

# Current diagnosis and treatment algorithms for anal incontinence

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## PREVALENCE AND RISK FACTORS

Anal incontinence (AI) is defined as the involuntary loss of flatus, liquid or solid stool that causes a social or hygienic problem [1]. It is under-reported by patients and under-recognized by providers, so the true prevalence is unknown. Published population-based AI rates are 0.5–28% and AI is six to eight times more common in women than men [1,2]. In nursing-home populations, AI is endemic, and rates reach 47% [3]. Women with urinary incontinence (UI) and pelvic organ prolapse are at greater risk; up to a third also complain of AI symptoms [4]. Recent estimates of the cost of anal incontinence are €2169 per patient per year, with most of these being indirect nonmedical costs [5].

## PATHOPHYSIOLOGY

Anal continence is maintained by several mechanisms, including normal stool delivery and consistency, intact sensation and motor innervation, an intact anal sphincter complex, and a functioning puborectalis muscle. AI can result from damage to a part of the continence mechanism or from multiple insults over time. In young women, the most common cause of AI is childbirth; AI can occur after overt laceration of the anal sphincters, and from nerve or muscle damage during vaginal birth. Overt obstetric tears into the anal sphincter complex at the time of vaginal delivery occur in up to 6% of women [6–9]. Despite repair, 20–50% of women complain of involuntary loss of flatus or stool postpartum [10–13]. A third of obstetric sphincter injuries are detectable only with ultrasonography (US) or electromyography (EMG) of the anal sphincter complex and are not associated with overt perineal laceration

[14]. These occult lacerations also result in AI symptoms. Caesarean delivery does not provide complete protection, because AI symptoms can occur after planned Caesarean delivery without accompanying labour [15]. Some symptoms might be due to pregnancy itself; 8–42% of women have mild AI symptoms before their first vaginal delivery during pregnancy [13,16]. Risk factors for AI in women over reproductive age include increasing age, medical comorbidities, poor health, UI and bowel-related symptoms. Table 1 provides a comprehensive list of conditions commonly associated with AI symptoms.

## ANATOMY

The anorectal canal is surrounded by a complex tube of muscle fibres composed of the internal and external sphincters. The striated muscles of the external sphincter are under voluntary control, and are responsible for the squeeze tone of the rectal canal. The smooth muscle of the internal sphincter maintains resting tone. Both muscle groups overlap for 2 cm and extend up the canal for 4 cm. The external sphincter is attached to the perineal body and is surrounded by the puborectalis muscle. The external anal sphincter has three distinct muscle groups; the subcutaneous external anal sphincter, the main external anal sphincter, and the winged external anal sphincter. These divisions were recently described from MRI of 50 nulliparous women, in most of whom all three divisions could be identified. The exact functional role of all parts of the external anal sphincter remains to be described [18,19]. The distal anal canal is a delicate sensory organ that can distinguish between solids, gas and liquids. The neural supply to the anorectal region is both somatic and autonomic; branches of the pudendal nerve as well as direct branches from the sacral nerves contribute to the continence mechanism [20], and arise from the S2–4 sacral foramen [19].

## DIAGNOSTIC EVALUATION

AI is a symptom, and its impact should be measured by the subjective perception of the patient [21]. At-risk patients require screening for symptoms, because patients are often reluctant to either report AI or seek help [22,23]. There are several validated questionnaires to evaluate symptoms and quality of life (QoL) changes. Symptom-severity scales measure the frequency and severity of symptoms, while QoL scales evaluate the impact of symptoms on QoL. Table 2 lists commonly used questionnaires.

In addition to screening for symptoms and QoL changes, all patients require an in-depth medical, surgical and obstetric history. Information about bowel patterns, consistency, urgency, straining or constipation, sexual abuse or regular anal intercourse, medications, diet and fluid patterns should also be obtained. Physical examination includes an abdominal examination to exclude palpable masses. A pelvic examination should be performed, including neurological examination to assess sensory and motor function, including anocutaneous reflex, sacral reflexes and perineal sensation. Digital anorectal examinations evaluate sphincter abnormalities and strength (resting and squeeze tone), strength of the puborectalis, and presence of fecal impaction, masses or haemorrhoids. Perineal inspection should include notation of scars, fissures or mucosal prolapse. The rest of the pelvis is evaluated for any associated pathology. Rectal examinations have proved as reliable as manometry for assessing rectal resting and squeeze tone [33]. Although there are standardized scales to evaluate pelvic floor exercise strength, there is no standard scale for evaluating rectal resting and squeeze tone [34,35]. Physical examination of the perianal tissues should include observation of fecal material on the perineum and separation of the anal sphincter, as assessed by the 'dove tail sign'; peri-anal dimpling should also be noted [4,36].

