

# The incidence of obstetric anal sphincter injuries following vaginal delivery: an observational study

Hany Abdelaleem Ali, Esraa Badran, Dina M. Habib, Abdallah M. Sayed

Department of Obstetric and Gynaecology,  
Faculty of Medicine, Assiut University, Assiut,  
Egypt

Correspondence to Abdallah M. Sayed, BSC,  
Department of Obstetric and Gynaecology,  
Faculty of Medicine, Assiut University,  
Assiut, Egypt  
Tel: +20 100 886 5168;  
e-mail: Abdallahmsm43@gmail.com

**Received** 17 June 2019

**Accepted** 09 July 2019

**Journal of Current Medical Research and Practice**

September-December 2019, 4:332–337

## Background

Obstetrical anal sphincter injuries (OASIS) involve third-degree and fourth-degree perineal tears after following vaginal delivery. The incidence of OASIS varies among different populations, and there are very few studies examining the incidence in Egypt. This study aimed to evaluate the incidence of OASIS, both overt and occult (ultrasound detected), among a cohort of primiparous women who delivered vaginally, and to assess the role of two-dimensional transperineal ultrasound (TPUS) in evaluating anal sphincter morphology.

## Patients and methods

A prospective observational study included 124 primiparous women with singleton vaginal delivery during the first year after delivery. We excluded women with a history of chronic intestinal disease (Crohn's disease, ulcerative colitis), acute gastroenteritis within the week preceding consultation, those who underwent any surgical or diagnostic procedure involving the anal canal, and multiparous women. History was taken, examination was performed, and two-dimensional TPUS was performed. For the second objective, a control group of 43 primiparous women who delivered by cesarean section (CS) was recruited to compare the ultrasound findings with those of women who delivered vaginally with the same inclusion and exclusion criteria.

## Results

Among the studied cohort of 121 women who delivered vaginally, no cases with overt OASIS were detected. Per rectal examination using pill-rolling motion to assess the thickness of the anal sphincter revealed 15 patients among the vaginal delivery group with poor thickness (representing 12.1%); on the other hand, in CS cases, all of them had normal thickness. Using TPUS for the evaluation of anal sphincter, we found three cases among those who delivered vaginally with disrupted mucosal star sign (2.4%) versus no cases in those who delivered by CS. The combined thickness of the internal and external anal sphincters was significantly thinner in the vaginal delivery group compared with the CS delivery group.

## Conclusions

The study showed low incidence of both overt and occult OASIS among primiparous women who delivered vaginally; TPUS is a technique that is both simple and feasible to diagnose occult OASIS.

## Keywords:

OASIS, OASIS following vaginal delivery, transperineal US

J Curr Med Res Pract 4:332–337  
© 2019 Faculty of Medicine, Assiut University  
2357-0121

## Introduction

Vaginal delivery leading to direct or indirect injury to the anal sphincter complex is the major cause of fecal incontinence among women aged less than 65 years [1]. Postpartum manometric and electrophysiological tests suggest that vaginal delivery is associated with impairment of anal function. Among women, anal incontinence symptoms worsen with further deliveries, irrespective of the history of anal sphincter tear [2].

Two main types of anal sphincter injuries exist. The first is the overt type that is usually evident in the delivery room and has the full chance to be repaired primarily [3]. The second type is the occult type; it usually remains undetected until discovered late by more sophisticated techniques such as endoanal sonography or manometry performed for the evaluation of persistent anorectal complaints.

Although the problem of postpartum anal sphincter damage is well recognized, yet we found scarce data with regard to the magnitude of this problem in Egypt, and there are only a few studies addressing the issue in the Arab world [4].

Endoanal (EA) ultrasound (US) has been described as the gold standard for imaging the anal sphincter by the International Continence Society and The International Urogynecologic Association [5,6]; although EA sonography is commonly used by colorectal surgeons, it is not universally available to gynecologists.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

The evaluation of the anal sphincter anatomy through a transperineal approach using a high-frequency transvaginal probe has been presented by several investigators [7,8].

