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Early or delayed? Timing of surgical reintervention in obstetric anal sphincter injuries: a systematic review

Surahman Hakim,[1,2] Valencia Hadinata,[1,2] Adib Kamil Putra Kadarusman[2]

[1]Urogynecology Division, Department of Obstetrics and Gynaecology, Dr. Cipto Mangunkusumo National General Hospital, Jakarta; [2]Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia

Abstract

This study aims to compare the outcomes of early and delayed surgical reintervention (secondary repair) for obstetric anal sphincter injuries (OASIS), focusing on surgical outcomes and quality of life, and to determine the optimal timing for reintervention. Articles were searched from four databases using formulated keywords. The selection process was conducted by applying predetermined inclusion and exclusion criteria. Data extraction focused on the outcomes and quality of life that were observed following the timing of repair. A total of 9 studies met the inclusion criteria, with sample sizes ranging from 50 to 500 participants, comparing early surgical intervention (within 14 days) with delayed intervention (3-4 months after primary repair) for OASIS repair. Early reintervention demonstrated significantly better outcomes, with a primary healing rate of 85% compared to 70% in delayed cases, and lower complication rates (15% *vs.* 25%), including fewer instances of infection, pain, and reoperation needs. Continence outcomes improved in both groups, but early intervention showed a slight advantage, with 90% of patients reporting better continence compared to 75% in the delayed group. Additionally, patient satisfaction was notably higher in the early intervention group, with reports of quicker recovery and enhanced quality of life post-repair. Early intervention generally yields superior outcomes with better healing, fewer complications, and improved continence, while delayed repair may still be beneficial in selected cases due to enhanced tissue revascularization after a healing period. Ultimately, surgical timing should be guided by objective measures such as the Wexner score to individualize management and optimize quality of life.

Key words: obstetric labor complications, perineum injuries, anal sphincter surgery, fecal incontinence surgery, quality of life.

Correspondence: Surahman Hakim, Urogynecology Division, Department of Obstetrics and Gynaecology, Dr. Cipto Mangunkusumo National General Hospital, Faculty of Medicine, Universitas Indonesia, Pangeran Diponegoro St No.71, Central Jakarta, Indonesia.
Tel.: +62 82112643676. E-mail: surahmanhakim22@gmail.com

Introduction

Obstetric anal sphincter injuries (OASIS) are defined as a third- and fourth-degree perineal injury that occurs during vaginal delivery, representing one of the most common complications associated with childbirth, with a global incidence ranging from 0.1% to 5%. In Asia, the incidence is notably higher, ranging from 10% to 34%. Every case of OASIS requires surgical repair.[1,2] Complications following primary repair occur in approximately 7% of cases, including wound infection, dehiscence, and the need for reoperation. Globally, 2.6% of women who undergo primary repair require secondary repair due to wound dehiscence.[3-5]

There are two main perspectives regarding the optimal timing of secondary repair: early and delayed. Some experts advocate for early repair, performed within 14 days postpartum, aiming to restore functionality and improve recovery outcomes as soon as possible. On the other hand, a delayed approach, typically performed 3-6 months postpartum, is believed to allow for better vascularization and reduced inflammation, thereby minimizing the risks of infection, fistula formation, and abscesses.[3-5] Both approaches have their own advantages and concerns, and the optimal timing for surgical reintervention of OASIS remains uncertain due to insufficient evidence.

This study aims to compare the outcomes of early and delayed surgical reintervention for OASIS, focusing on surgical success and quality-of-life outcomes. The goal is to address gaps in current clinical practices and provide evidence-based recommendations for determining the optimal timing for reintervention, ultimately improving patients' recovery and quality of life.

