



Obstetric anal sphincter injuries (OASIS) and secondary repair (overlapping sphincteroplasty) in a colorectal unit: case series

Abdel Latif Khalifa Elnaïm, MBBS, Doc. Surg. Malaysia (UKM), CRS Fellowship-Malaysia (UKM), MRCSEdin., FACS^{a,*}, Michael Pak Kai Wong, MBChB, M. Med Surgery (USM), CRS Fellowship-Malaysia^b, Ismail Sagap, MBBCH (Ireland), FRCS (Edin), Ms. Gen. Surg (UKM), CRS Fellowship (Cleveland)^c

Background: Obstetric anal sphincter injuries (OASIS) represent a significant complication of childbirth, with global variation in incidence. Although overlapping sphincteroplasty is widely regarded as the gold-standard surgical treatment, managing delayed or inadequately repaired cases remains challenging. Prevention through improved obstetric practices and early recognition of injuries is considered the optimal approach to minimizing the burden of OASIS.

Objectives: This case series aimed to evaluate the clinical outcomes of overlapping sphincteroplasty in patients presenting with delayed or missed OASIS.

Methods: The study included 12 female patients treated at a single institution over 4 years. All participants had a history of instrumental delivery and episiotomy, with symptoms of incontinence. Preoperative and postoperative assessments were performed using the Wexner scoring system. Overlapping sphincteroplasty was performed in all cases. Follow-up was conducted at 3 months, 6 months, 1 year, and 2 years to evaluate symptomatic improvement and patient satisfaction.

Results: The mean age of the participants was 38 years (range: 26–53 years). All patients experienced symptomatic improvement following surgery, with significant reductions in the Wexner scores and high patient satisfaction rates. The mean duration of symptoms before surgery was 14 months (3–36 months). Complications included a 25% rate of superficial wound breakdown and one case of deep wound breakdown requiring secondary repair. Despite this, no incontinence symptoms were reported at the 2-year follow-up.

Conclusions: Delayed overlapping sphincteroplasty is an effective surgical approach for treating missed or inadequately repaired OASIS, offering satisfactory outcomes. However, prevention through improved obstetric practices remains an optimal strategy.

Keywords: incontinence, OASIS, outcome, sphincteroplasty

Introduction

Obstetric anal sphincter injuries (OASIS) represent a significant challenge in maternal health, with global incidence rates varying widely due to differences in obstetric practices, healthcare resources, and awareness. Reported rates range from approximately 1% in Nordic countries to 30% in certain African regions, with an average worldwide incidence of 11%^[1,2]. These injuries can lead to devastating physical and psychological

HIGHLIGHTS

- Key findings: Delayed overlapping sphincteroplasty improves continence and provides symptom relief despite late presentation of missed obstetric anal sphincter injuries (OASIS).
- Strengths points: Includes Wexner scores, a 2-year follow-up, and standardized assessments for a robust evaluation.
- Study clinical relevance: Highlights the importance of early diagnosis, multidisciplinary care, and advanced surgical techniques for managing OASIS.

^aDepartment of Surgery, Kassala Police Hospital, Kassala, Sudan, ^bSunway Medical Center, Kuala Lumpur, Malaysia and ^cDepartment of Surgery, Hospital Canceled Tuanku Muhriz-UKM, Kuala Lumpur, Malaysia

Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

*Corresponding author. Address: Department of Surgery, Kassala Police Hospital, Kassala, Sudan. E-mail: almerfaby@gmail.com (A.L.K. Elnaïm).

Copyright © 2025 The Author(s). Published by Wolters Kluwer Health, Inc. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

Annals of Medicine & Surgery (2025) 87:2555–2561

Received 19 December 2024; Accepted 24 March 2025

Published online 4 April 2025

<https://dx.doi.org/10.1097/MS9.0000000000003253>

consequences, including fecal incontinence, which may affect up to 61% of women post-repair, depending on factors such as injury severity, maternal age, and delivery mode^[3].

While preventive measures such as perineal support and standardized obstetric training have shown promise in reducing OASIS rates, the management of these injuries requires a nuanced, multidisciplinary approach. Obstetricians typically emphasize immediate recognition and repair, whereas colorectal surgeons may focus on delayed or secondary interventions, particularly for patients with unresolved symptoms or missed diagnoses.