The transvaginal or transperineal approaches have potential advantages over EA sonography, including the absence of distortion of the anal canal by the transducer during the examination, evaluation of the anal sphincter and mucosa in the resting position, greater availability of vaginal transducers, and more patient-acceptable examination. However, the transperineal approach does have the disadvantage of difficulty in near-field imaging in some cases.

This study aimed to determine the incidence of obstetric anal sphincter injuries (OASIS) in a cohort of primiparous women during the first year after vaginal delivery and to assess the role of two-dimensional transperineal ultrasound (TPUS) in evaluating anal sphincter morphology and possible hidden tears.

## Patients and methods

The study was designed as a prospective observational study. It was conducted at Women's Health Hospital, Faculty of Medicine, Assiut University, during the period spanning from July 2016 to June 2018. The study was conducted in the labor ward (reception unit), which deals with the low-risk cases.

For detecting the incidence of OASIS (primary objective of the study), primiparous women who delivered vaginally, were identified prospectively in the obstetric log book, and their contact details and delivery data were retrieved from their medical files; thereafter, they were contacted by phone calls made by the researcher. Women were invited to participate in the study; those who agreed to participate were asked to attend the outpatient clinic for evaluation and signing the consent form. Women were excluded if they had a history of chronic intestinal disease (Crohn's disease, ulcerative colitis) or if they had acute gastroenteritis within the week preceding consultation; those who underwent any surgical or diagnostic procedure involving the anal canal and multiparous women were also excluded.

For the second objective, a control group of primiparous women who delivered by cesarean section (CS) were recruited to compare the US findings with those who delivered vaginally with the same inclusion and exclusion criteria.

The recruited patients were subjected to history taking, inquired about clinical data, obstetric data, and risk

factors for OASIS, which included maternal risk factors such as age, weight, height, and BMI, fetal risk factors such as birth weight of the newborn and postmaturity, obstetrical procedure such as duration of second stage of labor, episiotomy and its type, and instrumental vaginal deliveries.

Women were asked about symptoms for OASIS and the associated urinary and sexual symptoms using the global pelvic floor Bother Questionnaire that addresses symptoms and bother related to stress urinary incontinence, urinary urgency and frequency, urge incontinence, voiding difficulty, pelvic organ prolapse, obstructed defecation, fecal incontinence, and dyspareunia [9].

All patients were subjected to general examination including measuring of height, weight, calculation of BMI, and pelvic examination to evaluate the anal sphincter condition, which includes the inspection of the perineum with labial parting to obtain the condition of the perineum (normal or whether there are scars of episiotomy) and to measure the perineal length by tape. Inspection of the distal (caudal) posterior vaginal wall. Palpation was carried out with the examiner's dominant index inserted in the anus, and the ipsilateral thumb in the vagina. The two fingers then palpate with a 'pill-rolling' motion to assess the thickness of the sphincter subjectively, as good thickness indicates more than 50% of thickness or poor thickness indicates less than 50% of thickness.

If sphincter tears were detected, they were classified according to the WHO classification [10].

## Two-dimensional transperineal ultrasound examination

All patients were subjected to TPUS to evaluate sphincter morphology and possible hidden tears. We adopted the same technique described by Timor-Tritsch *et al.* [8].

The examination was performed by the same investigator (E.Y.B.) in the Ultrasound Unit of Women's Health Hospital using Medison Expert US machines and a standard transvaginal probe of 5–7 MHz. With the woman in the dorsal lithotomy position, the probe was gently placed on the perineum and gradually inclined until the best view of the concentric muscle layers was achieved and filled most of the screen. Special attention was paid to the entirety of the hypoechoic ring, representing the internal anal sphincters encircling the echogenic irregularity of the anal mucosa, and also to the completeness of the outer hyperechoic ring reflecting the external anal sphincter.

The intact rectal mucosa is a star-like image on the transverse section. The combined thickness of the

internal and external sphincters at the 12 o'clock position was measured. Any disruption in the sphincter (s) was defined as a gap, and the following US parameters were evaluated:

#### *Mucosal star sign*

This sign is seen on the transverse section created by the normal empty lower rectal mucosal folds and the constricted anus; a normal mucosal star appears at the lower scanning plane about 1.5 cm from the anal verge and shows centrally radiating folds, which signifies intact mucosal folds with intact sphincter thickness.