Materials and Methods

A systematic article search was done using three search engines (PubMed, ProQuest, and Wiley) and a specific keyword "((Obstetric Anal Sphincter Injury) OR (OASIS) OR (Perineal tear) OR (Anal Sphincter tear)) AND ((Secondary Repair) OR (Surgical Reintervention) OR (Early Repair) OR (Delayed Repair) OR (Timing of surgery)) AND ((Outcomes) OR (Quality of life) OR (Patient satisfaction) OR (Complications) OR (Reoperation rate))" on PubMed, "("Obstetric Anal Sphincter Injury" OR "OASIS" OR "Perineal tear" OR "Anal Sphincter tear") AND ("Secondary Repair" OR "Surgical Reintervention" OR "Early

Repair" OR "Delayed Repair" OR "Timing of surgery") AND ("Outcomes" OR "Quality of life" OR "Patient satisfaction" OR "Complications" OR "Reoperation rate") on ProQuest, and ("Obstetric Anal Sphincter Injury" OR "OASIS" OR "Perineal tear" OR "Anal Sphincter tear") AND ("Secondary Repair" OR "Surgical Reintervention" OR "Early Repair" OR "Delayed Repair" OR "Timing of surgery") AND ("Outcomes" OR "Quality of life" OR "Patient satisfaction" OR "Complications" OR "Reoperation rate") on Wiley. Selection was made based on inclusion and exclusion criteria from the discussion of three contributors. The inclusion criteria are studies involving patients with OASIS (grade 3 and 4 perineal tears) who had undergone both primary and secondary repairs, studies reporting outcomes such as quality of life, complication rates, continence status, and wound dehiscence rates. Exclusion criteria included articles not written in English and those where the full-text was unavailable. Titles and abstracts retrieved using the specified keywords were screened independently by three authors, with any disagreements resolved by the lead author. The final selection of studies was made after a thorough review of the full-text. Extracted data focused on outcomes of the repair, assessed both subjectively and objectively. Figure 1 shows the flowchart of article search.

Results

From three databases, 418 articles were retrieved. A total of 250 duplicates were removed, and 30 articles were excluded due to publication year issues. A total of 138 titles and abstracts were screened. Among these, 28 reports were not found, leaving 110 articles assessed for eligibility. A total of 20 articles were excluded because they were not written in English, and 80 articles were excluded because the full text was not available. Finally, nine articles met the inclusion criteria. A flowchart of the article selection process can be seen in Figure 1.

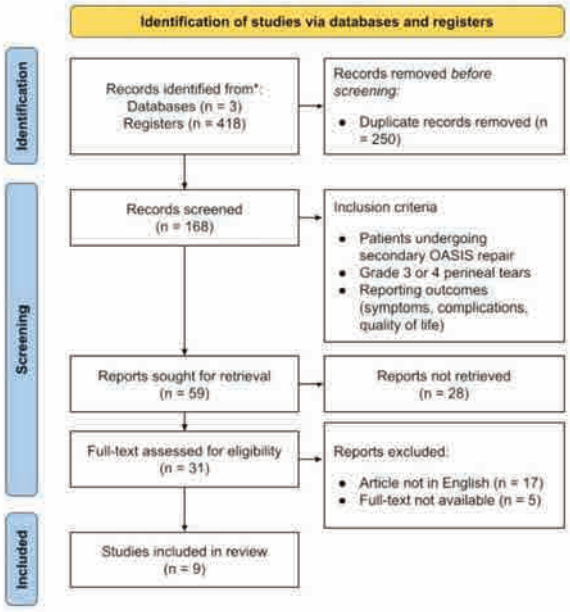

Figure 1. Flowchart of the article search. OASIS, obstetric anal sphincter injuries.

