Period of 2nd stage of labour (min)	102.56 (±70.76)	120.42 (±107.95)	102.48 (±57.69)	NS
Episiotomy	67.31% (35/52)	91.67% (22/24)	51.72% (15/29)	P=0.007
Perineal tear	40.38% (21/52)	54.17% (13/24)	34.48% (10/29)	NS
Grade I	15.38% (8/52)	12.5% (3/24)	24.13% (7/29)	
Grade II	15.38% (8/52)	25% (6/24)	6.9% (2/29)	NS
Grade III	9.62% (5/52)	16.67% (4/24)	3.45% (1/29)	
Newborn weight (kg)	3241.7 (±409.59)	3409.79 (±408.55)	3185.69 (±357.11)	NS

NS: No statistical significance.

Table 2

Table 2. Type of lesion according to delivery, hiatus measures and clinical incontinence.

	No lesion (n=52)	Media (± DT) o % Macrotauma (n=24)	Microtraumas (n=29)	P
Delivery				
Vaginal	54.9%(28/51)	9.8%(5/51)	35.3%(18/51)	P=0.006
Vacuum	44.4%(24/54)	35.2%(19/54)	20.4%(11/54)	
APD LAM's hiatus at rest (mm)	64.56±7.41	68.28±7.83	61.79±6.50	P=0.007
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TD LAM's hiatus at rest (mm)	38.74±5.23	51.23±10.62	37.27±4.67	P<0.0005
TD LAM's hiatus Valsalva (mm)	39.27±5.42	54.71±10.23	41.83±4.00	P<0.0005
TD LAM's hiatus in contraction (mm)	38.54±5.87	51.77±9.17	37.89±4.53	P<0.0005
Area of LAM's hiatus at rest ($cm^{2)}$	17.16±2.91	20.29±4.41	15.60±2.69	P<0.0005
Area of LAM's hiatus on Valsalva ($cm^{2)}$	17.72±3.65	23.79±4.41	20.40±3.63	P<0.0005
Area of LAM's hiatus in contraction ($cm^{2)}$	16.28±3.35	20.14±4.10	15.65±2.87	P<0.0005
LAM's área ($cm^{2)}$	12.68±3.06	13.30±2.90	12.44±2.78	NS
Urinary incontinence	19.2%(10/52)	16,7%(4/24)	20,7%(6/29)	NS
ICIQ-UI SF	12.7±2.2	12.5±4.2	13.2±4.8	NS

APD: Antero posterior diameter; TD: transverse diameter; LAM: levator ani muscle; NS: No statistical significance.

Tabla 3: Biometric parameters of the levator´s hiatus according absent or present the stress urinary incontinence.

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Delivery			
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APD LAM's hiatus at rest (mm)	64.2±7.36	66.6±8.3	NS
APD LAM's hiatus on Valsalva (mm)	67.5±8.2	69.8±8.9	NS
APD LAM's hiatus in contraction (mm)	61.7±7.4	61.9±8.5	NS
TD LAM's hiatus at rest (mm)	41.7±8.5	39.2±9.1	NS
TD LAM's hiatus on Valsalva (mm)	44.0±8.9	41.3 ±8.9	NS
TD LAM's hiatus in contraction (mm)	41.9±8.6	38.9 ±8.3	NS
Area of LAM's hiatus at rest (cm^2)	17.5±3.7	17.3±3.4	NS
Area of LAM's hiatus on Valsalva (cm^2)	19.9±4.5	19.8±4.5	NS
Area of LAM's hiatus in contraction (cm^2)	17.1±3.7	16.4±4.1	NS
LAM's area (cm^2)	12.5±3.0	13.7±2.5	NS

APD: Antero posterior diameter; TD: transverse diameter; LAM: levator ani muscle;

NS: No statistical significance.