A disrupted mucosal star sign appears to be located at the site of the defect in the sphincter [8].

The second parameter evaluated is the thickness of both the internal and external sphincters at the 12 o'clock position.

#### Sample size calculation

On the basis of a population size of 2000 and an assumed frequency of outcome of 25%, we calculated a sample size of 252 with a confidence level of 95%.

#### Statistical analysis

Data analysis was performed by SPSS software, version 18 (SPSS Inc., PASW statistics for windows version 18. Chicago: SPSS Inc.). Qualitative and quantitative variables were analyzed. *P* values of less than 0.05 were considered significant. Continuous data were compared using Student *t* test, and categorical data were compared using  $\chi^2$  test.

#### Ethical issues

The study was submitted to the Ethical Review Board of the Faculty of Medicine, Assiut University, and was approved. Written consent was obtained from all recruited women. Women received the appropriate management according to findings and were not subjected to harm.

#### Results

Over the study period spanning from July 2016 to June 2018, a sample of 735 primiparous women delivered vaginally in the reception unit, and they were identified from the obstetric log book. The delivery data of the 735 cases were retrieved from the medical files. All of them were invited to participate in the study through phone calls over the period of 40 days up to one year after vaginal delivery. Only 130 patients came to the outpatient clinic for evaluation. Six of them refused

to participate; 124 met the inclusion and exclusion criteria, and they agreed to participate in the study and signed the consent form. The control group included 41 cases of primiparous women who delivered by CS and consented to participate in the study.

#### Personal and clinical data

The mean age of the vaginal delivery group was  $22.23 \pm 3.16$  years, while there were only nine (7%) cases above 27 years and no cases above 35 years.

The mean BMI of the vaginal delivery group was  $23.3 \text{ kg/m}^2$ , and no cases were above  $30 \text{ kg/m}^2$ . There were no significant differences between primiparous women who delivered vaginally and those who delivered by CS in relation to the risk factors for OASIS. As regards the control group, the mean age was  $24.6 \pm 3.31$  years, and no cases were above 35 years of age. Their mean BMI was  $24.12 \pm 1.56 \text{ kg/m}^2$ . The residence and occupation of the 41 cases were 35 rural and 39 housewives, respectively (Table 1).

Table 2 shows the symptoms of pelvic floor dysfunction, as evaluated by the PFBQ for the group of patients who delivered vaginally, with most of the symptoms being urinary and 2.4% of the patients showing difficulty in defecation, and no patients having fecal incontinence. The patients in the CS group had no pelvic floor dysfunction symptoms when evaluated using the questionnaire.

#### Examination

A scar of mediolateral episiotomy was detected in 113 (91.1%) cases from 124. The perineal length

**Table 1 Patients' evaluation according to risk factors of obstetric anal sphincter injuries (n=124)**

Risk factors	n (%)
Age >27 years	9 (7)
Age >35 years	0
Episiotomy: mediolateral	
Yes	113 (91.1)
No	11 (8.9)
Midline episiotomy	0
Vacuum	0
Forceps	0
Shoulder dystocia	0
Epidural	0
Duration of 2 <sup>nd</sup> stage labor	
Mean±SD	73.59±28.30
Range	30.0-150.0
2 <sup>nd</sup> stage of labor more than 60 min	30 (24.1)
Birth weight of baby (kg)	
Mean±SD	3.07±0.38
Range	2.0-4.3
Body weight of baby more than 4 kg	1 (0.8)
Malpresentation	0

varied from 2 to 4 cm in all cases. No cases of overt OASIS were detected among the 124 cases included on per rectal examination using pill-rolling motion test (it is a subjectively assessment of thickness of anal sphincter, good thickness indicates more than 50% of thickness or poor thickness indicates <50% of thickness). There were 15 cases of vaginal deliveries who had poor thickness, which represented 12.1% of vaginal delivery cases in comparison with normal thickness in all CS cases ( $P = 0.023$ ) (Table 3).