Table 1 shows the nine included studies, which exhibited diversity in study design, population size, grading of perineal tears, timing of repair, and reported outcomes. The study designs included case series (*e.g.*, Arona *et al*., 1995; Okeahialam *et al*., 2021), cohort studies (Barbosa *et al*., 2019, 2020; Ganapathy *et al*., 2008), systematic reviews (Dudding *et al*., 2008; Dudley *et al*., 2013), and case reports (Ong *et al.*, 2022; Weledji *et al*., 2014). The population size ranged from individual case reports (Ong *et al*., 2022; Weledji *et al*., 2014) to larger systematic reviews (*e.g*., 714 patients in Dudding *et al*., 2008) and cohort studies (370 patients in Barbosa *et al*., 2019). Most studies included third- and fourth-degree perineal tears, though some also included second-degree tears (Dudley *et al.*, 2013), with some studies specifying outcomes for OASIS without detailing the exact grading. Timing of secondary repair was a critical differentiator. Early repairs, typically performed within 14-21 days postpartum, were examined in studies such as Arona *et al*. (1995), Barbosa *et al*. (2020), and Okeahialam *et al*. (2021), with Dudley *et al*. (2013) including repairs performed within 6 weeks. Delayed repairs, defined as occurring at least 3 months postpartum, were assessed in studies like Barbosa *et al*. (2019), Dudding *et al*. (2008), and case reports with longer delays, such as Weledji *et al*. (2014), where repair was performed more than 2 years postpartum. Outcomes varied between early and delayed repairs. Early repairs generally demonstrated higher healing rates and better functional outcomes. Arona *et al.* (1995) reported a 100% intact repair rate at 3 months, with minimal complications such as superficial separations that healed spontaneously. Barbosa *et al*. (2020) reported favorable Wexner and St. Mark's scores (mean Wexner score 5.2±4.7), though 37% experienced complications, including fistulas. Similarly, Okeahialam *et al*. (2021) noted that 83% of patients achieved normal squeeze pressures, though residual internal anal sphincter (IAS) defects persisted in some cases. Delayed repairs, while initially showing improvements in continence and functional outcomes, were associated with long-term deterioration. Dudding *et al.* (2008) reported that only 20% of patients maintained continence at 10 years, with outcomes linked to squeeze increment restoration. Barbosa *et al.* (2019) highlighted high rates of flatus (97%) and liquid stool incontinence (75%) in delayed repairs, with significant impacts on quality of life for patients with higher Wexner scores (≥9). Case reports like those by Ong *et al.* (2022) and Weledji *et al.* (2014) demonstrated individual successes with delayed repairs, including good short-term results, but emphasized the need for long-term follow-up. Figure 2 shows the risk of bias assessment utilizing the robvis tool. Overall, the risk of bias in D1 was gener-

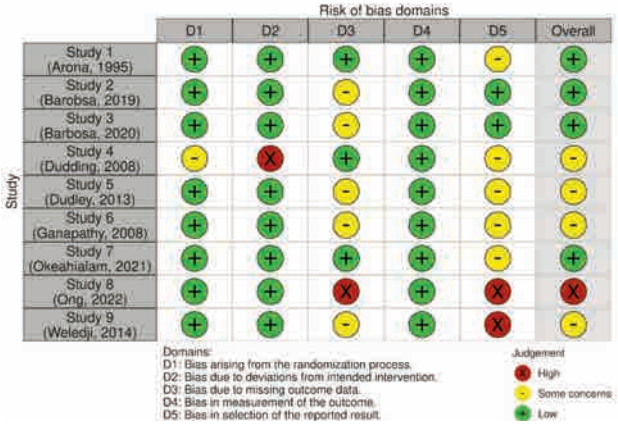

Figure 2. Flowchart of the article search. OASIS, obstetric anal sphincter injuries.

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Table 1. Summary of outcomes.