Surgical techniques, such as overlapping sphincteroplasty, have remained the gold standard for OASIS repair since their

Table 1
The clinical data of the study cohort

No	Age/Y	Referral source	Flatus incontinence	Fecal incontinence	Urine incontinence	Pelvic pain	Duration of symptoms/M	Postoperative complication
1	26	Gynecology	✓	✗	✗	✓	12	None
2	29	Surgical	✓	✓	✗	✗	6	Superficial breakdown
3	33	Gynecology	✓	✓	✗	✗	36	Deep breakdown
4	38	Surgical	✓	✓	✓	✗	24	None
5	39	Gynecology	✓	✓	✗	✓	18	None
6	42	Gynecology	✓	✗	✗	✓	9	None
7	45	Surgical	✓	✓	✓	✗	15	Superficial breakdown
8	58	Gynecology	✓	✓	✗	✓	20	None
9	50	Gynecology	✓	✓	✓	✗	8	None
10	51	Gynecology	✓	✓	✗	✗	5	Superficial breakdown
11	52	Surgical	✓	✗	✗	✓	3	None
12	53	Gynecology	✓	✗	✗	✗	12	None

introduction by Parks and McPartlin in 1971^[4]. Although this approach yields satisfactory short-term outcomes, debates persist regarding its long-term efficacy, optimal repair timing, and management of internal sphincter defects^[5]. Nonsurgical interventions, such as pelvic floor exercises, biofeedback, and emerging therapies, are vital in symptom improvement^[6]. The Wexner score, which is known as the Cleveland Clinic Incontinence Score, is widely used for assessing the severity of fecal incontinence. It assesses the frequency of incontinence to gas, liquid, and solid stool, as well as lifestyle alterations or the need for diapers due to incontinence. Each factor has a scale from 0 to 4, with higher scores indicating severe incontinence^[7].

Primary repair of the injured sphincter involves immediate surgical correction at the time of delivery upon early diagnosis. Factors affecting the success of the primary repairs, such as infection or wound dehiscence, necessitate a secondary repair. Traditionally, the secondary repair is performed after a few months to allow complete healing, but recent evidence advises for 2–3 weeks after the injury to avoid the complication of late repair^[8,9]. Table 2 shows the incidence of incontinence in previous studies and comparison of primary and secondary repair.

This case series aimed to evaluate the clinical outcomes of overlapping sphincteroplasty in patients presenting with delayed or missed OASIS. We presented a comprehensive overview of OASIS management and reporting outcomes of delayed overlapping sphincteroplasty in patients with unresolved symptoms.

Methods

This case series included all symptomatic patients with OASIS treated at our hospital, either from the surgical clinic or referred from obstetric departments between June 2016 and June 2020. Patients who refused to participate or refused the procedure were excluded from the study. The study was approved by our institute's Ethics and Research Committee (Approval code: sp/01/06/2016/1) and was conducted per the principles of the Updated Helsinki Declaration of 2013. All participants provided informed consent for participation and publication, and the patients' data were anonymized to ensure confidentiality. All 12 patients underwent overlapping sphincteroplasty as described in the procedure section, and an expert colorectal surgeon did all the procedures. Follow-up was scheduled for 2 weeks, 1 month, 3 months, 6 months, 1 year, and 2 years. During follow-up visits, the patient is asked about new complaints, bowel habits, chronic pain presence, and clinical continence status assessment. Reinforcement of pelvic physiotherapy and dietary guidance is a crucial part of the clinic visits, in addition to patients' education and support. Clinical examination included inspection for wound healing, detection of any local complications, assessment of anal tone, and performing a rectal digital examination. According to the assessment, a patient may undergo further evaluation by investigation or be planned for additional procedures whenever indicated. This case series has been reported in line with the PROCESS guidelines 2020^[10].