On examination of the three cases who had obstructive defecation, two of them had poor thickness, and one had good thickness.

### Ultrasound examination findings

By using two-dimensional TPUS for evaluation of anal sphincter, we found only three cases of vaginal deliveries had disrupted mucosal star sign (hidden occult obstetric anal sphincter injuries) presented 2.4% but all CS cases had intact mucosal star sign.

Measurement of the combined thickness of external and internal anal sphincters showed a statistically significant difference between cases who delivered vaginally and those who delivered by CS. In CS cases, the mean thickness was  $3.31 \pm 0.22$  mm, but, in 124 cases of vaginal deliveries, the mean thickness was  $2.73 \pm 0.69$  mm.

**Table 2 Symptoms according to pelvic floor Bother Questionnaire**

Symptoms	Vaginal ( $n=124$ ) $n$ (%)
Stress urinary incontinence	5 (4.0)
Frequent urination	3 (2.4)
Urgency	1 (0.8)
Urge incontinence	0 (0)
Dysuria	6 (4.8)
Bulge in vagina	0 (0.0)
Difficulty in defecation (obstructive defecation in the form of more straining)	3 (2.4)
Fecal incontinence	0 (0)
Sexual problems (dyspareunia)	11 (8.9)

**Table 3 Pelvic examination**

	Vaginal ( $n=124$ ) [ $n$ (%)]
Condition of perineum	
Normal	11 (8.9)
Scar of episiotomy	113 (91.1)
Perineal length (cm)	
Mean $\pm$ SD	2.71 $\pm$ 0.42
Range	2.0-4.0
Pill-rolling motion to assess the thickness of sphincter	
Intact with good thickness of more than 50%	109 (87.9)
Intact with poor thickness of less than 50%	15 (12.1)
Torn	0

Since the group of patients delivered by CS represented a control group for the studied patients, and the mean thickness of external anal sphincter (EAS) + internal anal sphincter (IAS) at the 12 o'clock position for this group was 3.4 mm, we considered the anal sphincter complex to be thin if it was less than 50% of this value, that is, less than 1.7 mm.

Among 15 cases who had poor thickness of sphincter detected clinically using pill-rolling motion, 12 (80%) cases had TPUS thickness of internal and external sphincters of less than 1.7 mm (Figs. 1–4).

### Discussion

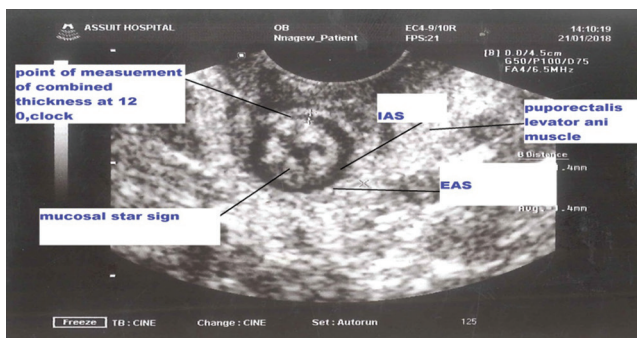
In the studied cohort, no patient had overt OASIS. Only three cases had obstructive defecation. Using two-dimensional TPUS, 2.4% of patients showed abnormal morphology of the anal mucosal folds (occult OASIS). However, we found a statistically significant difference in combined thickness of internal and external anal sphincters assessed by TPUS between vaginal and CS deliveries. The present study demonstrated that, in the vaginal delivery group, both the internal and external sphincter muscles were thinner at the anterior region (12 o'clock position) compared with those in the CS delivery group.

The incidence of OASIS may vary according to many variables including the use of any type of episiotomy (lateral, mediolateral, or midline), type of delivery (spontaneous or assisted vaginal), type of instrument used (vacuum or forceps), parity, type of obstetrical care provider, and race. Overall, studies looking at the incidence of OASIS on the basis of WHO's International Classification of Diseases WHO 2015 report an incidence of 4–6.6% of all vaginal births, with higher rates in assisted deliveries (6%) than in spontaneous deliveries (5.7%) [11,12].

