Review Article

Obstetric anal sphincter injury—the long game: primary and cumulative anal sphincter injury during childbirth and its long-term implications—a clinical practice review

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Abstract: Obstetric anal sphincter injury (OASI) can be a devasting outcome of childbirth. Women are living longer and very few studies follow women who have had an OASI into menopause, which we know has a negative effect on many bodily functions. Incidence rates of OASI are quoted at 3%. Risk factors such as primiparity, advanced maternal age, forceps delivery, prolonged second stage, perineal oedema and short perineal length have been identified. Antenatal perineal massage, manual perineal protection during the second stage and "restricted" episiotomy use have been shown to reduce the risk of OASI. Short term studies tend to quote promising recovery rates, with many women being asymptomatic at one year postpartum. There is a paucity in the literature on the long-term effects of OASI. Our aim is to outline what we know, discuss our current methods for prevention, diagnosis and treatment and to comment on the long-term data for women with OASI and recurrent OASI, the effect on quality of life and to describe the long term impact that a previous OASI has on women in respect to fecal incontinence and quality of life outcomes.

Keywords: Obstetric anal sphincter injury (OASI); faecal incontinence (FI); flatal incontinence; sphincter injury; long-term implications

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Introduction

Obstetric anal sphincter injury (OASI) has an incidence rate of 3% ranging from 3–6% in primiparous women and 0.8–1.7% in multiparous women (1,2). Damage to the anal sphincter complex can have devasting effects on quality of life due to faecal incontinence (FI), perineal pain and dyspareunia (3-6). Current UK guidelines report 60–80% of women are asymptomatic and do not report any FI/flatal incontinence, or fecal urgency at 12 months following delivery complicated by OASI (7-10) However, it must be noted that there is a cumulative, deleterious effect of subsequent vaginal deliveries on sphincter function even in the absence of another OASI (11-13). OASI prevention, diagnosis and treatment post-delivery and physician education is paramount in order to successfully manage this complex group of patients.

Perineal lacerations are grouped into four categories. A first degree tear involves superficial injury to the vaginal mucosa. A second degree tear involves injury to the skin

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and perineal body. A third degree tear involves injury to the anal sphincter complex and is further divided into three sub-categories: A <50% of the external anal sphincter (EAS) is torn, B >50% of the EAS is torn and C both the external and internal anal sphincters (IAS) are torn. Fourth degree tears involve damage to the sphincter complex and rectal mucosa. Due to the lack of injury to the anal sphincter complex, first and second degree tears rarely cause long term issues with fecal incontinence. With a rising rate of caesarean delivery worldwide, fewer women are having vaginal deliveries.

Globally, people are living longer (14) and expecting better quality of life and health. The national UK statistics office predict that by 2066, 26% of the total population will be over 65 years old and the US predict that their population of over 65 years old will almost double by 2050 (15). The median age of FI onset is 55 years, implying that age and menopause/lack of oestrogen may have compounding negative effects of previous anal sphincter injuries, the "multiple hit hypothesis" (16).

There is a paucity in the literature on the long-term effects of OASI. The aim of this article is to describe the long term impact of OASI in women with regards to flatal incontinence and FI and faecal urgency symptomatology.

Background

As our female population ages, pelvic floor disorders including urinary incontinence, FI and pelvic organ prolapse become more prevalent and more women are seeking medical advice regarding them (17). FI, which is defined as leakage of mucus, liquid or solid stool, is estimated to affect 9.4% of the adult female population (18). It has a significant negative impact on quality of life and mental health scores in women reviewed 6 month postpartum who experience ongoing FI. One in five women with FI report moderate to severe impact on quality of life (QoL) (19). FI is often under-reported due to the significant social stigma attached to such symptoms, with less than half of patients voluntarily reporting their incontinence symptoms (20).

Continence mechanism

Anal continence is a complex process involving integration of the rectum, internal and EAS complexes, the pelvic floor and the inter-related motor and sensory neural pathways (21). Continence is preserved by the EAS which maintains a high-pressure zone in the distal anal canal. With increased rectal distension, the internal anal canal relaxes. Rectal compliance allows deferral of defecation while rectal filling occurs (21). Common causes of incontinence include: direct injury to the sphincter complex, neurogenic deficits and congenital defects. During vaginal delivery (VD) women are exposed to two of these three causes (21).

FI is multifactorial. The IAS provides 75–80% of the resting anal pressure with the smooth muscle anal cushions maintaining an effective tight seal. The recto anal inhibitory reflex (RAIR) allows the IAS to relax in response to rectal distension (22). The EAS and puborectalis provides voluntary control over defecation via the pudendal nerve (23). The pudendal nerve originates from S2,3,4 nerve roots and travels through the lateral pelvic side wall to supply the EAS and the periurethral muscles through its terminal branch (24). An insult to any component can result in FI, whether this be immediate or years later (25).

