

Incidence and Immediate and Early Complications of Severe Perineal Tears during Childbirth in a Reference Obstetric Care Institution in Medellín, Colombia

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ABSTRACT

Introduction: Severe perineal tears (SPT) are complications that arise during childbirth. These can result in rectal fistulas and fecal and urinary incontinence, leading to medium- to long-term morbidity that requires proper diagnosis, management, and follow-up.

Objective: To determine the incidence of SPT and related immediate complications (within the first 48 hours) and early complications (within the first three months) following delivery.

Methodology: This article reports a descriptive cohort study on patients with SPT during obstetric care in a reference center in Medellín, Colombia, between 2015–2017. Medical records were reviewed, and clinical data and immediate and early complications were recorded during pelvic floor control appointments.

Results: A total of 14,247 vaginal births were attended. The incidence of SPT was 1.6%, with 1.3% being of third-degree and 0.3%, of fourth-degree. Of these, 66.5% had instrument-assisted vertex delivery, 81.9% had an episiotomy; the median expulsion period was 19 minutes, and 3% had shoulder dystocia. Immediate complications in patients with SPTs included: suture dehiscence and wound infection (0.85%), dehiscence (0.85%), and wound infection (0.42%). 18.4% attended the urogynecological control in the third month. Among them, 38.2% had at least one complication, mainly fecal and flatus incontinence (16.3% and 13.9%, respectively).

Conclusions: The incidence of SPT and immediate postpartum complications were infrequent. Postpartum follow-up strategies should be improved to identify and manage medium-term complications in a timely manner.

Incidencia, complicaciones inmediatas y tempranas de desgarros perineales graves durante el parto en una institución de referencia de atención obstétrica en Medellín, Colombia

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RESUMEN

Introducción: los desgarros perineales graves (DPS) son complicaciones que se presentan durante la atención del parto. Pueden desencadenar fístulas rectales e incontinencia fecal y urinaria, morbilidad a mediano y largo plazo que requiere diagnóstico, manejo y seguimiento adecuado.

Objetivo: determinar la incidencia de DPS y complicaciones relacionadas inmediatas –primeras 48 horas– y tempranas –primeros tres meses– posteriores a la atención.

Metodología: estudio de cohorte descriptiva de pacientes con DPS durante la atención obstétrica en un centro de referencia en Medellín, Colombia, entre 2015 y 2017. Se revisaron las historias y se registraron datos clínicos y complicaciones inmediatas y tempranas en la cita de control de piso pélvico.

Resultados: se atendieron 14.247 partos vaginales. La incidencia de DPS fue del 1,6%, 1,3% de grado III y 0,3% de grado IV. El 66,5% tuvo parto vértice instrumentado, 81,9% episiotomía; la mediana del periodo expulsivo fue 19 minutos, y el 3% presentó distocia de hombros. Las complicaciones inmediatas en las pacientes con DPS fueron: 0,85% dehiscencia de sutura e infección de la herida, 0,85% solo dehiscencia y 0,42% solo infección de la herida. El 18,4% asistieron al control uroginecológico al tercer mes. Entre ellas, el 38,2% tuvo al menos una complicación, principalmente incontinencia fecal y de flatos, 16,3% y 13,9% respectivamente.

Conclusiones: la incidencia de DPS y complicaciones del posparto inmediato fueron poco frecuentes. Se deben mejorar las estrategias de seguimiento posparto, con el fin de identificar y brindar un manejo oportuno de las complicaciones a mediano plazo.

INTRODUCTION

The occurrence of severe perineal tears (SPT) has been reported in up to 8.3% of births, involving the anal sphincter, with or without involvement of the rectal mucosa¹. Based on the severity and affected anatomical structures, perineal tears are considered severe when they belong to the third and fourth degrees according to the most accepted classification; they are also known as Obstetric Anal Sphincter Injuries (OASI)²⁻⁴.