Author, year	Study design	Study population	Grade	Early or delayed secondary repair	Outcomes
Arona *et al.*, 1995	Case series	23	Third (21) and fourth degree (3)	Early secondary repair 4-10 days (mean 7 days) after outpatient debridement and wound preparation	3-month follow up: - 100% repair intact - 5 cases of superficial perineal separation, healed spontaneously - 1 rectal-perineal fistula resolved without surgery - minimal dyspareunia reported by 1 of 15 sexually active patients - minimal dyschezia reported by 2 of 17 patients
Barbosa *et al.*, 2019	Prospective cohort	370 (at 2010 follow-up), 255 (at 2018 follow-up)	Third and fourth degree (not specified)	Delayed secondary repair (≥3 months postpartum)	At 18.3 (IQR 15.0-22.0) years of follow-up: - mean (SD) Wexner score was 8.8±4.8 - mean (SD) St. Mark's score was 11.7±5.0. - symptoms reported: flatus incontinence: 97%, incontinence for liquid stools: 75%, solid stools: 54% - there were no significant changes in incontinence frequencies over time. - women with a Wexner score of ≥9 had a significantly lower quality of life score in all domains than did women with a Wexner score of <9 ($p<0.001$).
Barbosa *et al.*, 2020	Retrospective cohort	34 patients	Third and fourth degree (not specified)	Early secondary repair (within 21 days postpartum)	After a median follow-up time of 6.7 years (IQR 3.3-16.6): - mean (SD) Wexner score was 5.2±4.7 - mean (SD) St. Mark's score was 6.8±5.7. - women with a Wexner score ≥9 had a significantly lower quality of life score in all domains of the FIQLS compared to women with a Wexner score <9 ($p<0.001$). - complications: 37%. (10 fistulas; 9 required surgery)
Dudding *et al.*, 2008	Systematic review	714 patients from included studies	OASIS (third and fourth degree not specified)	Delayed secondary repair (≥3 months postpartum)	- Improved functional outcomes initially (increases the mean resting pressure, mean squeeze increment, and anal canal length) - Long-term continence deteriorates (20% continent to stool at 10 year follow-up) ($r^2=0.71$; $p=0.0024$). - Success linked to squeeze increment restoration, deterioration is greatest in those who do not achieve full continence to liquid or solid stool at early follow-up - Although satisfactory in the short term, results deteriorate in the medium and long term.
Dudley *et al.*, 2013	Systematic review	52 patients from 2 included studies	Second, third, and fourth degree	Early secondary repair (within the first 6 weeks following childbirth)	Early secondary repair vs. primary repair only - risk ratio (M-H, fixed, 95% CI). - Wound healing within 4 weeks (17 participants): 1.69 [0.73, 3.88] - Resumed intercourse within 2 months (35 participants): 1.78 [1.10, 2.89] - Resumed intercourse by 6 months (35 participants): 1.08 [0.91, 1.28] - Dyspareunia at 2 months (26 participants): 0.44 [0.18, 1.11] - Dyspareunia at 6 months (32 participants): 0.39 [0.04, 3.87]
Ganapathy *et al.*, 2008	Retrospective cohort	103	Not specified (tear 40.8%, episiotomy 53.4%, small tear 5.8%)	Delayed repair (varied intervals postpartum; mean 233±244 days, range 22-1761 days)	8-week follow-up: - complete healing: 88.3% - healed, but with mild tenderness (2.9%) - repeat repair needed: 1% - GP follow-up in 35.9% cases
Okeahialam *et al.*, 2021	Case series	6 patients	OASIS (third and fourth degree not specified)	Early secondary repair (within the first 6 weeks following childbirth)	- Normal manometric incremental squeeze pressure was found in 5 of 6 women (83%) - EAUS showed IAS defects in 4 of 6 women (75%) with a history of IAS injury - There were no full-thickness external anal sphincter defects - Residual defects larger in the secondary repair group compared to primary repair alone (Starck score 5.7 *vs.* 2.1, $p=0.01$)
Ong *et al.*, 2022	Case report	1 patient	Third degree tear with cloaca-like defect	Delayed secondary repair (8 months postpartum)	Relatively good short-term results at the 3-week follow-up with a minor superficial wound breakdown which healed through secondary intention
Weledji *et al.*, 2014	Case report	1 patient	Chronic fourth-degree tear	Delayed (>2 years postpartum)	- Excellent immediate continence at 10th day postoperatively (2/20; sometimes incontinent flatus) - Long-term follow-up needed

FIQLS, Fecal Incontinence Quality of Life Scale; EAUS, endoanal ultrasound; IQR, interquartile range; SD, standard deviation; CI, confidence interval; GP, general practitioner; IAS, internal anal sphincter.

ally low because most studies were case series, case reports, or cohort studies, where patients were not randomized or specifically selected, but all eligible patients were included. D2 was consistent across studies, as most followed standardized protocols for secondary repair and intervention. However, concerns were more prominent in D3, particularly in studies with inadequate follow-up or significant loss to follow-up, limiting the ability to assess long-term outcomes. D4 was generally low, as most studies used objective tools like manometry, Wexner scores, or endoanal ultrasound. Persistent issues with D5, particularly the lack of comprehensive reporting on long-term outcomes like quality of life and recurrence of symptoms, highlight the need for future studies with more complete follow-up measures.