Table 2
The incidence of OASIS, incidence of incontinence after primary, and delayed repair in different studies

Incidence of OASIS	Incontinence after primary repair	Incontinence after delayed repair
1.5%-Sogaard <i>et al</i> , 2023	15.3%-Zimmo <i>et al</i> , 2021	33%-Garcia-Armengol <i>et al</i> , 2022
1.3%-Wang <i>et al</i> , 2023	19%-Laine <i>et al</i> , 2019	29%-Ong and Phan, 2022
1.9%-Fodstad <i>et al</i> , 2022	8.7%-Kuismanen <i>et al</i> , 2018	28%-Akinci <i>et al</i> , 2022
2.5%-Ferraz <i>et al</i> , 2022	12%–24%-RCOG, 2015	27%-Spinelli <i>et al</i> , 2021
1.7%-Ulander <i>et al</i> , 2021	9%-Johannessen <i>et al</i> , 2014	34%-Berkesoglu <i>et al</i> , 2021
1.8%-Borghese <i>et al</i> , 2021	9%–16%-Roos <i>et al</i> , 2010	30%-Berg <i>et al</i> , 2019
3.2%-Manoharan <i>et al</i> , 2021	14%-Andrews <i>et al</i> , 2006	30%-Rahman <i>et al</i> , 2017
2.4%-Baumann <i>et al</i> , 2020	17%-Fitzpatrick <i>et al</i> , 2000	35%-Pescatori <i>et al</i> , 2014
1.1%-Perry <i>et al</i> , 2020	25%-Sultan <i>et al</i> , 1994	32%-Roos <i>et al</i> , 2010
2.0%-Parant <i>et al</i> , 2020	10%–20%-Engel <i>et al</i> , 1994	31%-Heyman <i>et al</i> , 2009



Figure 1. Showing different patients' preoperative pictures.

Operative procedure

The procedure was performed under spinal or general anesthesia with the patient in a lithotomy position, and the pelvis was elevated using a small pad. A transverse incision was made between the anus and vagina, with small slanting extensions upwards and downward on both sides to ease dissection and widen the operative field, aiding hemostasis and facilitating wound closure. Low-energy diathermy was used for dissection until the divided edges of the sphincter muscle were clearly defined and free to the lateral ischio-anal space, providing sufficient muscle length for tension-free overlapping. Careful dissection is crucial to avoid bleeding from the vaginal vessels or accidental perforation of the vagina or anal canal. After excising the scar edges, the two ends were overlapped to recreate the sphincter using 2/0 absorbable monofilament sutures for 3–5 mattress sutures tied from lateral to medial. The skin was closed in a Z-like fashion from the vaginal side to the anal canal, providing more space for the new sphincter and elongating the anovaginal space, using 3/0 absorbable sutures. All patients were assessed preoperatively and postoperatively for anal incontinence symptoms using the Wexner scoring scale. Figures 1–4 show the different stages of the repair.

Results

The study included 12 female patients, 25% from surgical clinics and 75% referred from gynecology clinics. The patients' age ranged from 26 to 53 years, with a mean age of 38. At the presentation, all participants had varying degrees of flatus incontinence, and 75% had fecal incontinence. Urinary

incontinence was reported in 25% of the cases. Pelvic pain was a complaint in 33% of the patients (Table 1). The duration of symptoms until presentation ranged from three to 36 months, with a mean duration of 14 months, which did not affect the outcome. All the patients had a history of instrumental delivery and episiotomy. Following overlapping sphincteroplasty, all patients showed immediate improvement and continued pelvic exercises, as reflected by their preoperative and postoperative Wexner scores. There was a 25% incidence of superficial wound breakdown (involving the skin) and one case of deep wound breakdown (involving the repaired sphincter muscles) requiring secondary repair. Follow-up was conducted at 3 months, 6 months, 1 year, and 2 years, with all patients reporting satisfaction and no incontinence symptoms. All patients were counseled not to have a vaginal delivery in subsequent pregnancies.

Discussion

The management of OASIS encompasses a range of surgical and nonsurgical options. Surgical techniques, such as overlapping sphincteroplasty, direct apposition, graciloplasty, and total pelvic floor repair, aim to restore the integrity and function of the anal sphincter. Nonsurgical treatments, including medications, biofeedback therapy, rectal balloon therapy, pelvic exercises (e.g. Kegels), and nerve stimulation, are essential in managing symptoms^[5,11]. In this case, delayed overlapping sphincteroplasty and pelvic floor exercises demonstrated significant symptomatic improvement, even when the primary repair was missed or delayed.

Delayed presentation, defined as more than 3 months post-injury, was a common characteristic among the patients in this



Figure 2. Showing incision siting in different patients.

