Sphincter Repair and Postanal Repair

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Learning Objectives
After completing this chapter, the reader should be able to:

- Describe the diagnostic workup and indications for sphincteroplasty
- Discuss the technique of overlapping sphincteroplasty and associated technical pearls
- Present short-term and long-term results of sphincteroplasty in different patient populations
- Discuss the quality of life for patients who undergo sphincteroplasty based on most recent fecal incontinence grading scales
- Describe the indication for postanal repair and associated success rates after the procedure

37.1 Introduction

Fecal incontinence (FI) significantly affects patients' social, personal, and occupational life, and in severe cases FI symptoms can lead to social isolation and depression in otherwise healthy individuals. FI prevalence ranges from 2.2% to 17%, depending on the study population and the criteria use for defining FI [1].

Several factors are considered to produce symptoms of FI, including consistency and amount of stool (e.g., diarrhea), damage to the mucosa of the colon and rectum (e.g., colitis), neurologic factors (e.g., diabetes, Parkinson's disease), and injuries to the anal sphincter and pelvic floor mus-

cles. Surgeons frequently see patients who have developed FI after obstetric trauma or anorectal procedures. Anal incontinence secondary to sphincter tears is mainly found in female patients after third- or fourth-degree tears [2]. Previous anorectal surgeries, such as fistula surgery [3], hemorrhoidectomy [4], manual dilatation (Lord's procedure) [5], or lateral internal sphincterotomy for the treatment of anal fissure [6], have all been described as causes of FI. With midline episiotomies and/or operative vaginal delivery, the incidence of anal sphincter injuries can reach 50% [7].

Anal sphincter damage sustained during childbirth is one of the most common causes in middle-aged women [8]. Occult sphincter defects during vaginal deliveries have been diagnosed by anal ultrasound in up 35.4% of primiparous women and 43.8% of multiparous women and are especially common after forceps deliveries [9]. Prospective studies have confirmed a high rate of injuries after vaginal deliveries [10]. More recent meta-analysis demonstrates that the incidence of occult anal sphincter disruption after vaginal delivery is higher than previously estimated [11]. However, at least two-thirds of postpartum occult defects are asymptomatic. Damon et al. found that if signs of clinical FI and a history of vaginal delivery were present, an anal sphincter defect could be seen upon endoanal ultrasound (EAUS) in 62% of patients, and clinical symptoms were related to the size of these defects [12].

Recent technological advances in imaging techniques allow for improved diagnostic evaluation. Ultrasound allow for incorporating measurements of defects in the anal sphincters and the pubovisceral muscles [13].

37.2 Diagnostic Workup

The first step in evaluating patients suffering from FI includes a careful history and physical examination. Questions should be directed toward the type and degree of incontinence, as well as changes in patients' lifestyle.

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A validated scoring system (Williams, Pescatori, Wexner, AMS score, etc.) is often used to rate FI more accurately. A distinct sphincter disruption can often be palpated upon dynamic digital-rectal examination. Clinical evaluation and endoscopy exclude structural disorders, such as polyps or tumors. The basic clinical investigation frequently is complimented with more specific testing.

Ultrasound has secured an important role in the assessment of FI. Ultrasound provides an objective assessment of the sphincter integrity and can readily diagnose injuries and anatomic deficiencies of the internal and external anal sphincters and the pelvic floor [14, 15]. Various preoperative factors have been evaluated to determine the prognostic factors for successful sphincteroplasty. A preoperative voluntary contraction of the puborectal sling >8 mm convincingly discriminates between patients with a good functional outcome and those with an unsatisfactory outcome after sphincter repair for post-obstetric anal incontinence [16].

Defecography adds anatomic and functional imaging of the rectum and other structures. Defecography can be helpful in detecting a rectocele or internal rectal prolapse, which may contribute to incontinence symptoms in some patients [17]. Defecography can be performed with fluoroscopic or MRI technique.

Anorectal manometry provides objective data regarding anal canal pressures, sensation, and the rectoanal inhibitory reflex (RAIR). This information can be helpful in the diagnosis of the etiology of incontinence; however, some argue that it is of little clinical utility as decisions for treatment are largely based on symptoms [18].