Risk factors for OASI

Risk factors for OASI include: primiparity, advanced maternal age, induction of labour, augmentation of labour, prolonged second stage of labour (>2 hours), forceps delivery, increased neonatal head circumference, occiput posterior position, birth weight >4 kg and a short perineal length (<25 mm) during the first stage of labour (26-28).

Perineal oedema has been shown to be an independent risk factor for OASI (29). A study by Aiken *et al.* showed the length of the second stage of labour is associated with an increase in OASI, but only when it results in an instrumental delivery. This study reported a 6% increase in OASI risk per 15-minute increase in length of second stage before an instrument was placed. The increased risk is presumed to be due to perineal oedema (30).

Studies have shown racial differences in the risk of OASI. Differences in connective tissues collagen content is one proposed hypothesis for lower rate of perineal tears in black women compared to white women (31). A study by Handa *et al.* looking at over 2 million deliveries in California found women of Indian (OR 2.5) and Filipina descent (OR 1.5) to have a higher risk of OASI (32).

Prevention of OASI

Manual perineal protection is effective in reducing the risk of OASI in nulliparous women (29). Moderate quality evidence from a Cochrane review in 2017 suggested that

the use of a warm compress in the second stage of labour and antenatal perineal massage reduce the incidence of OASI (33). Controlled and slow delivery of the fetal head on crowning and "restricted" episiotomy (i.e., only when indicated rather than routine) have also been proven effective at reducing OASI (34). Manual perineal protection and performance of an episiotomy are not possible during waterbirth. A study by Preston *et al.* showed waterbirth to be associated with an approximately two-fold (OR 1.77) increase in OASI (35). Waterbirth was also shown to be a risk factor for OASI in a study by McPherson *et al.* (36). Birth position also affects the risk of OASI, with lower rates found in women delivering in a standing position compared to lithotomy position. A study by Elvander *et al.* showed lithotomy position was associated with the highest rate of OASI compared to all other birthing positions including sitting, lateral, knee, supine, squatting, standing and all fours (37).

The PEACHES programme was introduced in The Leeds Teaching Hospitals NHS Trust to reduce the rate of OASI and has been adopted in many centres worldwide (38). The algorithm includes: position, extra midwife present at birth, assess the perineum (throughout), communication, hands-on-technique (manual perineal protection, episiotomy if required and slowly. The Royal College of Obstetricians and Gynaecologists developed the OASI care bundle (39), which was implemented over 16 sites in 2017 and has been incorporated into labour management all over the world. The key elements of this bundle include: antenatal education on OASI and preventative measures, use of a mediolateral episiotomy where indicated, use of manual protection and examination of the perineum, including a rectal examination following VD. Standardised care bundles such as these should be part of routine practice in maternity hospitals.

Outcomes following OASI

A study by Abramowitz *et al.* (40) looking at asymptomatic EAS defects detected on endoanal ultrasound (EAUS) following a previous OASI or an occult sphincter injury following forceps delivery, randomized women to VD and delivery by caesarean section (CS) in their next pregnancy. Nine percent of the VD group had a subsequent OASI which is in keeping with the literature. At 6 months postpartum there was no difference in rates of anal incontinence, urinary incontinence, sexual function and physical and mental QoL scores in women who delivered by VD compared with those who had an elective CS. They concluded that in asymptomatic women, even with sphincter defects, advising elective CS is not indicated (40). This should be interpreted with caution as symptoms reported in the first 6–12 months post-partum may not translate into longer term outcomes. Almost two thirds of women with OASI may be asymptomatic at 6 months post-partum despite injury to the sphincter complex (41,42). This may be due to the ability to compensate via alternative continence mechanisms (25).

A study by Evans *et al.* assessed the medium term impact on symptomatology in women with a history of OASI. Thirty-eight percent were experiencing significant ongoing bowel symptoms and 64% reported sexual dysfunction when reviewed at, on average, 4 years post OASI. Within this cohort, 32% women chose an elective CS and 26% changed to private care (43). Nilsson *et al.* (11) showed compound sphincter injuries to be associated with more severe long-term consequences for bowel incontinence when assessing women 20 years after their first VD. The overall prevalence of FI in women without sphincter injury was 11.7%. This doubled to 23.8% (OR 2.27; 95% CI: 1.75–2.94) in women with 1 previous OASI and more than tripled to 36.1% (OR 3.97; 95% CI: 3.11–5.07) after 2 OASI (P<0.0001) (11).