TABLE 1 Summary of the causes of FI

Cause	
Congenital	Imperforate anus, rectal agenesis, cloacal defects (myelo)meningocele
Anatomical	Obstetric injury, anorectal and visceral surgery (midline or lateral internal sphincterotomy, fistulectomy, colectomy, ureterosigmoidostomy, haemorrhoidectomy, hysterectomy), accidental injury such as pelvic fracture or anal impalement
Neurobiological	Diabetes mellitus, multiple sclerosis, stroke, dementia, spina bifida, pudendal neuropathy due to nerve stretch injury (vaginal delivery, descending perineal syndrome, rectal prolapse, chronic straining at stool), degenerative changes of sphincter mechanism due to ageing, tabe dorsalis, central nervous system tumour, trauma, spinal cord injury or infection, Hirschsprung's disease, Alzheimer's disease, Parkinson's disease, myotonic dystrophy, amyloidosis, multiple system atrophy (Shy-Drager syndrome), toxic alcohol neuropathy, myasthenia gravis
Functional	Psychiatric disorders, retarded or interrupted toilet training, malabsorption, inflammatory bowel disease, radiation proctitis, hypersecretory tumours, rectal intussusception, fecal impaction, physical disabilities, encopresis, laxative abuse, anal fistula, irritable bowel syndrome, post-cholecystectomy and infectious diarrhoea, drug side-effects

With permission from Muller et al. [17].

## DIAGNOSTIC TESTING

The use of diagnostic testing in the treatment of AI is limited by a lack of normative data, poor standardization of testing and reporting of results, and lack of information about the negative- and positive-predictive value of test results (for either diagnosis or clinical outcomes of therapeutic interventions). These deficiencies preclude rigid recommendations for the use of any or all of these methods, although they are often used. The utility of diagnostic tests, including endo-anal US, anal manometry, external anal sphincter EMG and defecating proctography, was evaluated in a study of 50 patients. Two experts made diagnoses based on medical history and physical examination, and then re-evaluated their diagnosis after diagnostic testing. Diagnoses were changed in 19% of cases, and management plans altered in 16%. Despite this, surgically treatable causes of AI were seldom missed [34].

### US AND MRI

Current imaging tools to evaluate the anal sphincter complex include US (endoanal, endovaginal, translabial, and three-dimensional), MRI and defecography. Endoanal US and MRI both have high soft-tissue resolution capabilities in imaging pelvic floor anatomy, and can reliably detect anal sphincter disruptions. MRI gives excellent visualization of the anal sphincter complex, but is costly and its use is restricted to speciality centres [37]. Endoanal US is less costly, and findings correlate with anal manometry [38], EMG activity [39], MRI [40],

TABLE 2 Symptom severity and QoL scales

Scale (abbreviation)	Type	Number questions
Wexner FI scale (FIS) [24]	Symptom severity	5
American Medical Systems score (AMS) [25]	Symptom severity	5
Pescatori score [26]	Symptom severity	3
Vaizey scale [27]	Symptom severity	7
FI severity index (FISI) [28]	Symptom severity	5
Colo-Rectal-Anal Impact Questionnaire (CRAIQ) [29]	QoL	Short form 7; Long form 31
FI QoL scale (FIQOL) [30]	QoL	29
Manchester Health Questionnaire (MHQ) [31]	Symptom severity, QoL	31
Modified Manchester Health Questionnaire (MMHQ) [32]	Symptom severity, QoL	38

and surgical findings [41,42]. Translabial imaging uses 8–10 MHz vaginal probes, which are found in most ultrasound diagnostic centres, but comparisons of translabial and 'gold standard' endoanal US of the anal sphincter complex are scarce [43]. Recently, three-dimensional US was used to identify lesions both in the levator ani and anal sphincter complex with resolution similar to that of MRI; whether this will offer additional diagnostic capabilities to the practising clinician remains to be established [44,45].