SPT occur during the maximum expansion of the perineum in the third phase of labor. Some maternal and fetal risk factors that promote their occurrence have been described⁴⁻⁵. Among the former, related to the mother, are nulliparity, low maternal weight, gestational age greater than 37 weeks, and prolonged expulsion. Among the latter, associated with the fetus, are highlighted by weight greater than 3500 g, shoulder dystocia, and a larger head circumference. To minimize the risk of occurrence, the effectiveness of episiotomy for prophylactic purposes has been evaluated. However, the evidence is not conclusive, and the opposite effect has even been described⁵.

If OASI are diagnosed during a vaginal birth, surgical repair is carried out as soon as possible after delivery, which is defined as an immediate repair and represents the cornerstone of treatment. When resources for immediate repair are not available, OASI repair can be delayed for up to 12 hours without any apparent harmful effect⁶. Different aspects related to the surgical correction of SPT can influence the onset of complications; a lower risk of infection has been described when repairs are made with monofilament sutures compared to multifilament⁷.

On the other hand, the superiority of the overlapping technique over the end-to-end one for the anastomosis in anal sphincter repair was evidenced in a Cochrane meta-analysis in 2013. It concluded that the overlapping technique reduces the incidence of fecal urgency and worsening of anal incontinence at 12 months, with no differences in other complications or quality of life up to 36 months after birth care⁸. Yet, other authors believe there is no superiority of one technique over the other and that, despite proper surgical repair, patients can develop short and long-term sequelae⁶⁻⁷. Monitoring patients after repair provides an opportunity to review the status of the SPT, wound healing, and compliance with post-operative guidelines. It also allows for controlling constipation, urinary dysfunction, and pain⁷.

The purpose of this study was to determine the incidence of SPT and related immediate (within the first 48 hours) and early (within the first three months) complications after childbirth care.

MATERIALS AND METHODS

A descriptive and retrospective cohort study was conducted on patients who received childbirth care at a reference center for high-risk obstetric care in Medellín, Colombia, between January 2015 and December 2017.

Included in the study were patients with SPT, singleton pregnancies, and vaginal deliveries managed at the institution. No exclusion criteria were defined for the study. Two investigators identified the target patients from the obstetrics service procedure registry, which mandatorily logs data of expectant mothers whose childbirth is managed in the Hospital. Information on the mode of delivery, whether the vaginal delivery was instrumental, the presence of a tear, and its severity level were also recorded.

Based on these records, an evaluation was conducted on the electronic medical history to ascertain the inclusion criteria and to extract data on the study's variables of interest: demographic characteristics, body mass index (BMI), obesity classification as per the World Health Organization⁹,

comorbidities, obstetric history, and delivery characteristics. For the neonates, weight and the cephalic, thoracic, and abdominal perimeters were noted. From the SPT correction, information was gathered about the type of tear, lesion management, the kind of suture material employed, and the antibiotic treatment administered.

Those complications related to the tear occurring within the first 48 hours post-delivery (immediate complications) or up until the mother's discharge (if it happened within a shorter span) were identified during admission to the institution. These complications encompassed suture dehiscence, wound infection, hematomas, and the need for reintervention. Complications identified three months post-delivery during the urogynecological follow-up appointment were classified as early complications. They included fecal, flatus, and stress and urge urinary incontinence, rectovaginal fistulas, pelvic organ prolapse, and dyspareunia. Attending the urogynecological follow-up was contingent upon the authorization of the patient's insurance providers within the Colombian General Social Security System.

Variable data were recorded in an electronic database with field validation to minimize typing errors and later exported to the IBM SPSS 21 software for statistical data analysis. A descriptive analysis was done, showcasing absolute and relative frequency measures. For quantitative variables, upon evaluating assumptions of normality, data were displayed as mean and standard deviation or median and interquartile range.

This research received approval from the Health Research Ethics Committee of Universidad Pontificia Bolivariana and was endorsed by the University Clinic.