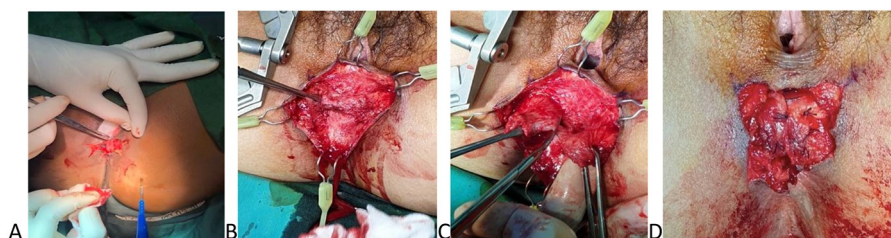


Figure 3. Showing different stages of the overlapping sphincteroplasty. (A) Making incision and deep dissection. (B) Exposing the sphincter muscle fibers. (C) Identifying and isolating the cut edges of the sphincter. (D) The repair.

study. Despite this delay, all patients exhibited significant improvement in continence, as reflected by the postoperative reduction in Wexner scores (Fig. 5). These findings are consistent with prior studies demonstrating that overlapping sphincteroplasty is an effective technique for anal sphincter repair, even in cases of delayed presentation^[12].

The cohort's mean duration of symptoms was 14 months. However, the outcomes were not significantly influenced by symptom duration, patient age, or referral source. While some studies suggest better results in younger patients undergoing early repair at experienced centers^[13], the outcomes in this study indicate that overlapping sphincteroplasty remains a viable option regardless of these variables.

The timing of repair is critical for OASIS management. Immediate repair within 12 hours of injury is widely recommended for optimal short- and long-term outcomes; however, some evidence suggests that delayed repair may yield comparable results in certain settings^[14,15]. Challenges associated with delayed repair include fibrosis and anatomical distortion, which require meticulous surgical technique and planning^[5,14].

In this series, all repairs were performed using overlapping sphincteroplasty, a technique initially described by Parks and McPartlin. This technique is known for its durability and low complication rates^[3,4,16]. The absence of neurological injury in this cohort likely contributed to the favorable outcomes, as neuropathy is a known factor in persistent incontinence despite successful repair^[17].

In the postoperative phase of our study, all patients reported immediate improvement, with sustained anal continence and satisfaction during the 2-year follow-up. Our findings align with larger studies, one of which reported a 48% rate of sustained fecal continence at 84 months postoperatively, with a patient satisfaction rate of 85%. A similar study revealed significant functional improvements, with a 93.3% patient satisfaction rate over

a 10-year follow-up. Our complication rates were comparable to those of these studies, with a 25% incidence of superficial wound breakdown (Clavien-Dindo Grade II) and one case requiring secondary repair (Clavien-Dindo Grade IIIb)^[18,19].

A major limitation of this study was the absence of preoperative imaging or anorectal physiology studies, such as endoanal ultrasound (EAUS) or manometry, to objectively confirm sphincter defects. These modalities are increasingly recommended for preoperative planning, particularly in delayed cases, and can help tailor surgical strategies by identifying the extent of sphincter defects^[7,20]. EAUS and anal manometry are critical in managing anal sphincter injuries. EAUS gives more anatomic details for the accurate detection of sphincter gaps, while anal manometry evaluates the sphincter functional integrity by measuring resting and active pressures. Both tools are recommended for their objectivity in the diagnosis and management of anal sphincter injuries^[21,22].

Similarly, no postoperative imaging or objective assessments were performed to evaluate sphincter integrity and function. Objective evidence of improvement, such as restored sphincter tone on examination or improved parameters on EAUS or manometry, would provide a more comprehensive evaluation of the surgical success. Although symptom-based measures, such as the Wexner score, are validated and widely used, integrating these tools with imaging and physiological assessments would strengthen future studies^[23].

The lack of documentation regarding the initial diagnoses of third- or fourth-degree perineal tears raises questions about whether these were missed injuries or cases of failed primary repair. Training obstetric and surgical teams to recognize and manage OASIS promptly is critical for improving early repair rates and outcomes. Collaborative protocols between obstetric and colorectal units can enhance diagnostic accuracy and timely intervention^[15,24].