### DEFECOGRAPHY

Defecography provides dynamic evaluation of the pelvic floor providing both structural and functional information on the presence of enterocele, rectocele, cystocele, perineal descent, intussusception and rectal prolapse. Dynamic MRI offers better images, but is

again limited by cost and availability. Standardization both of testing and interpretation of defecography is not established, making its role in the diagnosis of AI undefined [46].

### ANORECTAL MANOMETRY

Anorectal manometry provides functional information about anal resting and squeeze tone. A variety of instrumentation is available to measure anal pressures, including water-filled perfusion catheters, water-filled or air-filled balloons, sleeve catheters and pressure transducers. The most commonly used devices are water-perfused multichannel catheters with a radial array. The usefulness of testing is limited by the relative absence of standardized test protocols, normative data from healthy individuals or predictive value for clinical symptoms [36,47]. Manometry can

provide supplementary functional information to the evaluation of anatomy provided by US.

#### NEURODIAGNOSTIC STUDIES

EMG data can be obtained from either surface leads or needles. Surface EMG can be useful for evaluating patients with impaired squeeze tone, to differentiate between muscle damage and nerve damage. Needle EMG or mapping of anal sphincter defects is no longer recommended for the routine clinical evaluation, and has been replaced by US and MRI [47,48]. Although commonly used, pudendal nerve latency provides information only about the activity of the fastest nerve fibres and does not provide reliable information about nerve damage. Despite prolonged latencies, patients undergoing anterior sphincteroplasty had a significant improvement in continence with minimum morbidity, underlining its limited use in determining who should have surgical intervention for AI [49].

#### MANAGEMENT OF AI

Although AI is difficult to cure, most patients note an improvement from medical or surgical interventions. All patients should have a trial of medical management before surgical management because of sub-optimal long-term success rates for the surgical correction of AI. A frank discussion about expectations for continence after either surgical or medical management is essential for patient counselling.

#### NON-SURGICAL MANAGEMENT

Non-surgical management options for AI include dietary and fluid manipulation, medications, enemas, behavioural and physical therapy, biofeedback, and use of plugs and pads. Bowel regimens, including regular toileting, the use of enemas, and dietary and fluid manipulations, might not cure AI, but might enable the patient to resume a more active lifestyle.

##### *Dietary and fluid management*

Increasing dietary fibre with diet changes, or bulking agents or fibre supplements such as methyl cellulose or psyllium, helps to increase stool size. A larger, better formed stool might

improve rectal sensation and emptying. However, in some patients increasing fibre can worsen AI. These patients might be better treated by constipating agents and a bowel regimen of scheduled enemas for evacuation.

##### *Pharmacotherapy*

Pharmacotherapy for AI can be divided into three groups. Constipating agents, including loperamide (Imodium), diphenoxylate hydrochloride and atropine sulphate (Lomotil), are most beneficial to women with AI related to watery or loose stools. Constipating agents reduce urgency, incontinence episodes, and pad use. Side-effects include constipation, abdominal pain, diarrhoea, headache, and nausea. No data support using constipating agents for patients with normal stool consistency [50].

Drugs that enhance anal sphincter tone include phenylephrine gel, sodium valproate and loperamide. These help most in cases of AI with normal anal sphincter function. Side-effects include a localized dermatitis with phenylephrine gel, and abdominal pain and nausea with sodium valproate. Laxatives are beneficial in cases of AI associated with constipation and fecal impaction. Hormone replacement therapy might be beneficial for postmenopausal women with AI. A small prospective observational study of 20 women found that AI symptoms improved in 65% of cases, and 25% became asymptomatic after 6 months of use. Further investigation is needed to confirm these results [51].