RESULTS

During the study period, the institution managed 19878 deliveries, of which 71.6% (14247) were vaginal. The incidence of SPT was 1.6% (233/14247): 1.3% (184/14267) were of third degree, and 0.3% (49/14247), were of fourth grade.

The median age of the patients was 24 years (IQR 20-29). 20% (47/233) had a normal weight, 27% (63/233) were overweight, and 12.8% (30/233) had obesity of class I or II. 30.0% (70/233) had a comorbidity, with gestational diabetes being the most prevalent at 6.43% (15/233). In terms of obstetric history, 78.9% (184/233) were primigravida. The remaining characteristics are detailed in Table 1.

Table 1. Characteristics of patients with SPT

Characteristics	N = 233 (%)
Tear degrees	
Third-degree tears	184 (78.9)
Fourth-degree tears	47 (20.1)
General	
Age, years – median (IQR)	24 (20-29)
Body mass index	
Underweight	0 (0)
Normal	47 (20.1)
Overweight	63 (27)
Obesity class I & II	30 (12.8)
Obesity class III	0 (0)
No information	93 (39.9)
Comorbidities	
At least one	70 (30)
Hypothyroidism	18 (7.7)
Gestational diabetes	15 (6.4)
Asthma	11 (4.7)
Others	16 (6.8)
Obstetric History	
Primigravida	184 (78.9)
Abortions	32 (13.7)
Cesareans	8 (3.4)
Deliveries	15 (6.4)
Previous perineal tears, N = 15	2 (13.3)
Previous episiotomy, N = 15	2 (13.3)
Current Delivery	
Gestational age \geq 37 weeks	224 (96.1)
Expulsive duration, minutes - median (IQR)	19 (12-35)
Cephalic presentation	232 (99.6)
Instrumented vertex delivery	155 (66.5)
Episiotomy	191 (81.9)
Median	165 (86.3)
Medio-lateral	26 (13.7)
Intrapartum complications	46 (19.7)
Uterine atony	25 (10.7)
Non-perineal tears	17 (7.3)
Shoulder dystocia	7 (3)
Newborn	
Weight, grams – mean (SD)	3238 (375.3)
Head circumference, cm – median (IQR)	34 (33-35)
Chest circumference, cm – median (IQR)	32.3 (31-33)
Abdominal circumference, cm – median (IQR)	30.5 (29-32)

Source: Prepared by authors

Among the delivery characteristics of patients with STPs, 96.1% (224/233) stands out for being full-term pregnancies. Episiotomy was performed in 81.9% (191/233) of the cases, with the median technique being the most frequently used. Forceps-assisted delivery was observed in 66.5% (155/233) of the deliveries. The median duration for the expulsion phase was 19 minutes (IQR 12-35). Non-perineal tears were noted in 7.3% (17/233) of the patients, and shoulder dystocia was observed in 3% (7/233) of the cases. As for the neonatal characteristics, the average weight was 3248 grams (SD: 375.3), and the median head circumference was 34 cm (IQR 33-35) (See Table 1).

Regarding suturing, in 11.2% (26/233) of the patients, only one type was exclusively used: Polyglactin was employed in 5.6% (13/233) —nine patients with gauge 2-0 and four with gauge 0. In the other 5.6% (13/233), 2-0 Catgut chrome was used. In general, the sutures used in the repair of the SPT that were most commonly utilized were a combination of 2-0 Catgut chrome/Polyglactin 910, 2-0 in 37.8% (88/233), 2-0 Catgut chrome/Polyglactin 910, 0 in 33.0% (77/233); and in 9.9% of the patients, three sutures were used: 2-0 chromic Catgut/Polyglactin 910 of gauges 2-0 and 0 corresponding to 9.9% (23/233) of the patients (see Table 2).