In the present study, no cases suffered overt sphincter tears and, consequently, no cases had fecal incontinence. This could be explained by the low-risk group recruited, the fact that the calculated sample size was not achieved, and because the cases were not recruited consecutively with possible selection bias.

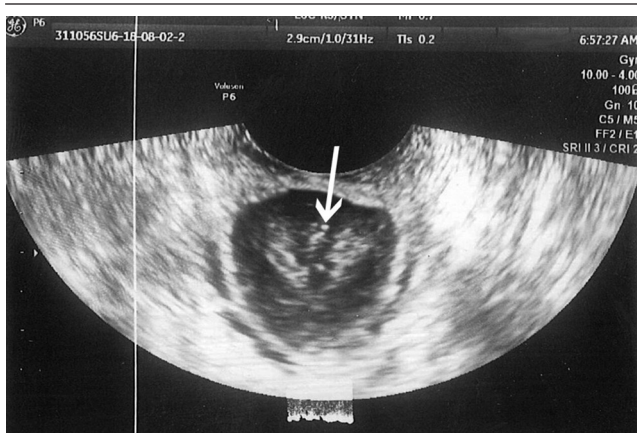
Other studies have reported a low incidence of OASIS, such as the one conducted by Sheiner *et al.* [13], that reported an incidence of 0.1% for third-degree perineal tears in singleton, term vaginal deliveries. Independent risk factors for third-degree perineal tears were fetal macrosomia (>4000 g) [odds ratio (OR), 2.5; 95% confidence interval (CI), 1.2–4.9], vacuum

Figure 1



TPUS image of mucosal star sign, IAS, EAS, and puborectalis muscle (Assiut University WHH US Unit by E.Y.B.). TPUS, transperineal ultrasound.

Figure 3



TPUS imaged arrow refers to the disrupted mucosal star sign. TPUS, transperineal ultrasound.

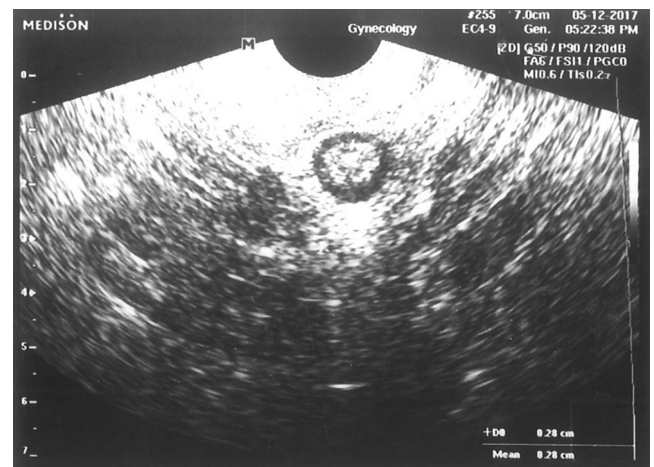
extraction (OR, 8.2; 95% CI, 4.7–14.5), and forceps delivery (OR, 26.7; 95% CI, 8.0–88.5). In our study, there were no macrosomic babies and no instrumental deliveries.

Zafran and Salim [14] reported an incidence of 0.4% for OASIS in singleton, term, vertex vaginal deliveries. Independent risk factors for perineal tears were vacuum extraction (OR, 4.21; 95% CI, 1.31–13.53).

Melamed *et al.* [15] reported an incidence of 0.6% for third-degree and fourth-degree perineal tears in singleton, viable, vertex vaginal deliveries. Independent predictors of OASIS were forceps delivery (OR, 5.5; 95% CI, 3.9–7.8), vacuum extraction (OR, 1.9; 95% CI, 1.4–2.6), large-for-gestational-age neonates (>90<sup>th</sup> percentile) (OR, 1.5; 95% CI, 1.1–2.0), and gestational age more than 40 weeks (OR, 1.4; 95% CI, 1.1–1.7).