##### *Physical therapy and biofeedback*

Pelvic floor muscle training is a well established treatment for UI [52]. Because the striated anal sphincter is under voluntary control, it is theoretically amenable to the same re-education and strengthening techniques used for treating UI [53]. Physiotherapy with or without biofeedback is often prescribed for treating AI and, because they are commonly done together, separating their effects is difficult. Biofeedback involves mechanical or electrical devices that provide sensory feedback to the patient about the efficacy of voluntary control of continence; it can be used to 'retrain' the rectum to increase sensitivity to fecal material boluses and can enhance the ability to appreciate rectal filling as well as increasing sphincter squeeze tone. Patients with voluntary sphincter control and

normal rectal sensation benefit more than those without [54]. In a prospective cohort study of 266 patients, physical and biofeedback therapy interventions were shown to improve squeeze pressure, urge sensation and maximum tolerable volume in the short term [55]. Another prospective cohort study evaluated 105 patients (12 males) who had not responded to dietary manipulation, medications and timed toileting, and were then enrolled in a biofeedback programme. Patients had three to eight sessions initially, and reinforcement sessions at 3, 6 and 12 months. Sessions included pelvic floor muscle-strengthening exercises with biofeedback training using manometry; a mean of 7.8 sessions/patient were required. Resting and squeeze anal sphincter pressures increased, as well as the squeeze duration. Rectal sensory perception improved, as did the threshold for a desire to defecate, and the ability to retain saline infusions [56]. Randomized data evaluating biofeedback have provided mixed outcomes. Advice and education improved continence, QoL, psychological well-being, and anal sphincter function, compared to pelvic floor exercises or biofeedback. The benefits of this simple intervention were maintained at 1 year after finishing treatment [57]. Another randomized trial compared pelvic floor exercises with biofeedback from digital examination, to biofeedback with manometry or US, and found no differences among the three interventions; all showed a significant improvement in symptom severity in patients with mild-to-moderate fecal incontinence (FI, defined as loss of liquid or solid stool, excluding flatus) [58].

##### *Electrical stimulation*

Anal electrical stimulation for the treatment of AI was first described over 40 years ago. Surface electrodes, intra-anal or intravaginal plugs are used to deliver high frequency electrical stimulation. It is not known whether the beneficial effects are secondary to muscle strengthening, rectal sensitization, or some general effect [59]. Most protocols recommend high-frequency stimulation at 50 Hz for 15–20 min twice daily. Electrical stimulation is often used in conjunction with physiotherapy and biofeedback, making separation of the effects of these interventions difficult.

The efficacy of electrical stimulation therapy was studied in three randomized trials. Two

trials evaluated its effect on postpartum FI; the first randomized 40 women to anal biofeedback and exercises with electrical stimulation, or vaginal biofeedback and exercises with no electrical stimulation. The authors reported that women with electrical stimulation had a greater improvement in continence status than the group with no electrical stimulation; however, group assignment varied both in the delivery of electrical stimulation and the route (endo-anal vs endovaginal) of biofeedback [60]. A second trial randomized 60 postpartum women to intra-anal EMG biofeedback physiotherapy with or with no electrical stimulation. In both groups there was a significant improvement in FI and QoL scores, but no added benefit of electrical stimulation [61]. A third trial randomly assigned 90 patients with FI to two groups, one with daily 'therapeutic' anal electrical stimulation of 35 Hz, and the other to 'sham' stimulation with 1 Hz. There was no statistically significant difference between the groups in the improvement in bowel control, suggesting that the mechanism of action of electrical stimulation might be secondary to improved sensitization rather than muscle strengthening [59].

#### *Sacral nerve stimulation (SNS)*

SNS as a treatment option for FI was first described in 1995 [62]. Motor output from the sacral and pudendal nerves, and modulation of both local spinal reflex arcs and autonomic supply to the rectum, pelvic floor and the spinal tracts to the higher centres in the brain are provided by electrodes implanted in the sacral foramen [20]. Because efficacy was shown in divergent populations, the selection of patients for placement is pragmatic [20]. Permanent implantation is based on the functional results achieved after a temporary testing period with peripheral nerve stimulation [63]. Patients who respond during the test period are then permanently implanted with pulse generators.

The efficacy of SNS was shown not to be due to a placebo effect in a double-blind crossover study of 34 patients [64]. Most series evaluating the treatment of AI with SNS are small (5–30 patients) with a follow-up of 4.5–32 months. Most studies showed a significant improvement, as measured by incontinent episodes, incontinence scores, or both, but there have been no long-term

multicentre trials [20]. A recent prospective study followed 46 patients (four males) from several centres in the UK for a median of 12 months; 41% achieved full continence to liquid and solid stool, and a subset followed for 6 years after implantation have maintained their continence [65]. Potential complications associated with this treatment are low, with an overall removal rate of 4% [66]. Randomized data are needed to confirm these results [67].