Nerve conduction studies have also been used in the assessment of FI. Pudendal nerve testing can be used to evaluate nerve damage, but pudendal nerve testing can be difficult to perform accurately and the technique has a significant learning curve. It is estimated that diagnostician must perform at least 40 exams to become efficient [19]. Pudendal nerve terminal motor latency measurement has been shown in some studies to have predictive value in patients who undergo sphincteroplasty. This prognostic information may be of value to patients in deciding whether to undergo such an invasive procedure [20, 21]. Other authors have demonstrated that pudendal nerve testing is normal or unilaterally normal in 88% of the time and that only 12% of patients with bilaterally prolonged pudendal nerve latency have significantly poorer outcomes [22]. Recent data indicates that pudendal nerve injury does not independently predict the success of sphincteroplasty [23–25]. Nerve testing has slowly faded away as a main diagnostic modality and today nerve testing is only performed in certain indicated situations.

Needle electromyography (EMG) of the pelvic floor musles involves direct testing of the external anal sphincter by placing a needle electrode in the muscle. EMG is therefore associated with significant discomfort and is nowadays infrequently used [20].

37.3 Indications

If the patient has significant symptoms and conservative treatment options (dietary modification, medications, biofeedback, etc.) have failed, patients may be considered for a surgical sphincter repair if they have an isolated sphincter injury. Sphincteroplasty used to be the standard of care for the management of FI related to anal sphincter injury [26], but more recent studies demonstrate that sacral nerve stimulation (SNS) is another viable alternative in these patients. Some centers recommend SNS as a first-line treatment, even in the presence of sphincter defects [27–30].

Patients best suited for surgical corrections are usually younger women with fecal incontinence secondary to an obstetrical injury [31]. Anal sphincteroplasty has the ability to also correct anatomical defects, such as a thinned perineal body or a rectovaginal fistula.

37.4 Surgical Technique

The patient usually receives a full bowel preparation with polyethylene glycol solution, perioperative antibiotics, and a Foley catheter. The operation is performed under general anesthesia with the patient in the prone jackknife position. Some surgeons use the lithotomy position.

The operation starts with a curvilinear incision on the perineum, and the dissection is carried until the edges of external anal sphincter are identified and isolated. Care is taken not to dissect too far laterally to avoid nerve injury. Sometimes, a concomitant levatorplasty is performed.

Separate attention to the internal anal sphincter imbrication has not been demonstrated to add to the overall success rate of sphincteroplasty [32–36]. The ends of anal sphincter muscles are usually overlapped and repaired with mattress sutures, providing new bulk to the sphincter complex. After the muscle repair, a simple wound closure is performed with the midportion left open for drainage. Postoperatively, daily showers or sitz baths are recommended. The estimated time for wound closure is approximately 4–6 weeks.

37.5 Technical Considerations at Surgery

37.5.1 Overlapping vs. End-to-End Repair

Historically, sphincter injuries were usually repaired with an end-to-end technique. Failure rates were however high and in 1971 Sir Alan Parks introduced a new technique, overlapping sphincter repair [34]. This type of repair became widely accepted and has been the surgery of choice until this day [35].

A Cochrane review from 2006 showed that there was no statistically significant difference in perineal pain, dyspareunia, flatus incontinence, and FI between the two repair techniques at 12 months. At the same time, the overlap group had, statistically significant lower incidence in fecal urgency and lower anal incontinence score. The overlap technique was also associated with a statistically significant lower risk that anal incontinence symptoms will worsen over a 12-month period. There was, however, no significant difference in quality of life [36].

The results of overlapping anal sphincter repair seem to deteriorate with time. Patients should be counseled that a majority will have improved FI after the procedure, but continence is rarely perfect, and function may deteriorate with time [37]. A few studies have reported more promising results, with lasting improvement and satisfactory long-term functional results [38].

In a comparison between the two techniques, Tjandra et al. [39] found no significant difference in functional outcome of overlapping vs. apposition of the sphincter ends. This prospective, randomized controlled trial demonstrated that the outcomes were similar. Although, the population size was relatively small, there is little additional data published comparing the two techniques.

Overlapping sphincteroplasty has remained the standard at surgical repair, with supporting short-term and long-term results. A direct relationship between the size of the tear and the degree of dysfunction has not been confirmed [40].

37.5.2 Separate Suturing of External and Internal Sphincters

A modified surgical approach, with separate suturing of the external and internal anal sphincters, has been suggested by Lindqvist et al. [41]. Separate suturing technique resulted in significant improvement of anal incontinence symptoms at 1-year follow-up [42]. This has, however, not been replicated in larger trials or with longer follow-up.