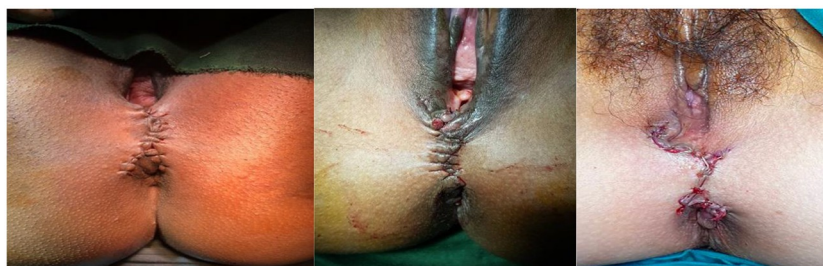


Figure 4. Showing different patients' postoperative pictures.

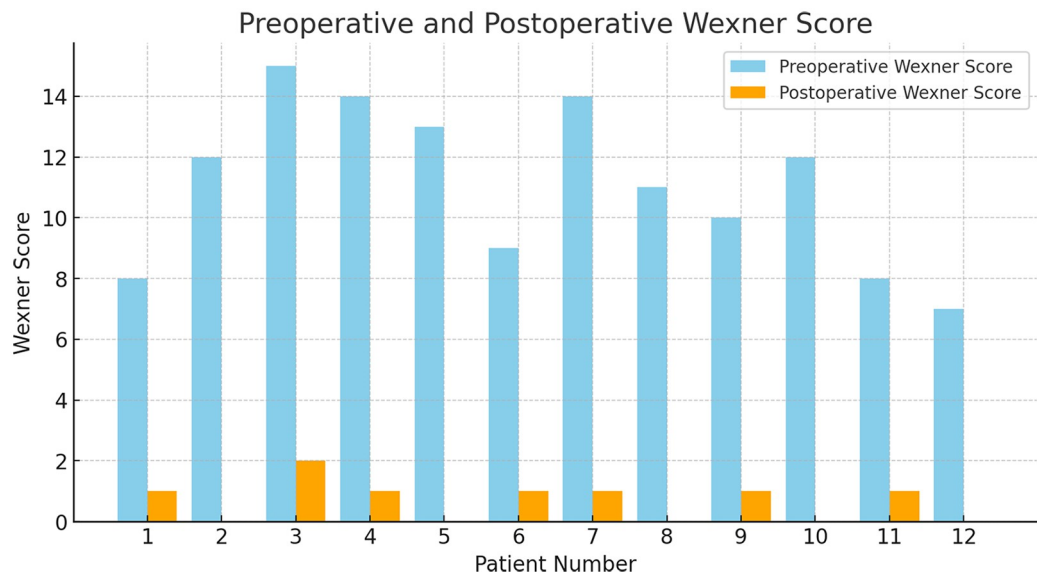


Figure 5. Shows the preoperative and postoperative Wexner’s scores.

Additionally, the retrospective design, small sample size, and reliance on patient-reported outcomes limit the generalizability of this study. Prospective studies with larger cohorts, long-term follow-up, and detailed assessments of repair techniques (e.g. separate internal and external sphincter repair) are warranted to clarify their impact on outcomes^[5,6,23]. Emerging treatments such as stem cell therapy and nerve stimulation also merit exploration^[7,20,22].

This case series underscores the feasibility and clinical effectiveness of delayed overlapping sphincteroplasty in managing unresolved OASIS. Although primary repair is widely regarded as the gold standard for OASIS management, this case series demonstrates that delayed repair can serve as an effective alternative for women with missed diagnoses or inadequately managed injuries, emphasizing the critical role of prevention, early detection, and timely intervention in reducing the burden of OASIS. Achieving these goals requires a coordinated, multidisciplinary approach involving obstetricians, midwives, and colorectal surgeons^[15,25,26]. Enhanced collaboration can improve the awareness, early recognition, and management of these injuries.

Future advancements in the field should prioritize integrating validated assessment tools, such as the Wexner Incontinence Score, and incorporating objective preoperative and postoperative evaluations, including EAUS and anorectal manometry. These diagnostic measures, combined with innovative surgical techniques, such as separate repairs of the internal and external anal sphincters, may further optimize clinical outcomes and improve long-term success rates^[27].

Conclusions

This case series highlights the effectiveness of delayed overlapping sphincteroplasty for missed or inadequately repaired OASIS, achieving significant improvements in continence and patient satisfaction. Despite challenges such as fibrosis and distortion in

delayed cases, meticulous surgical techniques and systematic follow-up have yielded favorable outcomes. Prevention remains the key, emphasizing early diagnosis, timely repair, and multidisciplinary collaboration. Future studies should integrate advanced diagnostics, assess long-term outcomes, and explore alternative techniques to optimize care.