Discussion

Healing and functional outcomes

Early repair, typically performed within 14-21 days postpartum, demonstrated superior healing rates and functional outcomes. For example, Arona *et al.* (1995) reported a 100% intact repair rate at 3 months post-surgery with minimal complications, such as superficial separations that resolved spontaneously.[5] Similarly, Barbosa *et al*. (2020) found lower Wexner scores (mean 5.2±4.7) and improved quality of life in patients undergoing early repair compared to delayed procedures.[6] These findings are further supported by Okeahialam *et al.* (2021), where 83% of patients achieved normal squeeze pressures after repair.[7]

In contrast, delayed repairs, typically performed 3 months or later, showed initial functional improvements but were associated with significant long-term deterioration. Dudding *et al*. (2008) reported that although delayed repairs initially improved continence, only 20% of patients maintained continence at 10 years.[8] Similarly, Barbosa *et al*. (2019) observed high rates of incontinence (97% for flatus and 75% for liquid stools) and lower quality of life for those with severe incontinence (Wexner scores ≥9).[6] This approach is further linked to increased maternal morbidity and diminished quality of life due to ongoing issues such as persistent anal incontinence, pain, and sexual dysfunction while awaiting secondary repair.[9] These findings highlight how delayed vascularization and healing may compromise tissue integrity and long-term functional restoration. Chronic wounds are defined as those that fail to follow the normal healing process and show no signs of effective healing within 3 months after tissue injury. Evidence suggests that the window for optimal healing is within this critical period. However, the delayed repair strategy for OASIS, which is typically scheduled 3 months or more postpartum, exceeds this window, increasing the risk of chronic wound development. This delay perpetuates chronic inflammation, reducing angiogenesis and thereby impairing the formation of new blood vessels essential for tissue repair.[10] Additionally, prolonged delays can result in neurovascular degradation, leading to a loss of nerve function and diminished blood supply to the affected area, which is reflected in high incontinence rates and lower quality of life.[6]

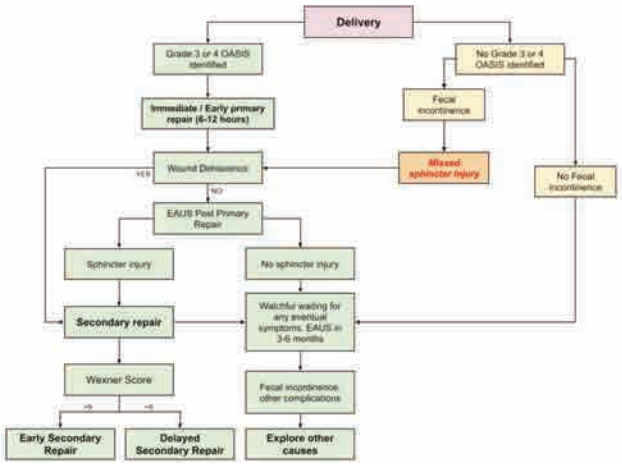

Figure 3. Primary and secondary obstetric anal sphincter injuries (OASIS) repair algorithm. EAUS, endoanal ultrasound.

Complications and quality of life

Studies such as Arona *et al.* (1995) reported minimal complications following early repair, including a 100% intact repair rate and superficial perineal separations that healed spontaneously.[5] This aligns with the principle that early intervention minimizes the risk of prolonged exposure to bacterial contamination and unresolved inflammation. By addressing the injury before chronic changes develop, early repair capitalizes on the body's initial inflammatory response, which is important for wound healing.[11] Additionally, Okeahialam *et al*. (2021) found that early repair led to a high percentage of patients (83%) achieving normal squeeze pressures.[7] The lower infection rates in early repairs are likely attributed to reduced colonization of the wound by pathogens, as the surgical environment and tissue remain relatively clean during the initial stages post-injury.[12] Furthermore, by preventing the wound from becoming chronic, early repair avoids the fibrotic changes and tissue degradation often seen in delayed cases, which increase susceptibility to complications such as fistula formation and abscesses.[6]

While delayed repair has been linked to certain short-term successes, the risk of complications and functional deterioration increases over time. Both Ong *et al.* (2022) and Weledji *et al.* (2014) reported relatively good short-term outcomes following delayed repairs. At the 10th day and 3-week follow-up, these studies noted successful healing with only minor superficial wound breakdowns.[13,14] Similarly, Ganapathy *et al*. (2008) reported high rates of complete healing (88.3%) with minimal tenderness in a cohort of patients undergoing delayed secondary repair.[15] However, these results do not represent long-term outcomes, as delayed repairs are often associated with chronic complications.

