

Faecal incontinence in the era of sacral neuromodulation

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Summary

Faecal incontinence is a debilitating condition that significantly affects an individual's quality of life. Accurate assessment and a thorough understanding of the underlying aetiology are crucial in determining the appropriate management approach. Conservative management strategies, including dietary modifications, pelvic floor exercises and biofeedback therapy are the first therapeutic steps. If these measures are not effective, patients should be referred to a specialised pelvic floor centre for further treatment evaluations. With the latest updates on national and international guidelines, this review aims to provide a comprehensive overview of current best practices in the management of faecal incontinence, with a particular focus on the role of sacral neuromodulation.

Epidemiology and definition

Faecal incontinence is a symptom and is defined as the recurrent uncontrolled passage of faecal material for at least 3 months according to the Rome IV definition. The prevalence is estimated to be around 10–15% of the adult population, with a higher incidence in women and the elderly [1, 2]. The terminology differentiates between faecal, flatus and mucus incontinence, and collectively refers to them as anal incontinence.

The pathophysiology of faecal incontinence is multifactorial and can involve sphincter weakness or injury, impaired rectal sensation or decreased compliance of the rectal reservoir [3]. It is the long-term consequence that occurs as a symptom of various pre-existing diseases or traumatic lesions, usually years after the initial event, such as obstetric trauma, haemorrhoid resection surgery or rectal surgery [4]. The most common causes include episiotomy or perineal tears with lesion of the anal sphincter during childbirth, impaired neurological function from conditions like stroke or spinal cord injury, and age-related degenerative changes in the sphincter muscles and rectal compliance [5].

Physiology of human defecation

The process of human defecation consists of four coordinated and sequential stages: the basal phase, the pre-expulsive phase, the expulsive phase and the end phase. These phases work in an orchestrated manner to facilitate the controlled expulsion of faeces.

The basal phase is characterised by contraction of the internal anal sphincter. Continence is maintained through a predominant retrograde activity pattern in the rectosigmoid region [6]. As the rectum fills, the pre-expulsive phase begins, triggering the rectoanal inhibitory reflex, which relaxes the internal anal sphincter, allowing for afferent sensory sampling of rectal contents [7]. This relaxation is mediated by the autonomic nervous system, with sympathetic nerves maintaining sphincter contraction and parasympathetic nerves inducing relaxation. The expulsive phase involves voluntary relaxation of the external anal sphincter and pelvic floor, aided by increased abdominal pressure, leading to expulsion. This activity is coordinated by the pontine nuclei in the brainstem. Finally, the end phase restores anal sphincter tone and pelvic floor relaxation. For the purposes of this review, faecal incontinence is defined as the inability to defer defecation, i.e. to revert from the pre-expulsive to the basal phase, due to an underlying disorder of the afferent sensory pathways, the efferent motor pathways from the rectum – which appears to be the main pacemaker – or the sphincter musculature [7, 8].

Conservative management options

Recent clinical practice guidelines from leading national and international societies, such as the European Society of Coloproctology (ESCP), the American Society of Colon and Rectal Surgeons (ASCRS) and the International Continence Society, have updated their recommendations with broad commonalities on the assessment and management of faecal incontinence. These guidelines universally advocate for a conservative first-line approach involving pelvic floor physiotherapy, optimisation of bowel function and stool consistency, and pharmacological interventions. However, guidelines also recognise that the specific treatment algorithms recommended are generally based on low-level evidence. For the initial management of faecal incontinence, a stepwise approach is recommended. First and foremost, the condition needs to be objectively assessed, which can often be accomplished through a simple history-taking and digital rectal examination, without the need for sophisticated technology [4]. The Wexner Score, a validated questionnaire, can be used to quantify the severity of the condition [9]. It gives information on the frequency of faecal incontinence with liquid or solid faeces, measurements taken and the impact on quality of life.

Faecal incontinence is a prevalent and debilitating condition that can substantially diminish an individual's quality

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of life. It is also a stigmatised disorder, where healthcare providers must proactively enquire about symptoms, as patients often do not voluntarily disclose this sensitive issue [10]. Maintaining continence relies on mobility, mental capacity, manual dexterity and motivation, and a multidisciplinary and holistic approach is often required to address this distressing problem [11]. A comprehensive assessment is crucial in establishing the underlying aetiology and determining the appropriate treatment plan [2].

Conservative management measures include dietary modifications, pelvic floor muscle training, biofeedback therapy, and the use of medications or devices to manage incontinence [5]. Dietary changes, such as increasing fibre intake or avoiding certain foods that may contribute to loose stools, can help improve stool consistency and reduce the severity of incontinence. Pelvic floor muscle training under the guidance of a specialised physiotherapist can strengthen the muscles responsible for maintaining continence and improve the overall function of the pelvic floor [3]. The pelvisuisse website (<https://www.pelvisuisse.ch/>) gives an overview of certified physiotherapists.