37.5.3 Scar Tissue

There seems to be an immediate benefit to overlap scar over scar, which can be adequately evaluated and quantified with ultrasound. This may also facilitate repair of larger defects [42].

37.5.4 Suture Material

Several different suture materials have been suggested by authors, including monofilament nylon, pullout wire, cat-gut, silk, and PDS. Evaluation of 40 case series of women who underwent overlapping anal sphincteroplasty with the use of either permanent or absorbable sutures demonstrated decreased FI severity scores with permanent sutures, but the overall patient-reported degree of FI symptoms was similar [43].

37.5.5 Diverting Stoma

In patients with a severe trauma to the perineum other than after delivery, a proximal diverting colostomy is often constructed to decrease the risk for infectious complications and to facilitate nursing management. Patients undergoing elective anal sphincteroplasty are, however, usually operated without diverting stoma. The presence of a stoma has not proven to improve the rate of wound healing and a diverting stoma also adds the risk for stoma-related complications [44].

37.6   Other Considerations

37.6.1 Primary Repair vs. Sphincteroplasty

A third- or fourth-degree perineal tear at child delivery is usually repaired immediately with a "primary repair." For optimal outcomes, these injuries should be repaired under optimal conditions. Persisting sphincter defects are reported in up to 66% [45, 46], and up to 40% of these women eventually develop FI symptoms [47].

In situations when there is no available surgical specialist, primary repair can be delayed 8–12 h without worse outcomes at 1-year follow-up [48]. Delayed primary repair is usually not recommended routinely, but can be an alternative under special circumstances [49, 50].

For secondary repair with sphincteroplasty after obstetric injury, a delay of at least 6 months to 1 year has been recommended to allow the tissue to recover [50]. Soerensen et al. prospectively looked at sphincter repairs done as a delayed primary (within 72 h postpartum) or as an early secondary reconstruction (within 14 days after delivery) without a diverting stoma in women who had sustained a third-degree or fourth-degree obstetric tear. They found equal results with acceptable long-term functional outcome in both groups [51].

In acute emergency trauma situations, the recommended initial treatment is usually debridement of nonviable tissue, removal of foreign material, open drainage, and often proximal diversion with distal washout. Depending on the extent of injury and the associated trauma, reconstructive surgery may be deferred.

37.6.2 Failed Primary Repair

There seems to be no difference in outcome in patients who had an unsuccessful primary repair and those who had an occult injury (and thus no previous primary repair) [51]. Recent data evaluating risk factors for primary repair conclude that repairs performed during on-call hours, with inexperienced personnel, and often misdiagnosed at first, increase the risk for a failed repair, while use of antibiotics and laxatives may improve the outcome [52]. Patients undergoing more than two previous repairs (including previous secondary sphincteroplasty) usually have poorer outcomes [52].

37.6.3 Age

Sphincteroplasty can be successfully performed in elderly patients [53], but it has been debated whether their repair has the same success rate as in younger patients. Simmang et al. [53] found no difference in outcome in patients with a mean age of 66 years (range 55–81 years) when compared to younger patients. Other authors have reported similar results [54, 55]. Nikiteas et al. [52] reported poorer results in patients older than 50 years, especially with concomitant obesity and perineal descent.

37.6.4 Pudendal Neuropathy

Pudendal neuropathy has been reported to be a predictive factor of failure following anterior overlapping sphincteroplasty, while other studies have not seen a difference in patients with or without pudendal neuropathy [56]. Sphincteroplasty is usually considered even if there is a documented pudendal neuropathy. The potential impact of this should be discussed with the patient preoperatively.

Some patients have an inability to voluntarily contract the sphincter muscles at preoperative clinical examination. This may indicate a severe neurological injury and this may be a predictor of possible failure after surgical repair.

37.6.5 Biofeedback

Biofeedback is used as a first-line therapy for FI. Several studies demonstrate a positive effect of biofeedback in patients with sphincter defects. In a follow-up study by Sander et al. [57], 48 patients were followed up after third- or fourth-degree sphincter lacerations. After 1 month, ten patients (21%) complained of anal incontinence with majority being incontinent only for gas. After 1 year, only three patients (7%) had symptoms of incontinence. The authors concluded that pelvic floor exercises are appropriate first-line treatment options. Electrical stimulation was abandoned in this study due to anal pain.