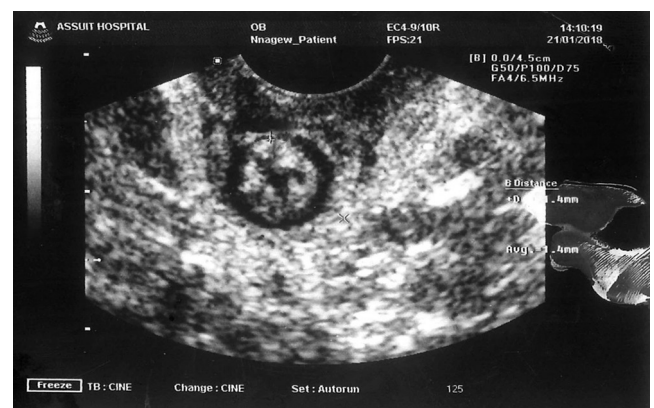
The low rate of OASIS in our study and previous studies could be explained by avoidance of midline episiotomy and almost extinct use of forceps. It can also be explained by proper technique of perineal protection

Figure 2



Intact sphincter with a combined thickness of 2.8 mm and an intact mucosal star sign.

Figure 4



Thinning of combined thickness at 12 o'clock position of the sphincter was 1.2 mm.

at the time of delivery of the head and low-risk cases who participated in the study [16].

For the second objective, a control group of primiparous women who delivered by CS were recruited to compare the US findings with the US findings of those who delivered vaginally with the same inclusion and exclusion criteria.

Measurement of the combined thickness of external and internal anal sphincters showed a statistically significant difference between cases who delivered vaginally and those who delivered by CS. No patients among those who delivered by CS were found to have loss of continuity of either the internal or external anal sphincter. However, in those who delivered vaginally, three cases had disruption of the anal mucosal folds, and 12 patients had thin anal sphincter complex that was less than 1.7 mm.

A study that examined the sphincter thickness 6 months after delivery using translabial US enrolled

433 women comparing those who delivered vaginally and those who delivered by CS; only IAS measurements at the proximal and distal 12 o'clock position were significantly thicker for CS patients, but there were no significant differences in measurements between primiparous patients who had vaginal delivery or CS and sphincter thinning or asymmetry, particularly at the 12 o'clock position [17].

The clinical significance of a thinner muscle is still unclear, as some studies showed that the sphincter measurements may not relate to incontinence and that the anterior EAS may be naturally shorter than the remainder of the muscle in the absence of any injury [17].

The reported prevalence of occult OASIS varies widely, ranging from 0.1 to 19% among different populations, depending on parity, type of episiotomy used, rates of operative vaginal delivery, and misdiagnosis [18].

While our study showed a low incidence of occult OASIS (2.4%), there are other studies showing a higher incidence using EA US for detection. One study reported that 28% (42 of 150) of nulliparous women who delivered vaginally and had no anal sphincter tears (third-degree or fourth-degree perineal tears) diagnosed clinically were shown by anal endosonography to have occult tears [19].

Other studies using TPUS also reported higher incidence than that detected by us, with a figure of 11.5% [20].

The low rate of occult OASIS in our study could be explained by the small sample size, involvement of low-risk cases, avoidance of instrumental vaginal delivery, and liberal use of mediolateral episiotomy.

## Conclusions

The study showed a low incidence of both overt and occult OASIS among primiparous women who delivered vaginally, and TPUS is a technique that is both simple and feasible to diagnose occult OASIS.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## References