Table 2. Management of SPT and their complications

Characteristics	N = 233 (%)
Sutures used for tear repair	
One suture	26 (11.2)
Two types of sutures	207 (88.2)
Catgut chrome 2-0 / Polyglactin 910, 2-0	88 (37.8)
Catgut chrome 2-0 / Polyglactin 910, 0	77 (33.0)
Catgut chrome 2-0 / Polyglactin 910, 2-0 y 0	23 (9.9)
Catgut chrome 2-0	13 (5.6)
Polyglactin 910, 2-0	9 (3.9)
Other	23 (9.8)
Antibiotic regimen for tear; N = 80	
Metronidazole	72 (90)
Clindamycin + gentamicin	3 (3.8)
Metronidazole + ciprofloxacin	1 (1.3)
Other	4 (4.9)
Antibiotic use frequency according to tear type	
Grade III n = 184	33 (17.9)
Grade IV n = 47	47 (100)
Urogynecology referral	
Attended evaluation by the urogynecology unit	43 (22.1)
Complications during delivery (early)	
Suture dehiscence	4 (1.7)
Reintervention due to dehiscence	1 (0.4)
Wound infection	3 (1.3)

Source: Prepared by authors

All fourth-degree tears received antibiotic treatment as did 18% (33/184) of third-degree. Among the treatment regimens used, metronidazole was the most frequently prescribed, either in-hospital or outpatient (90%).

The most common immediate complications (first 48 hours) of managing severe tears were suture dehiscence in 1.7% (4/233), where one patient required re-intervention, and surgical wound infection in three patients (1.3%) (see Table 2). None of the patients in which three sutures were used for SPT repair presented immediate complications such as dehiscence or wound infection. The four patients who experienced suture dehiscence were sutured with Catgut chrome 2-0/Polyglactin 910, 0, and three did not receive antibiotics. The three patients who presented with wound infection did not receive antibiotics were sutured with Catgut chrome 2-0/Polyglactin 910, and the severity of the tear was of third-degree.

84.1% (196/233) of patients with SPT were discharged with an order for outpatient evaluation by the urogynecology unit three months after delivery; 21.9% (43/196) attended the appointment. Early complications identified in this group of patients were fecal incontinence in 16.2% (7/43), flatus incontinence in 13.9% (6/43), urinary incontinence (primarily urgency) in 9.3% (4/43), fistulas in 6.9% (3/43), including two rectovaginal, and dyspareunia in 6.9% (3/43). 83.7% (36/43) required some form of treatment; among them, 83.3% (30/36) received exclusive pelvic floor therapy, and the rest received multiple therapies. See Table 3.

Table 3. Clinical evaluation of patients with SPT attending urogynecological assessment three months after childbirth

Outcomes	N = 43 (%)
At least one complication	13 (38.2)
Fecal incontinence	7 (16.2)
Flatus incontinence	6 (13.9)
Urinary incontinence	4 (9.3)
**Effort	1 (2.3)
**Urgency	3 (6.9)
Fistulas	3 (6.9)
Dyspareunia	3 (6.9)
Management: n = 36	
Pelvic floor physiotherapy	31 (83.3)
Surgical	4 (2.7)
Pharmacological	4 (2.7)
Need for ultrasound follow-up after three months	13 (30.2)

Source: Prepared by authors

DISCUSSION

The incidence of SPT was 1.6% (233/14247) in the population studied between January 2015 and December 2017, which is considered the main finding of this study. This is the first report of its kind in Colombia with a significant number of patients in a national obstetric care reference center.

The institution where the study was conducted is a university hospital that serves as a regional reference for managing obstetric patients. On average, it handles 6600 births per year; the care is provided by specialists in gynecology and obstetrics as well as continuous participation of interns and residents.

A much lower SPT incidence than expected is observed compared to what has been reported in the literature⁴. In Europe, the frequency of these tears has been reported between 2.1% and 8.3% for a similar number of births¹⁴. In Latin America, the incidence is lower, between 0.3% and 2.2%¹⁰. The variability in the incidence of this childbirth complication may be due to different characteristics of the pregnant women, newborns, childbirth care, and care center⁴⁻⁵.