#### *Anal plugs*

Anal plugs are specially developed devices for containing FI. They were first used for patients with FI resulting from major neurological problems. Available data suggest that plugs are not tolerated well, and in many trials, many patients stopped using them. Polyurethane plugs performed better than polyvinyl-alcohol plugs in one randomized trial [68]. Plugs can be used as an alternative to other forms of management or as an adjuvant treatment for patients with FI [69].

### SURGICAL MANAGEMENT

The surgical management of AI includes sphincteroplasty, the placement of artificial neosphincters, implantation of sacroneuromodulation generators, and newer techniques of bulking agents or radiofrequency ablation. Unfortunately, post-anal repair or posterior levatorplasty has not been shown to be effective for FI in most patients, and will not be discussed here.

#### *Sphincteroplasty*

The mainstay of surgical intervention for AI is anterior sphincteroplasty for patients with anterior sphincter defects. Two methods of external anal sphincter repair are commonly used; the traditional 'end-to-end' technique, or an overlapping technique. Parks [70] first introduced the overlapping repair in 1971 because of what was thought to be unsatisfactory success rates with end-to-end repairs. Initial results with overlapping sphincteroplasty were good, with 60–82% of patients reporting symptom improvement with short-term follow-up [1,34]. More recently, five papers reported less promising longer-term results with mean follow-ups of 3–10 years. After overlapping repair, cure rates of 0–28% were reported [71–75] (Table 3).

Anorectal physiological testing or clinical features other than patient age in one study [71], and the presence of a persistent internal anal sphincter defects in another [74], did not predict long-term outcomes. Continence to flatus was rare, suggesting that surgical intervention for flatal incontinence might have very limited efficacy.

Three randomized trials compared the two repair methods. Two trials randomized postpartum women to overlapping or end-to-end primary repair of obstetric lacerations. In a trial of 112 women, anatomical and functional success rates were equally poor with both methods. Despite primary repair, >60% of patients had evidence of sphincter separation on postpartum US, and over half complained of AI symptoms [10]. A more recent randomized trial had similar results, with 41 women randomized, 23 to an end-to-end and 18 to an overlapping repair. Objective US findings were promising; 85% of patients had intact sphincters, with no difference between the groups. Although the external sphincters appeared intact, 42% of women still complained of anorectal symptoms, and there were no differences between the groups [76]. These trials are in contradistinction to an obstetric cohort study with historic controls, which found that AI symptoms decreased from 41% to 8% with overlapping repair, and high anatomical success (85%) measured by an intact sphincter complex on US [14]. One randomized trial that compared overlapping to end-to-end repair, in 23 patients undergoing sphincter repair remote from delivery, reported that the patient-rated success of 75% was the same in both groups at a mean of 18 months of follow-up; the authors concluded that there was no difference in success rates of the two methods [77].

Variation in surgical technique was studied in one randomized trial, which found that opening incisions close to the posterior Fourchette had fewer wound complications than incisions made in the line of the vaginal mucocutaneous junction [78]. Repair of the internal anal sphincter is controversial, but one author reported increased continence rates in women with an intact internal anal sphincter after repair of obstetric third- or fourth-degree lacerations [79]. The type of suture used for anal sphincter repair has not been studied in randomized trials. However, polyglycolic acid and catgut were compared for repair of obstetric laceration repair and

TABLE 3 Long-term results after overlapping sphincteroplasty

Reference	Patients with follow-up, n/N (%)	Mean (range) follow-up	Outcomes
Malouf <i>et al.</i> [71]	46/55 (84)	77 months (60–96)	0% continent 10% incontinent flatus only 79% soiling
Karoui <i>et al.</i> [72]	74/86 (86)	40 months	21% incontinent stool 28% continent 23% incontinent flatus only 49% incontinent stool
Halverson <i>et al.</i> [73]	49/71 (69)	69 months (48–141)	14% continent 54% incontinent stool
Bravo Gutierrez <i>et al.</i> [74]	135/191 (71)	10 years (7–16)	6% continent 16% incontinent flatus only 19% soiling
Barisic <i>et al.</i> [75]	56/65 (86)	80 months (26–154)	57% incontinent stool 27% continent 21% incontinent flatus only 13% soiling 39% incontinent stool

episiotomy in large randomized trials; polyglycolic acid was associated with decreased pain and analgesia use, as well as decreased rates of wound separation [80–82].