The Wexner score is a validated clinical instrument widely used to quantify the severity of fecal incontinence. The scoring system ranges from 0 to 20, where 0 indicates perfect continence and 20 represents complete incontinence, with points assigned based on the frequency of incontinence to solid, liquid, gas, need to wear pads, and lifestyle alteration. The persistence of a high Wexner score after primary repair can indicate suboptimal healing or unresolved sphincter dysfunction, suggesting a need for early secondary intervention to restore function and quality of life. Barbosa *et al.* (2019) conducted a very impactful long-term cohort study assessing outcomes in women who underwent delayed secondary sphincter repair following obstetric injury. At a median follow-up of 18.3 years, the mean Wexner score was 8.8±4.8, and most women continued to report significant symptoms of incontinence, particularly to flatus and liquid stools. Importantly, the

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study established a meaningful threshold: women with Wexner scores ≥9 reported significantly poorer quality of life across all Fecal Incontinence Quality of Life Scale domains compared to those with scores <9 ($p<0.001$). This highlights the clinical utility of the Wexner score not only as a symptom tracker but also as a predictive marker for patient well-being, allowing clinicians to identify candidates who would benefit most from early surgical reintervention or secondary repair.

Limitations

This systematic review's several limitations should be acknowledged. First, most of the included studies did not directly compare early and delayed secondary repair, instead focusing on either one approach. Consequently, the analysis was descriptive rather than analytical, limiting the ability to draw definitive conclusions about the relative efficacy of the two strategies. Second, the outcomes reported varied significantly across studies, complicating comparisons and reducing the consistency of the analysis. Additionally, the absence of randomized controlled trials (RCTs) represents a significant gap, as high-quality experimental data are important to establish causality and provide stronger evidence for clinical recommendations. Variability in follow-up durations and the lack of standardized outcome measures further highlight the need for more uniform study designs. Future research should prioritize conducting RCTs comparing early and delayed secondary repair, using standardized protocols and consistent outcome measures. Additionally, studies should explore the impact of patient-specific factors, such as comorbidities, severity of injury, and individual healing capacities, on surgical outcomes.

Recommendations

Based on current evidence and the proposed algorithm, we recommend a structured approach to managing persistent anal incontinence following primary OASIS repair. The algorithm takes clinical symptoms, endosonographic findings, and most importantly, the Wexner score, into consideration to determine the timing and necessity of surgical reintervention. Patients who continue to experience symptoms despite primary repair should first be evaluated using the Wexner score. A score of ≥9 is considered a meaningful threshold, as validated by Barbosa *et al*. (2019),[16] indicating a significant impact on quality of life. In such cases, further assessment with endoanal ultrasound is recommended to determine the integrity of the sphincter complex. If a sphincter defect is confirmed, and the patient's score remains high, early secondary repair may be considered. On the other hand, patients with Wexner scores <9 or without significant anatomical defects may benefit from conservative management or delayed intervention. Thus, we propose the following algorithm (Figure 3) for managing OASIS, modified from the previously proposed algorithm for immediate and medium-term repair of OASIS by Viannay *et al.* (2021).[17] This algorithm supports personalized, symptom-driven care while offering a logical pathway that balances the timing of intervention with patient-reported outcomes and imaging findings.

Conclusions

The timing of secondary repair in OASIS represents an important determinant of surgical and functional outcomes. Early reintervention generally demonstrates superior results, reflected in higher healing rates, lower complication risks, improved continence, and better overall patient satisfaction. Early repair takes advantage of the body's acute inflammatory and reparative phase, reducing the likelihood of chronic wound development and minimizing long-term sequelae such as persistent incontinence, dyspareunia, or pelvic floor dysfunction. Nevertheless, delayed repair should not be dismissed as unfavorable. In specific clinical scenarios, such as when patients present beyond the early window, when primary repair has already failed, or when local tissue conditions are not optimal, delayed intervention remains justified. Allowing a period of natural healing and improved revascularization may strengthen tissue integrity, lower the risk of infection, and provide a more stable surgical field. Although delayed repair has been linked to long-term deterioration in some studies, it can still achieve meaningful recovery of function and quality of life in carefully selected cases. Ultimately, the choice between early and delayed secondary repair should not be dictated solely by time elapsed since delivery but must be individualized to each patient's functional status and symptom burden. Utilizing standardized tools such as the Wexner score and ultrasound results provides an objective framework for decision-making. By stratifying patients according to continence function and quality-of-life impact, this study proposes an evidence-based algorithm to optimize the timing of secondary OASIS repair.

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