It has been reported that the incidence of OASI varies depending on the age of the pregnant woman at the time of delivery; from the age of 25, there is a higher frequency of hidden pelvic floor injuries evidenced by ultrasound¹¹ although other studies report it even at ages above 19¹². An explanation for this is given by Bowling *et al.*, who suggest that the female pelvis before 25 is still structurally developing, which might lead to a low risk of SPT¹¹⁻¹². Similarly, primiparity has been 4.9 to 7 times more frequent in mothers with SPT^{2,13-14}, which aligns with the findings of this research, where 79% of the patients were first-time mothers¹⁵. Gundabattula *et al.* found that primiparity increased the likelihood of experiencing SPT by 4.9 times¹³. In the same vein, the Royal College of Obstetricians and Gynecologists (RCOG) and the American College of Obstetricians and Gynecologists (ACOG) report a risk increase of 6.9 and 7.0 times, respectively²⁸.

In contrast, overweight and obesity have been associated with a linear decrease in the risk of perineal trauma¹⁶, and avulsion of the levator ani muscle and the anal sphincter¹⁷. This is due to the high concentration of serum and myometrial membrane cholesterol that modulates the oxytocin receptor in the uterine smooth muscle and prevents uterine overstimulation during the second stage of labor¹⁶. In this study, 39.8% (93/233) of the patients with OASI —of whom weight and height information was found— had a BMI between 25 and 35.

The foregoing suggests that pelvic floor injuries are multifactorial and uterotonics, during the second stage of labor, play a significant role as found in some studies¹⁸. Additionally, the duration of the second stage of labor, instrumentation with forceps, and the anthropometric characteristics of the newborn have been associated with an increased risk of tearing^{2,4,18-20}. The use of forceps has been reported as a risk factor for anal sphincter tears^{4,13,21}. Of the 233 patients with SPT in the study, 66.5% (155/233) had instrumented delivery, and 84.5% (131/155) underwent episiotomy; the frequency of instrumented delivery and episiotomy are integral to the training period at the study institution, and the expertise gained makes them pioneers at the national level in these practices.

The repair of the anorectal mucosa should be performed with 3-0 Polyglactin suture, resulting in less irritation and discomfort, whereas the external and internal anal sphincter ought to be corrected with monofilament sutures like 2-0 Polyglactin^{2,10,22}. The RCOG, ACOG¹⁰, and the latest clinical practice guidelines from the Colombian Ministry of Health and Social Protection of 2013 support the recommendation of using absorbable synthetic sutures for the surgical correction of perineal tears due to their tensile strength, hypoallergenic properties, and low likelihood of infectious complications; however, adequate studies are scarce²²⁻²³.

Some clinical practice recommendations from scientific associations indicate that Catgut chrome is an acceptable alternative for closure although not the ideal choice²³. Kettle *et al.* conducted a systematic review with 10171 patients with perineal tears, comparing the use of different suture materials for their repair. It was found that standard synthetic sutures led to less pain on the third day, fewer analgesic requirements, and a lower probability of wound dehiscence compared to the use of Catgut chrome²⁴.

There is no consensus regarding the duration of antibiotic management in patients with third- and fourth-degree tears. The UK's Royal College recommends that intraoperative and postoperative broad-spectrum antibiotic coverage should only be used for patients with fourth-degree tears to reduce the incidence of infections and wound dehiscence². The use of metronidazole to cover possible anaerobic contamination from fecal matter is recommended². Similarly, ACOG advises that a single dose of antibiotic at the time of repair is reasonable in the context of OASI¹³, and Colombian guidelines from the Ministry of Health recommend the intraoperative use of a single-dose antibiotic for fourth-degree tears²². In this research, the routine practice was to use antibiotics in all patients with fourth-degree tears, and less frequently in those with third-degree tears, mainly with metronidazole. According to Colombian and other international guidelines, patients were given metronidazole as a first choice. The use of second or third-generation cephalosporins is also suggested and in cases of β -lactam allergy, gentamicin combined with metronidazole is accurate²⁴. Within the research, a potential limitation for evaluating immediate complications is that immediate postpartum surveillance in a hospital setting is given within the first 24 hours by institutional protocol. It is unknown if some patients with potential complications later consulted other institutions.