Strengths of the study

- 1. Standardized assessment tools: The study consistently employed the Wexner scoring system for preoperative and postoperative evaluations, ensuring reliable monitoring of symptom improvement.
- 2. Systematic follow-up: Patients were monitored regularly (3 months, 6 months, 1 year, and 2 years), enabling robust short- to medium-term outcome assessment.
- 3. Single-surgical approach: The use of overlapping sphincteroplasty as the sole technique allowed for a focused evaluation of its efficacy in delayed cases.
- 4. Practical clinical relevance: The findings demonstrate the potential of delayed sphincteroplasty to achieve symptom resolution, offering hope to patients with missed or inadequate primary repairs.

Limitations of the study

- 1. Single-center design: The findings are based on the experience of one institution, which limits their generalizability. A multicenter study would provide broader insights.
- 2. Limited sample size: The small cohort reduces the statistical power and restricts subgroup analyses.
- 3. Short study period: A longer recruitment period could allow for a larger sample size and better representation of delayed cases.
- 4. Lack of objective diagnostic tools: The absence of baseline and follow-up EAUS or anorectal manometry limits the

ability to assess sphincter integrity and repair success objectively.

5. Medium-term follow-up: The study's follow-up period of up to 2 years provides insights into medium-term outcomes, but a longer follow-up is needed to evaluate the durability of the repair.
6. Hospital resource constraints: The lack of access to advanced diagnostic and assessment tools highlights a gap that may influence the comprehensiveness of evaluations.
7. Lack of standard assessment of quality of life for the patients who participated in the study.

Ethical approval

The Ethics and Research Committee obtained ethical approval, and all patients gave consent to participate.

Consent

All patients gave consent for publication.

Sources of funding

The authors receive no funding for this study.

Author's contribution

A.L.K.E. contributed to the study proposal, patient care, data analysis, and drafting of the manuscript and the final editing. M.P.K.W. participated in the literature review and editing of the manuscript. I.S. contributed to the final approval and editing of the manuscript. All the authors have read and approved the manuscript.

Conflicts of interest disclosure

The authors declare no potential conflicts of interest regarding this article's authorship and/or publication.

Research registration unique identifying number (UIN)

Not applicable.

Guarantor

All the authors take full responsibility.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Data availability statement

Data are provided within the manuscript's text.

Acknowledgments

Not applicable.