Counselling for subsequent delivery

Due to the wide variety of reported outcomes, the evidence is conflicting as regard to the best mode of delivery post an OASI. Most women will have a subsequent VD (2,44) and patients report that the postpartum counselling received impacted their decision on mode of delivery (44). The recurrence risk of an OASI is reported to be 6.8–10% (11,45,46), up to three-fold the risk of a first VD. D'Souza *et al.* reported that positive predictors for rOASI were increased birth weight and maternal age at both index and subsequent deliveries, a more severe degree of initial OASI and Asian ethnicity (46).

The RCOG advise that if a woman with a previous OASI is symptomatic or has abnormal EAUS or anal manometry findings, that an elective CS should be considered (47). Scheer *et al.* reported that asymptomatic women with a normal EAUS and manometry who have a VD and no recurrent OASI, did not have any change in anal manometry or quality of life scores when reviewed at 13 weeks postpartum (48). However, a study by Bek *et al.* showed that 17% of women who are symptomatic post OASI will experience worsening of their symptoms post

subsequent VD (49).

The severity of tear is also an important factor in counselling. It seems that an insult to the IAS causes the most long-term damage and can lead to severe incontinence (50-52). These women have worse outcomes in terms of incontinence symptoms, manometry pressures and quality of life scores (39,51). Primary fourth degree tears have also been found to have a higher rate of recurrence than primary third degree tears 7.73% *vs.* 4.69% (26).

Evaluation of OASI

Tools at our disposal for evaluation of FI include history and physical examination, quality of life/symptom questionnaires, anorectal manometry, EAUS, transperineal ultrasound and pudendal nerve assessment (53). Objective testing plays an important role in the evaluation of FI (53) and it can lead to an alteration in diagnosis (19%) and treatment (16%) when compared to history and exam alone, particularly in complicated cases (54).

Anal manometry is a basic test of anorectal function and is widely used as an initial investigation. It provides a profile of anal pressures at rest and during voluntary squeeze and can be used for comparison after treatment (55). It can also be used to show an objective improvement in sphincter tone in women following pelvic floor physiotherapy (56).

EAUS assesses structural integrity and morphology of the anal sphincters (53). It is currently the gold standard for evaluation of OASI and most studies reveal 100% sensitivity in identifying sphincter defects (25,55,57). Transperineal ultrasound has become more common in the last two decades and has been shown to be at least as good as EAUS (Ros *et al.*, 2017). It can also be more acceptable to patients as it is less intrusive (58). EAUS is superior to MRI for assessing IAS defects, comparable for EAS defects but inferior to MRI for evaluating EAS atrophy (25,59).

Faecal and urinary incontinence post-partum may also be attributed to damage to the innervation of the pelvic floor muscles, either in isolation or in combination with direct muscular trauma (60). Pudendal nerve terminal motor latencies (PNTMLs) measure the time required after stimulating the pudendal nerve with an electrode to induce EAS contraction. Prolongation of this suggests a neuropathy (53). A study by Sultan *et al.* showed increased birthweight and a longer active second stage to be associated with significant prolongation of the PNTMLs in the absence of OASI. Nerve injury is not always symmetrical and usually affects the left side more than the right (61). Twenty percent of individuals have been found to have asymmetric innervation of the anal canal providing a possible explanation for the variation in severity of symptoms across individuals (62). The clitoral-anal reflex has been proposed as a more sensitive and clinically more accessible way of assessing both pudendal afferent sensory and efferent motor functions, providing more accurate information than PNTML (24).

Menopause and FI/QoL

The peak incidence of FI is in the fifth and sixth decade, reaffirming that OASI effects worsen with time. Cumulative effects of deliveries, the aging process, menopause and progression of neuropathy may lead to FI revealing itself many years later (25,63,64). Different rates of FI are reported across different studies, which may reflect the widely varying definitions used in studies. A study by McArthur reported 6% of women 12 years post OASI suffered with FI (65). In contrast, a study by Mous reported a 45% symptomatic anal incontinence rate 25 years post OASI (66). A Norwegian study (67) of 1,122 women who had a delivery complicated by OASI were followed up 15–23 years after delivery by postal questionnaire. Edwards reported that in later years women who experienced FI were found to express moderate to severe regret regarding their choice of mode of delivery after OASI (44). In this study 82% (41/50) opted for a repeat VD, 16% (8/50) had a planned CS and 2% (n=1) had an unplanned CS (44).

Treatment options for FI

Treatment options for managing FI focus on restoring continence and improving quality of life. However, many women have more than one continence mechanism which is compromised, thus making FI difficult to treat (68,69).

Treatment algorithms from the International Consultation on Faecal Incontinence and NICE FI management guideline advise patient education on diet, the importance of fibre, bowel habit, stool consistency and triggers, anti-diarrhoeal medications such as loperamide, pelvic floor muscle training and sphincter exercises as part of the initial management (53,70-73). A diet that promotes ideal stool consistency and predictable bowel emptying is desirable (71). Fibre has been shown as an effective intervention in the short term to increase stool bulk and reduce incontinence episodes (68,73). Medications including loperamide, hyoscyamine and amitriptyline can

help slow colonic transit time, increase resting anal tone and prevent post prandial leakage (53,74).