Pelvic floor disorders in the postpartum period are common. Up to 80% of patients can develop at least one alteration that may persist in the first year, achieving improvement in up to 80% of cases²³⁻²⁶. Various short- and long-term outcomes have been reported such as fecal incontinence, flatus and urinary incontinence, rectovaginal fistulas, and other manifestations that demonstrate decreased pelvic floor contraction^{7,20,26}. European and American guidelines for gynecology and obstetrics recommend an assessment by a specialist in urogynecology and pelvic floor between 6 and 12 months after the correction of tears, as well as the initiation of pelvic floor physiotherapy in all patients^{2,10}.

Urogynecological follow-up is essential for identifying short-term complications and those in the first three postpartum months. This practice was not carried out for all study patients, and in those who attended the consultation, the importance of postpartum assessment to identify SPT complications was reaffirmed.

The main limitation of the study in identifying SPT complications was the poor attendance at urogynecological control appointments because only one in every five patients attended. Also, a lack of complete information in the medical history regarding obstetric history and BMI was evident, underscoring the need to standardize the medical history and management guidelines to ensure comprehensive care and postpartum follow-up by an interdisciplinary team. This will allow for an objective evaluation of results in the long term.

The results of this study have helped improve the management guide for patients with third- and fourth-degree perineal tears at the institution. For instance, it has contributed to ensuring greater adherence and standardizing the suture material and the doses and prophylactic antibiotic regimens applied during surgical correction and discharge according to available evidence. The challenge now is to strengthen the outpatient follow-up of these cases and develop strategies adapted to the Colombian health system, aiming to reduce short and long-term morbidity in these patients.

CONCLUSIONS

The incidence of perineal tears and complications during the immediate postpartum period was infrequent in a tertiary, university-affiliated obstetric care institution. This study presented an opportunity to develop strategies for monitoring women treated at this institution, seeking to mitigate challenges arising from health system processes and administrative issues. The objective was to identify and provide timely and comprehensive management of medium-term complications, thereby influencing the quality of life and the incidence of genitourinary tract morbidity in our obstetric population. Furthermore, this research lays the groundwork for additional studies to evaluate the significance of instrument-assisted delivery in relation to OASI, with the intent to discern whether it is as significant a risk factor as previously believed.

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CONFLICT OF INTEREST

None declared by the authors.

REFERENCES

1. Jansson MH, Franzén K, Hiyoshi A, Tegerstedt G, Dahlgren H, Nilsson K. Risk factors for perineal and vaginal tears in primiparous women - the prospective POPRACT-cohort study. *BMC Preg Child* [Internet]. 2020 Dec;20:749. <http://dx.doi.org/10.1186/s12884-020-03447-0>
2. Royal College of Obstetricians & Gynaecologists [Internet]. London: Royal College of Obstetricians & Gynaecologists; 2015. Third- and fourth-degree perineal tears, management (green-top guideline no. 29). Royal College of Obstetricians & Gynaecologists. [modified 2015 Jun 12, cited 2022 Jun 13]. Available from: <https://www.rcog.org.uk/en/guidelines-research-services/guidelines/gtg29/>
3. Košec V, Djaković I, Čukelj M, Ejubović E, Sumpor B, Djaković Ž. Increased oasis incidence - indicator of the quality of obstetric care? *Acta Clin Croat* [Internet]. 2019 Jun;58(2):365–70. <http://dx.doi.org/10.20471/acc.2019.58.02.22>
4. Barca JA, Bravo C, Pintado-Recarte MP, Cueto-Hernández I, Ruiz-Labarta J, Cuñarro Y, et al. Risk factors in third and fourth degree perineal tears in women in a tertiary centre: An observational ambispective cohort study. *J Pers Med* [Internet]. 2021 Aug;11(8):685. <http://dx.doi.org/10.3390/jpm11080685>
5. Gachon B, Desgranges M, Fradet L, Decatoire A, Poireault F, Pierre F, et al. Is increased peripheral ligamentous laxity in term pregnant women associated with obstetric anal sphincter injury? *Int Urogynecol J* [Internet]. 2018 Mar;29(11):1589–95. <http://dx.doi.org/10.1007/s00192-018-3598-2>
6. Spinelli A, Laurenti V, Carrano FM, Gonzalez-Díaz E, Borycka-Kiciak K. Diagnosis and treatment of obstetric anal sphincter injuries: New evidence and perspectives. *J Clin Med* [Internet]. 2021 Aug;10(15):3261. <http://dx.doi.org/10.3390/jcm10153261>