References

- [1] Kuismanen K, Nieminen K, Karjalainen K, *et al.* Outcomes of primary anal sphincter repair after obstetric injury and evaluation of a novel three-choice assessment. *Tech Coloproctol* 2018;22:209–14.
- [2] Mongardini FM, Cozzolino G, Karpasiotakis M, *et al.* Short- and long-term outcomes of sphincteroplasty for anal incontinence related to obstetric injury: a systematic review. *Updates Surg* 2023;75: 1423–30.
- [3] Akıncı O, Keklikkiran ZZ, Tosun Y. Comparison of the outcomes of overlapping and direct apposition sphincteroplasty techniques in anal sphincter repair. *Turk J Surg* 2022;38:134–39.
- [4] García-Armengol J, Martínez-Pérez C, Roig-Vila JV. Anatomic sphincteroplasty with combined reconstruction of internal and external anal muscles in the anal incontinence surgical treatment. *Cir Esp (Engl Ed)* 2022;100:580–84.
- [5] Koughnett J, Silva G. Anorectal physiology and testing. *Gastroenterol Clin North Am* 2013;42:713–28.
- [6] Walsh KA, Grivell RM. Use of endoanal ultrasound for reducing the risk of complications related to anal sphincter injury after vaginal birth. *Cochrane Database Syst Rev* 2015;2015:CD010826.
- [7] Garg P, Singh P, Kaur B, *et al.* New objective scoring system to clinically assess fecal incontinence. *World J Gastrointest Surg* 2023;15: 1423–32.
- [8] Okeahialam NA, Thakar R, Sultan AH. Early secondary repair of obstetric anal sphincter injuries (OASIs): experience and a review of the literature. *Int Urogynecol J* 2021;32:1611–22.
- [9] Barbosa M, Glavind-Kristensen M, Møller Sørensen M, *et al.* Early secondary repair of obstetric anal sphincter injury: postoperative complications, long-term functional outcomes, and impact on quality of life. *Tech Coloproctol* 2020;24:221–29.
- [10] Mathew G, Agha RA, Sohrabi C, *et al.* for the PROCESS Group. Preferred Reporting of Case Series in Surgery (PROCESS) 2023 guidelines. *Int J Surg* 2023;109:3760–3769.
- [11] Spinelli A, Laurenti V, Carrano FM, *et al.* Diagnosis and treatment of obstetric anal sphincter injuries: new evidence and perspectives. *J Clin Med* 2021;10:3261.
- [12] Mathé M, Valancogne G, Atallah A, *et al.* Early pelvic floor muscle training after obstetrical anal sphincter injuries for the reduction of anal incontinence. *Eur J Obstet Gynecol Reprod Biol* 2016;199: 201–06.
- [13] Berkesoglu M, Colak T, Turkmenoglu MO, *et al.* Long-term results from modified sphincteroplasty in patients with traumatic sphincter injury: a retrospective study. *Sao Paulo Med J* 2021;139:58–64.
- [14] Lakmal K, Basnayake O, Jayarajah U, *et al.* Short- and long-term outcomes of overlapping sphincter repair for fecal incontinence following sphincter repair. *J Coloproctol (Rio J)* 2021;41:30–36.
- [15] Galandiuk S, Roth LA, Greene QJ. Anal incontinence—sphincter ani repair: indications, techniques, outcome. *Langenbecks Arch Surg* 2009;394:425–33.
- [16] Barbosa M, Glavind-Kristensen M, Møller Soerensen M, *et al.* Secondary sphincter repair for anal incontinence following obstetric sphincter injury: functional outcome and quality of life at 18 years of follow-up. *Colorectal Dis* 2020;22:71–79.
- [17] Berg MR, Gregussen H, Sahlin Y. Long-term outcome of sphincteroplasty with separate suturing of the internal and the external anal sphincter. *Tech Coloproctol* 2019;23:1163–72.
- [18] Lamblin G, Bouvier P, Damon H, *et al.* Long-term outcome after overlapping anterior anal sphincter repair for fecal incontinence. *Int J Colorectal Dis* 2014;29:1377–83.
- [19] Matzel KE, Bittorf B, Günther K, *et al.* Long-term functional outcome after overlapping sphincteroplasty for anal incontinence: is there a chance for cure? *J Clin Med* 2022;11:3755.
- [20] Cerdán Santacruz C, Cerdán Santacruz DM, Milla Collado L, *et al.* Multimodal management of fecal incontinence focused on sphincteroplasty: long-term outcomes from a single center case series. *J Clin Med* 2022;11:3755.

- [21] Huber M, Larsson C, Harrysson M, *et al.* Use of endoanal ultrasound in detecting obstetric anal sphincter injury immediately after birth. *Acta Obstet Gynecol Scand* 2023;102:389–95.
- [22] Sultan AH. Imaging: the role of endoanal ultrasound in the management of women with obstetric anal sphincter injuries. *Int Urogynecol Assoc*; 2022. Available from: <https://www.iuga.org>.
- [23] Simone F, Katie P. Surgical management of fecal incontinence: a historical perspective. *J Gynecol Surg* 2023;39:142–46.
- [24] Hehir MP, O'Connor HD, Higgins S, *et al.* Obstetric anal sphincter injury, risk factors and method of delivery—an 8-year analysis across two tertiary referral centers. *J Matern Fetal Neonatal Med* 2013;26: 1514–16.
- [25] Kersting S, Berg E. Anal sphincter repair zur therapie der stuhlinkontinenz - wann und wie? [Anal sphincter repair in the treatment of anal incontinence - when and how to do it?]. *Zentralbl Chir* 2012;137: 328–34.
- [26] Harvey M-A, Pierce M, Walter J-E, *et al.* Obstetrical Anal Sphincter Injuries (OASIS): prevention, recognition, and repair. *J Obstet Gynaecol Can* 2015;37:1131–1148.
- [27] Jabbar SAA, Camilleri-Brennan J. An evaluation of the long-term effectiveness of Gatekeeper™ intersphincteric implants for passive faecal incontinence. *Tech Coloproctol* 2022;26:537–43. Erratum in: *Tech Coloproctol*. 2022 Sep;26(9):767.