Some studies [58] use technological devices to improve results of home treatment with biofeedback, and there are smartphone applications used for the same purpose.

Patients who have undergone sphincteroplasty are usually referred for postoperative pelvic floor exercises and biofeedback [59].

37.6.6 Concomitant Perineal Operations

Patients with FI and a sphincter defect sometimes have other concomitant pelvic floor pathologies. Combining the sphincteroplasty with levatorplasty, procedures for urinary incontinence and/or pelvic organ prolapse are sometimes performed [60, 61]. Sphincteroplasty sometimes need to be combined with a repair of a more extensive perineal reconstruction of the pelvic floor for cloaca-like deformities [62].

Some authors have recommended a simultaneous repair with sphincteroplasty and a repair for rectal prolapse [63]. Usually, however, we would recommend to fix the prolapse first (with appropriate repair) and subsequently consider additional treatment with sphincter repair or SNS if the prolapse repair fails to improve/correct the FI symptoms.

37.6.7 Alternative Surgical Options

Different types of muscle transpositions/flaps have been suggested to treat FI. Usually, the gracilis or gluteus muscles have been used, but long-term results have not been encouraging. Dynamic graciloplasty, transposition of a gracilis muscle that was stimulated with an electric stimulator, has been tried but carried a high complication rate and is no longer available [64–66].

Artificial sphincters have also been tried [67]. An inflatable device has been used, but carries a rather high complication rate (mainly infections), and is no longer available on the market. More recently, a magnetic sphincter has been tried with promising results [68], but it is unfortunately currently not available.

Another option is SNS, first proposed by Dr. Matzel in 1995 [69]. SNS treats FI successfully in a majority of patients [69, 70]. Though SNS and sphincteroplasty have not been directly compared prospectively in the literature, numerous studies have shown that patients with FI and sphincter defects can have excellent outcomes with SNS [70–75]. The success of SNS in these patients also does not appear to be correlated to the degree of sphincter defect.

37.6.8 Financial Aspects

Sphincteroplasty is a relatively inexpensive operation compared to more sophisticated procedures such as SNS. Successful sphincteroplasty substantially improves FI patients' quality of life and reduces the overall cost of treatment [76].

37.7 Measurement of Outcomes After Sphincteroplasty

Measuring outcomes after treatment of FI can be done in several different ways, and each modality has their own advantages and disadvantages.

37.7.1 Descriptive Measures

Descriptive measure questionnaires do not provide summary scores. Mayo Fecal Incontinence questionnaire was designed to measure the prevalence of FI in the community and risk factors associated with incontinence [77]. Other descriptive questionnaires include Osterberg Assessment and Malouf Postoperative Questionnaire, but they only have descriptive value and are rarely used [78, 79].

37.7.2 Severity Measures

Severity measures usually rate the type and frequency of FI [80–83]. The disadvantage of these measurements is that the impact on quality-of-life changes is not directly addressed, though it is clear that a higher frequency of incontinence episodes leads to a lower quality of life. A Wexner score of 9 or higher indicates a significant impairment of quality of life [81].

37.7.3 Impact Measures

The impact on quality of life can be evaluated with impact measures. FI can significantly disrupt quality of life, and this condition can be quite debilitating. General quality of life questionnaires have a long history of use, with established reliability, validity, and population norms (e.g., the Short Form-36 (SF-36)). The disadvantage is that they are measuring general quality of life and they are not specifically aimed at quality of life issues related to FI. Lately, Fecal Incontinence Quality of Life scale (FIQL) has been increasingly used [83]. The instrument is FI specific, and it is sensitive. FIQL is composed of 29 items that form four scales: lifestyle (10 items), coping/behavior (9 items), depression/self-perception (7 items), and embarrassment (3 items).

37.8 Results of Sphincteroplasty

37.8.1 Short-Term Results

Short-term results (<5 years) of sphincteroplasty are usually quite good, with significant improvement rates of about 70–90% (Table 37.1). Unfortunately, few patients are relieved of their symptoms completely, and results often deteriorate with time (Fig. 37.1). It is therefore important that patients are counseled about these issues (Fig. 37.2).