Psyllium and fibre supplementation

Soluble fibre supplements, such as psyllium, are a common first-line treatment for faecal incontinence. Increasing the bulk and consistency of the stool through fibre intake can enhance rectal sensation and facilitate more controlled defecation, thereby improving continence. However, not all fibre sources are equally effective. A randomised trial showed that psyllium yielded the greatest reduction in incontinence episodes, with a 51% decrease, compared to a 20% decrease with gum arabic and only an 11% decrease with placebo. Conversely, carboxymethylcellulose was even found to increase faecal incontinence [12].

Loperamide and antidiarrhoeal medications

The evidence suggests that loperamide, an antidiarrhoeal medication, may be more effective than psyllium fibre supplementation for managing faecal incontinence. A randomised trial [13] found a statistically similar reduction in incontinence episodes of 59% with loperamide vs 51% with psyllium ($n = 80$, $p = 0.18$). Additionally, the authors reported that the adverse effects profile of loperamide appears to be more favourable, with patients reporting less bloating or abdominal pain compared to fibre supplementation. However, the loperamide group did experience more obstipation as a side effect.

Education and lifestyle modifications

Educating patients on the underlying pathophysiology of faecal incontinence and empowering them with practical strategies can significantly improve outcomes. In countries like Denmark, this consulting and education is performed by nurse-led clinics. A trial performed in the USA compared patient education + placebo with patient education + loperamide [14]. The addition of loperamide to an educational programme led to a 73% reduction in faecal incontinence episodes per day vs a 59% reduction with education alone. But the main takeaway was that all groups improved, highlighting the importance of education, lifestyle

modifications and patient engagement as essential components of a comprehensive management approach.

Interventional and surgical treatment options

In cases where conservative measures prove insufficient, various surgical options may be considered. Before the consideration of surgery, further diagnostics are recommended to determine the underlying aetiology [15].

Specialised diagnostic testing like anorectal manometry, rectal sensory testing, endoanal ultrasound and MRI defecography are recommended to objectively understand aetiology and underlying reasons of faecal incontinence [16].

The evaluation of surgical options then includes all findings of the above diagnostics. If an anatomical abnormality or a significant dynamic structural evacuation disorder is found, such as rectal prolapse or rectocele, the respective surgical correction should be considered. Furthermore, the degree of sphincter defect plays an important role in decision-making and therapeutic options. For a defect greater than 180 degrees, the surgical options include sphincteroplasty with or without vaginal and perineal reconstruction, sacral neuromodulation or creation of a colostomy. For a 90–180 degree defect, the options are sacral neuromodulation, colostomy and sphincteroplasty. For a defect less than 90 degrees, only sacral neuromodulation and colostomy are recommended [16].

Over the past few decades and also in comparison to previous guidelines, recommendations for surgery have undergone significant changes. Procedures like dynamic graciloplasty and implantation of artificial or magnetic anal sphincters [17] are no longer recommended or have even been withdrawn from the market [16]. Emerging modalities such as the Gatekeeper/Sphinkkeeper and bioinjectables have very limited data, and thus are not represented in current clinical practice guidelines. This has left clinicians with a relatively narrow set of surgical options to treat faecal incontinence. However, the following surgical options have gained importance and growing evidence supporting their effectiveness in managing faecal incontinence [18–21].