7. Meister MR, Rosenbloom JI, Lowder JL, Cahill AG. Techniques for repair of obstetric anal sphincter injuries. *Obstet Gynecol Surv* [Internet]. 2018 Jan;73(1):33–9. <http://dx.doi.org/10.1097/ogx.0000000000000521>
8. Fernando RJ, Sultan AH, Kettle C, Thakar R. Methods of repair for obstetric anal sphincter injury. *Cochrane Database Syst Rev* [Internet]. 2013 Dec;(12):CD002866. <https://doi.org/10.1002/14651858.CD002866.pub3>
9. Weiland A, Nannette LK, Zipfel S, Ehehalt S, Ziser K, Junne F, et al. Predictors of weight loss and weight loss maintenance in children and adolescents with obesity after behavioral weight loss intervention. *Front Public Health* [Internet]. 2022 Mar;10:813822. <http://dx.doi.org/10.3389/fpubh.2022.813822>
10. American College of Obstetricians and Gynecologists. ACOG practice bulletin no. 198: Prevention and management of obstetric lacerations at vaginal delivery: Prevention and management of obstetric lacerations at vaginal delivery. *Obstet Gynecol* [Internet]. 2018 Sep;132(3):e87–e102. <http://dx.doi.org/10.1097/aog.0000000000002841>
11. Caudwell-Hall J, Kamisan Atan I, Guzman Rojas R, Langer S, Shek KL, Dietz HP. Atraumatic normal vaginal delivery: how many women get what they want? *Am J Obstet Gynecol* [Internet]. 2018 Oct;219(4):379.e1–379.e8. <http://dx.doi.org/10.1016/j.ajog.2018.07.022>
12. Marschalek M-L, Worda C, Kuessel L, Koelbl H, Oberaigner W, Leitner H, et al. Risk and protective factors for obstetric anal sphincter injuries: A retrospective nationwide study. *Birth* [Internet]. 2018 Mar;45(4):409–15. <http://dx.doi.org/10.1111/birt.12346>
13. Gundabattula SR, Surampudi K. Risk factors for obstetric anal sphincter injuries (OASI) at a tertiary centre in south India. *Int Urogynecol J* [Internet]. 2018 Mar;29(3):391–6. <http://dx.doi.org/10.1007/s00192-017-3398-0>
14. Tan ACC, Mohd-Yusoff FB, Salleh MFAB, Chua AC. What are the factors that may predict the severity of perineal tears in obstetric anal sphincter injuries and how are their outcomes? A 10-year retrospective analysis in a Southeast Asian population. *Int Urogynecol J* [Internet]. 2022 Apr;33:1667–74. <http://dx.doi.org/10.1007/s00192-022-05164-y>
15. Secretaría Distrital de Salud de Bogotá, Asociación Bogotana de Obstetricia y Ginecología (ASBOG). Guía de manejo de trabajo de parto, parto y sus complicaciones [Internet] [cited 2022 Jun 23]. Available from: <http://www.saludcapital.gov.co/DDS/Paginas/GuiasAtencion.aspx>
16. Durnea CM, Jaffery AE, Gauthaman N, Doumouchsis SK. Effect of body mass index on the incidence of perineal trauma. *Int J Gynaecol Obstet* [Internet]. 2017 Nov;141(2):166–70. <http://dx.doi.org/10.1002/ijgo.12403>
17. Kamisan-Atan I, Lai SK, Langer S, Caudwell-Hall J, Dietz HP. The impact of variations in obstetric practice on maternal birth trauma. *Int Urogynecol J* [Internet]. 2019 Feb;30(6):917–23. <http://dx.doi.org/10.1007/s00192-019-03887-z>
18. Joris F, Hoesli I, Kind A, Ries JJ, Kavvadias T. Obstetrical and epidemiological factors influence the severity of anal incontinence after obstetric anal sphincter injury. *BMC Preg Child* [Internet]. 2019 Mar;19:94. <http://dx.doi.org/10.1186/s12884-019-2238-2>
19. Ali M, Migisha R, Ngonzi J, Muhumuza J, Mayanja R, Joe Lapat J, et al. Risk factors for obstetric anal sphincter injuries among women delivering at a tertiary hospital in southwestern Uganda. *Obstet Gynecol Int* [Internet].;2020 May:6035974. <http://dx.doi.org/10.1155/2020/6035974>
20. Aguiar M, Farley A, Hope L, Amin A, Shah P, Manaseki-Holland S. Birth-related perineal trauma in low- and middle-income countries: A systematic review and meta-analysis. *Matern Child Health J* [Internet]. 2019 Mar;23(8):1048–70. <http://dx.doi.org/10.1007/s10995-019-02732-5>
21. Caudwell-Hall J, Kamisan Atan I, Martin A, Guzman Rojas R, Langer S, Shek K, et al. Intrapartum predictors of maternal levator ani injury. *Acta Obstet Gynecol Scand* [Internet]. 2017 Jan;96(4):426–31. <http://dx.doi.org/10.1111/aogs.13103>
22. Ministerio de salud y protección social, Colciencias. Guía de Práctica Clínica para la prevención, detección temprana y tratamiento del embarazo, parto o puerperio [Internet]. Bogotá: 2013. Available from: <https://www.minsalud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/INEC/IETS/Gu%C3%ADa.completa.Embarazo.Parto.2013.pdf>