After these initial steps, specialised management is advised. This includes pelvic floor muscle training, bowel retraining, biofeedback, electrical stimulation and rectal irrigation.

Pelvic floor physiotherapy yields positive short-term results but its effects are not sustained and decrease over time (75). Biofeedback physiotherapy can help enhance a patient's awareness of anorectal function to improve coordination and sphincter control (70). It compliments pelvic floor exercises, increasing the number of muscle fibres innervated by existing nerves (76) and improves the ability to detect rectal filling through sensory retraining (77,78). A trial period of 8–12 weeks is suggested but in reality, improvement may take considerably longer for conservative measures to have an effect. Further investigations and surgical opinion is warranted if there is no improvement, particularly in cases of severe FI (70).

The surgical options include secondary anal sphincter repair, sacral nerve stimulation (SNS), percutaneous tibial nerve stimulation (PTNS), bulking agents, the Secca procedure, artificial anal sphincters and diverting colostomy.

There have been significant improvements in surgical treatment of FI with sphincter repair in selective patients showing short term improvements in 70–80% of patients (68,79). However, there is a paucity of data on long term follow up and success rates deteriorate with time, with success rates reported to be 20–58% at 5 years (68,79). Predictors of long-term failure include wound infection, advanced age at time of repair and duration of FI symptoms (79,80). Prolonged PNTML, indicating neuropathy, has been shown to be associated with failed sphincter repair (63,64). However this remains a controversial topic.

SNS was introduced for refractory FI in 1995 (81). The exact mechanism of action is unknown, but it has been suggested that in reduces colonic activity, increases resting pressure and changes rectal sensitivity through enhancement of cortical awareness, not a direct colonic effect (82,83). It is a staged procedure. If a 2–4-week temporary percutaneous peripheral nerve electrode yields symptom improvement of at least 50% reduction in FI episodes, then a definitive implantation of a pulse generator is undertaken (82,84). Success rates are reported to be between 70–90% (17,85,86). Others found statistically significant improvements in FI scores (87) which were maintained when followed up long term; up to 6 years (85,88,89). PTNS is a relative non-invasive, low cost option for treatment of FI which has shown to be highly effective in treating FI. It has been shown to significantly reduce the number of FI episodes, but has not been shown in the longer term to improve resting pressure, squeeze pressure and tolerable pressure (90).

Injection of a bulking agent has shown promise in short term trials for improvement in faecal leakage, however long-term data is lacking (91).

The Secca procedure has shown similar success rates with statistically significant improvement in incontinence scores at 6 months post procedure (92-94). This Secca device is introduced into the anal canal and delivers temperature-controlled radiofrequency energy to the anorectal junction, aiming to increase collagen deposition and fibrosis (93,94). However, it's efficacy reduces with time, with only 6% reporting this result clinically significant improvement at 3 years (95).

Artificial urinary sphincters were first used in 1987 (96) and since then adapted for anal incontinence use—the Acticon® Neosphincter and the more recent Magnetic anal sphincter. Patient selection is key with this option (97) and infection is the main concern. Patients must have severe FI for longer than 6 months and have failed conservative management (95). In a review 5 years post insertion of the magnetic anal sphincter 53% of the 23 patients had a device failure which meant device explanation or stoma creation. However, there were significant improvements in all 4 areas of Faecal incontinence Quality of life instrument in those that retained their devices (98).

Definitively, a diverting colostomy restores quality of life if other options have failed (68).

Limitations

Limitations of this review article include potential gaps in the literature searching practices. There are also limited studies on long term outcomes of OASI and more research is required in this area going forward.

Conclusions

FI has detrimental effects on women's quality of life. OASI is a significant risk factor for FI, particularly after the age of 50. With the world's population living longer and women become more vocal about FI, our OASI prevention strategies and postpartum counselling needs more focus. Overall, there is an increasing awareness of FI. We are becoming more aware of risk factors for OASI and preventative measures, and uniform implementation

of prevention measures including the PEACHES and OASI care bundles should be introduced in practice and in guidelines. A formal debrief and clinical assessment should be carried out for all women who have had an OASI in the postnatal period and future pregnancies should be discussed at this time. Women should have formal counselling regarding the risk of recurrence of OASI and impact that this may have on their quality of life in the future, including during the menopause. Offering everyone a caesarean delivery is not the answer as rising CS rates poses its own risks. However, in women with known risk factors for recurrence or older women who wish for a smaller family, delivery by CS should be considered.

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://gpm.amegroups.com/article/view/10.21037/gpm-22-47/coif). The authors have no conflicts of interest to declare.

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