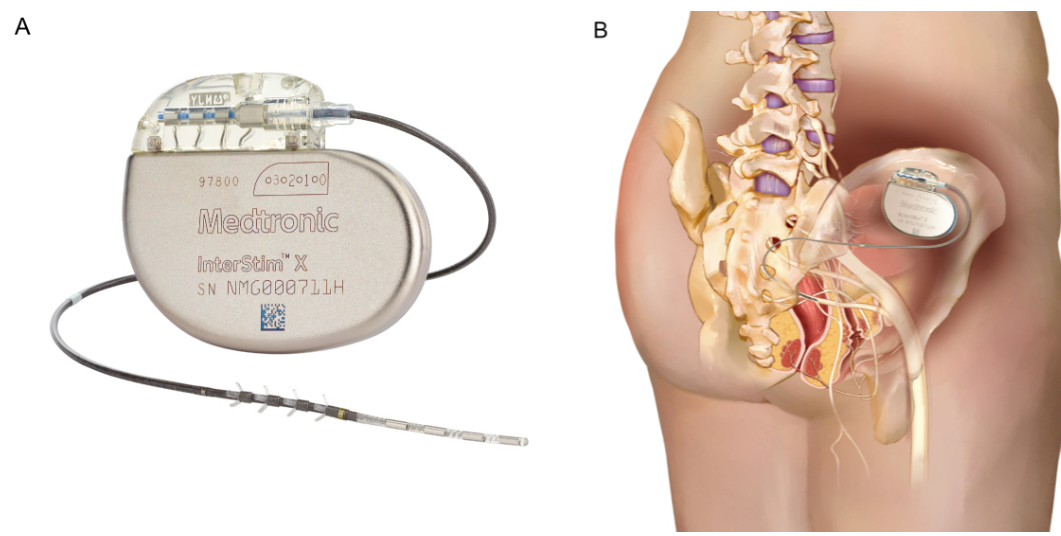
Sphincteroplasty

Sphincter reconstruction, a surgical option for faecal incontinence caused by sphincter defects, may be indicated for patients with structural defects, such as obstetric trauma [22] repair. Long-term outcomes of sphincter repair are variable, with various groups reporting a high recurrence rate of faecal incontinence within 80 months and more than 76% with treatment failure or only a small improvement of faecal incontinence [23–25]. While initial outcomes can be positive, long-term results show that this effectiveness decrease over time [24, 26]. The average length of time before this decline becomes apparent can vary, but after five years patients typically recognise a subjective reduction of the initially gained continence. In our experience, only patients with a very recent sphincter lesion event benefit from a sphincter repair.

Sacral neuromodulation

Sacral neuromodulation is a surgical procedure that involves the implantation of a device that stimulates the

Figure 1: Sacral neuromodulation device – Medtronic InterStim System. (A) Medtronic InterStim™ X implantable pulse generator with lead for sacral nerve stimulation. (B) Anatomical placement near the S3 sacral nerve for modulating bowel and bladder function. With kind permission of Medtronic Schweiz AG.



sacral nerves, which can help improve bowel function and control [27]. Numerous studies have demonstrated the effectiveness of sacral neuromodulation in managing faecal incontinence, with significant improvements in symptom severity and quality of life [28]. In particular, long-term data on this approach are promising [29]. Sacral neuromodulation not yet fully understood but aims to modulate the neuronal control of bowel function and thereby improve faecal incontinence [27, 30, 31]. Electrical modulation is believed to enhance interoception and improve the deferment mechanisms [32]. Furthermore, sacral neuromodulation is emerging for new indications: it has been shown to also improve chronic constipation [33, 34], low anterior resection syndrome (LARS) [35–38] and signs of rectal evacuation disorders [34, 39–41]. Therefore, the benefits of sacral neuromodulation in the management of faecal incontinence have become increasingly recognised, leading to its inclusion as a recommended surgical option in the newest clinical practice guidelines.

In recent years, many publications have sought to re-evaluate treatment strategies and the value of other surgical interventions in the context of the growing recognition of the benefits of sacral neuromodulation. This emerging concept has been dubbed “the era of sacral neuromodulation”, which reflects the increasing importance and acceptance of this therapy as a key approach for managing faecal incontinence.

Sacral neuromodulation therapy involves a staged surgical approach, providing an opportunity to assess its efficacy before definitive implantation.

In the first stage, often referred to as the test phase, the electrodes, which are connected to a temporary external stimulator, are placed near the sacral nerve. The patient monitors the effectiveness of this therapy by keeping a diary of their symptoms and faecal incontinence episodes during the trial period. This stage offers the benefit of assessing the patient’s response, allowing for the optimisation of electrode selection, stimulation intensity and frequency. If significant symptom improvement is observed,

a second surgery is performed to implant the device subcutaneously [42, 43].

In Switzerland, sacral neuromodulation implantation is limited to designated centres that have been certified for sacral neuromodulation implantation. At the authors’ institution, sacral neuromodulation was introduced in 2004, and since then more than 100 implantations have been performed.

Colostomy

When all other conservative and surgical treatment options have been exhausted, a colostomy may be considered as a final resort for patients with severe and debilitating faecal incontinence. For individuals with severe faecal incontinence and recurrent symptoms despite maximal medical therapy and failure of surgical options, a diverting stoma represents a viable option that can effectively restore continence and return independence.

Conclusion

Faecal incontinence represents a significant and frequently debilitating condition that necessitates a comprehensive approach for effective management. Key steps in managing faecal incontinence include the early identification of high-risk individuals, such as those with childbirth-related trauma or neurological disorders. Proactive screening, which involves actively asking about symptoms, is important. Utilising tools like the Wexner Score helps quantify the severity and guide the selection of appropriate management strategies. The initial management should focus on conservative interventions, including dietary modifications, as well as improving stool consistency with psyllium and/or medications such as loperamide.

When conservative treatments prove insufficient, referral to a specialised pelvic floor centre is recommended for further diagnostics and evaluation for surgical management. Among the available surgical options, sacral neuromodulation has emerged as a method providing symptom control and quality of life improvement. The recognised effi-

cacy of sacral neuromodulation has led to its inclusion in clinical practice guidelines, positioning it as a pivotal therapy for patients who do not respond adequately to first-line treatments.

Potential competing interests

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflict of interest related to the content of this manuscript was disclosed.

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