- Madoff RD, Williams JG, Caushaj PF. Current concepts (fecal incontinence). *N Engl J Med* 1992; 326:1002–1007.
- Fornell E, Matthiesen L, Sjødahl R, Berg G. Obstetric anal sphincter injury ten years after: subjective and objective long term effects. *BJOG* 2005; 112:312–316.
- Fernando RJ, Sultan AH, Radley S, Jones PW, Johanson RB. Management of obstetric anal sphincter injury: a systematic review and national practice survey. *BMC Health Serv Res* 2002; 2:9.
- AL Dakhi LO, Al Shehri EH, Qureshi VF, Al Obaid A, Al-Badr A. Prevalence and risk factors of severe perineal injuries during childbirth in Saudi Arabia. *Kuwait Med J* 2015; 47:325–329.
- Bliss DZ, Mellgren A, Whitehead WE, Chiarioni G, Emmanuel A, Santoro GA, *et al.* Assessment and conservative management of faecal incontinence and quality of life in adults. In: Abrams P, Cardozo L, Khoury S, Wein A, eds. *In 5<sup>th</sup> international consultation on incontinence, Chapter 16*. Paris: ICDU-EAU; 2013; 443–1486.
- Haylen BT, de Ridder D, Freeman RM, Swift SE, Berghmans B, Lee J, *et al.* An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. *Int Urogynecol J* 2010; 21:5–26.
- Yagel S, Valsky DV, Hamani Y. *Evaluating obstetric tears to the anal sphincter by transperineal 3D ultrasound (abstract)*. Stockholm, Sweden: ISUOG; 2004.
- Timor-Tritsch IE, Monteagudo A, Smilen SW, Porges RF, Avizova E. Simple ultrasound evaluation of the anal sphincter in female patients using a transvaginal transducer. *Ultrasound Obstet Gynecol* 2005; 25:177–183.
- Peterson TV, Karp DR, Aguilar VC, Davila GW. Validation of a global pelvic floor symptom bother questionnaire. *Int Urogynecol J* 2010; 21:1129–1135.
- Royal College of Obstetricians and Gynaecologists. *Management of third and fourth degree tears*. London: RCOG; 2007.
- Baghestan E, Bordahl PE, Rasmussen SA, Sande AK, Lyslo I, Solvang I. A validation of the diagnosis of obstetric sphincter tears in two Norwegian databases, the Medical Birth Registry and the Patient Administration System. *Acta Obstet Gynecol Scand* 2007; 86:205–209.
- Ekeus C, Nilsson E, Gottvall K. Increasing incidence of anal sphincter tears among primiparas in Sweden: a population-based register study. *Acta Obstet Gynecol Scand* 2008; 87:564–573.
- Sheiner E, Levy A, Walfisch A, Hallak M, Mazor M. Third degree perineal tears in a university medical center where midline episiotomies are not performed. *Arch Gynecol Obstet* 2005; 271:307–310.
- Zafran N, Salim R. Impact of liberal use of mediolateral episiotomy on the incidence of obstetric anal sphincter tear. *Arch Gynecol Obstet* 2012; 286:591.
- Melamed N, Gavish O, Eisner M, Wiznitzer A, Wasserberg N, Yogev Y. Third- and fourth-degree perineal tears--incidence and risk factors. *J Matern Fetal Neonatal Med* 2013; 26:660.
- Ginath S, Mizrahi Y, Bar J, Condrea A, Kovo M. Obstetric anal sphincter injuries (OASIs) in Israel: a review of the incidence and risk factors. *Rambam Maimonides Med J* 2017; 8:e0018.
- Meriwether KV, Hall RJ, Leeman LM, Migliaccio L, Qualls C, Rogers RG. The relationship of 3-D translabial ultrasound anal sphincter complex measurements to postpartum anal and fecal incontinence. *Int Urogynecol J* 2015; 26:1191–1199.
- Krissi H, Aviram A, Hiersch L, Ashwal E, Eitan R, Peled Y. Structured hands-on workshop decreases the over-detection rate of obstetrical anal sphincter injuries. *Int J Colorectal Dis* 2016; 31:45–50.
- Faltin D, Boulvain M, Irion O, Bretones S, Stan C, Weil A. Diagnosis of anal sphincter tears by postpartum endosonography to predict fecal incontinence. *Obstet Gynecol* 2000; 95:643–647.
- Ozyurt S, Aksoy H, Gedikbasi A, Yildirim G, Aksoy U, Acmaz G, *et al.* Screening occult anal sphincter injuries in primigravid women after vaginal delivery with transperineal use of vaginal probe: a prospective, randomized controlled trial. *Arch Gynecol Obstet* 2015; 292:853–859.