23. Marty N, Verspyck E. Déchirures périnéales obstétricales et épisiotomie : aspects techniques. RPC prévention et protection périnéale en obstétrique CNGOF. *Gynecol Obstet Fertil Senol* [Internet]. 2018 Dec;46(12):948–67. <http://dx.doi.org/10.1016/j.gofs.2018.10.024>
24. López M, Espuña M, Ros C, Bataller E, Palacio M, Anglès S, et al. Protocolo: Lesiones perineales de origen obstétrico: diagnóstico, tratamiento y seguimiento [Internet]. 2006. Available from: <https://www.studocu.com/pe/document/universidad-nacional-federico-villarreal/obstetricia/lesiones-perineales-de-origen-obstetrico-grados-y-manejo/23184596>
25. Ramage L, Yen C, Qiu S, Simillis C, Kontovounisios C, Tekkis P, et al. Functional and quality of life outcomes following obstetric anal sphincter injury (OASI): does the grade of injury affect outcomes? *Int Urogynecol J* [Internet]. 2017 May;28:1709–17. <https://doi.org/10.1007/s00192-017-3334-3>
26. Volløyhaug I, Taithongchai A, Van Gruting I, Sultan A, Thakar R. Levator ani muscle morphology and function in women with obstetric anal sphincter injury: Levator injury, muscle contraction and incontinence. *Ultrasound Obstet Gynecol* [Internet]. 2019 Mar;53(3):410–16. <http://dx.doi.org/10.1002/uog.20115>