Peri-operative care is poorly studied. Extensive bowel preparations that include both mechanical and antibiotic treatments, accompanied by a restricted diet for 1–3 days before surgery, are commonly used. Six randomized trials evaluated the role of mechanical bowel preparations in patients undergoing bowel anastomosis and found no difference in wound infection rates or other variables measured [83]. One dose of broad-spectrum i.v. antibiotic administered during repair is commonly used, and some continue oral antibiotics for 1 week after repair [10,14]. Dietary restrictions are also commonly used after surgery, although one randomized controlled trial of 54 patients who had anorectal reconstructive surgery found that women randomized to a regular diet after surgery were less likely to have fecal impaction, and had their first postoperative bowel movement sooner than women on a clear diet and oral constipating agents. There were no differences in septic or urological complications [84].

Women with anal sphincter defects and abnormal neurological testing (e.g. delayed pudendal nerve motor latencies) have

lower rates of continence after surgery than women with normal testing [1]. Despite poor objective outcomes with sphincteroplasty, many patients are satisfied with the improvement in function despite continued AI, and would choose to have the surgery again [1,72]. Detailed counselling and goal-setting by both patient and providers is essential when considering using these repairs.

#### Neosphincters

Neosphincters encircle the anal canal and act as a substitute for the anal sphincter, and can be of biological or artificial origin. Their use has been limited by significant morbidity, and serious complications occur in more than half of patients.

Gracilis muscle transposition is the most common technique for creating a biological neosphincter. Initial results were poor, which led to the addition of the implantation of a device to electrically stimulate the transposed gracilis muscle. The intention of this modification was to transform fast-twitch fatigable anal sphincter muscle fibres to slow-twitch fatigue-resistant fibres [85–87]. Using this technique, a prospective multicentre trial with a mean follow-up of 23 months reported symptom improvement in 74% of patients, adverse events in 74%, and a re-operation rate of 40% for complications [87]. Another

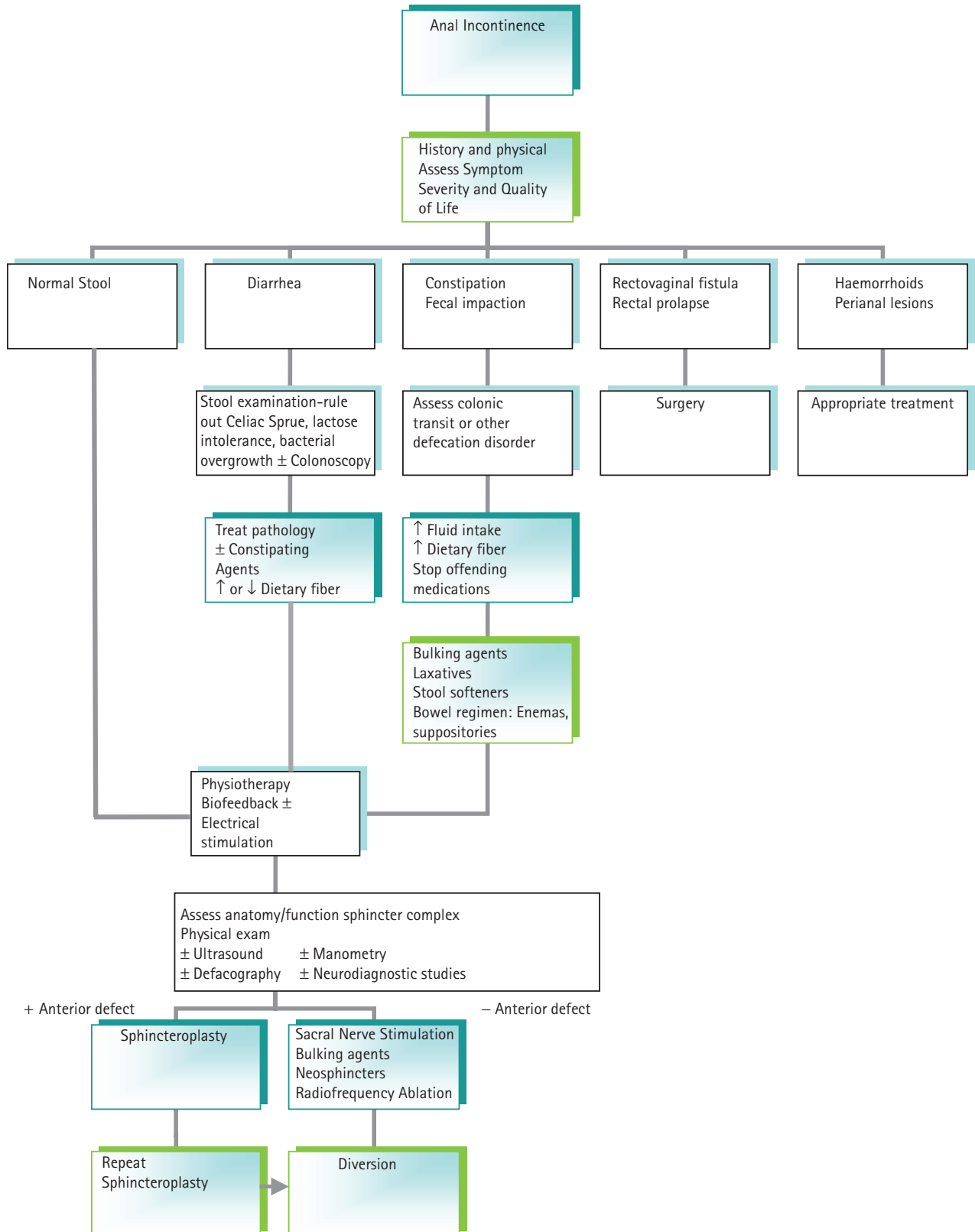
more recent prospective study of 28 patients with congenital anorectal malformations reported satisfactory continence in 35% of them, and a complication rate of 53%, with the most serious being infection [88].

Artificial anal sphincters are composed of a cuff that encircles the anal canal below the plane of the levator ani muscle. The cuff is connected to an intraperitoneal reservoir operated by a control implanted in the labia or scrotum. Early data reported symptomatic improvement in half of patients [89]. Unfortunately, this procedure is associated with significant morbidity, including infection, wound breakdown, cuff or pump erosion, fecal impaction, and mechanical failure [90]. A recent review of reports on the effectiveness and safety of artificial sphincters concluded that the procedure was of uncertain benefit and might harm many patients [91].

#### Injectable bulking agents

Since first reported in 1993 [92], several agents have been used to treat cases of FI with submucosal injections of PTFE, autologous fat, glutaraldehyde cross-linked collagen, or carbon-coated zirconium oxide beads. Injections are either trans-sphincteric [93], or proctoscopically guided through the rectal mucosa above the dentate line [94]. A recent randomized trial compared transperineal injection of silicone biomaterial

FIG. 1. Treatment algorithm for management of AI.



with and with no US guidance and showed more improvement in continence in the US-guided group [95]. More data are needed before this becomes a mainstay of AI treatment.

#### Radiofrequency ablation

Temperature-controlled radiofrequency energy is delivered to the anorectal junction after local block at several sites. Evaluation of the efficacy and safety of this procedure showed a significant improvement in AI symptoms in 60% of patients and a complication rate of 4% [96], with benefits potentially extending to 2 years after ablation [97]. Similar techniques for the treatment of UI had poor long-term success rates, and more data are needed before this procedure is widely adopted.

#### Colostomy

A diverting procedure is the last choice for patients who fail other treatments for their AI, and whose AI has a major impact on their QoL. These patients should be evaluated carefully before considering this procedure, including psychiatric counselling. Most patients report an improvement in their QoL after colostomy, despite the difficulties that they face in caring for the stoma [98].

In conclusion, the evaluation and treatment of patients with AI is complex. A proposed strategy for management of these patients is summarized in Fig. 1. Because of poor long term surgical outcomes non-surgical therapy should be pursued in the majority of patients, and not all require physiological testing for adequate care.

#### CONFLICTS OF INTEREST

None declared.

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**Abbreviations:** (A)(U)(F)I, (anal)(urinary)(fecal) incontinence; **QoL**, quality of life; **US**, ultrasonography; **EMG**, electromyography; **SNS**, sacral nerve stimulation