37.8.2 Long-Term Results

Unfortunately, the long-term results of sphincteroplasty are not as successful as surgeons would like them to be (Table 37.2). A systematic review by Glasgow and Lowry demonstrated that although fecal continence deteriorates over the long-term (more than 5 years) following anal sphincterotomy, patient QOL and satisfaction remain relatively high [96] (Fig. 37.3).

Table 37.1 Results for overlapping sphincteroplasty: short term (<5 years)

| Author	Year	N	Age (mean years (range))	Success (%)
Oliveira et al. [27]	1996	55	48 (27–72)	71
Pfeifer et al. [27]	2004	41	34 (19–71)	73
Tjandra et al. [39]	2003	23	45 (31–68)	74
Yoshioka and Keighley [84]	1989	27	34 (17–81)	74
Fang et al. [85]	1984	79	(17–68)	89
Fleshman et al. [86]	1991	28	38 (22–75)	75
Morren et al. [87]	2001	55	39 (24–73)	56
Elton and Stoodley [88]	2002	20	n.a.	80
Barisic et al. [89]	2006	65	n.a.	74
Mevik et al. [90]	2009	29	45 (6–77)	86

n.a. not available
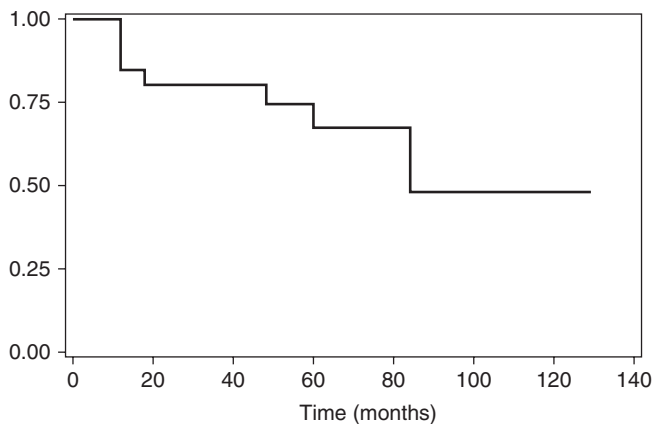
Fig. 37.1 Degradation of anal continence over time [91]
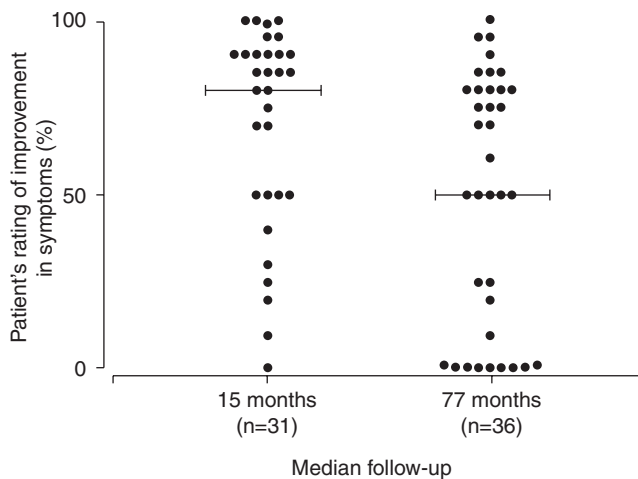
Patient's ratings of improvement in symptoms from preoperative state in 38 patients without stoma or further surgery after sphincter repair
Bars show median values.

Fig. 37.2 Patients' ratings of improvement in symptoms over time [25]

Table 37.2 Results for overlapping sphincteroplasty: long term (>5 years)

Author	Year	N	Age (mean years (range))	Success (%)
Gilliland et al. [21]	1998	77	47 (25–80)	60
Malouf et al. [25]	2000	55	43 (26–67)	50
Karoui et al. [92]	2000	86	n.a.	49
Halverson and Hull [24]	2001	71	38.5 (22–80)	46
Bravo-Gutierrez et al. [23]	2001	191	37 (20–74)	62
Trowbridge et al. [93]	2006	86	n.a.	11
Barisic et al. [89]	2006	65	n.a.	48
Soerensen et al. [51]	2008	22	31 (22–38)	50
Oom et al. [94]	2009	160	n.a.	37
Mevik et al. [90]	2009	17	45 (6–77)	53
Johnson et al. [95]	2010	33	36	67
Ratto et al. [70]	2010	24	47.6 (26–70)	85.7

n.a. not available

Fig. 37.3 Comparison of long-term outcome with length of follow-up as described by Halverson and Hull [24]
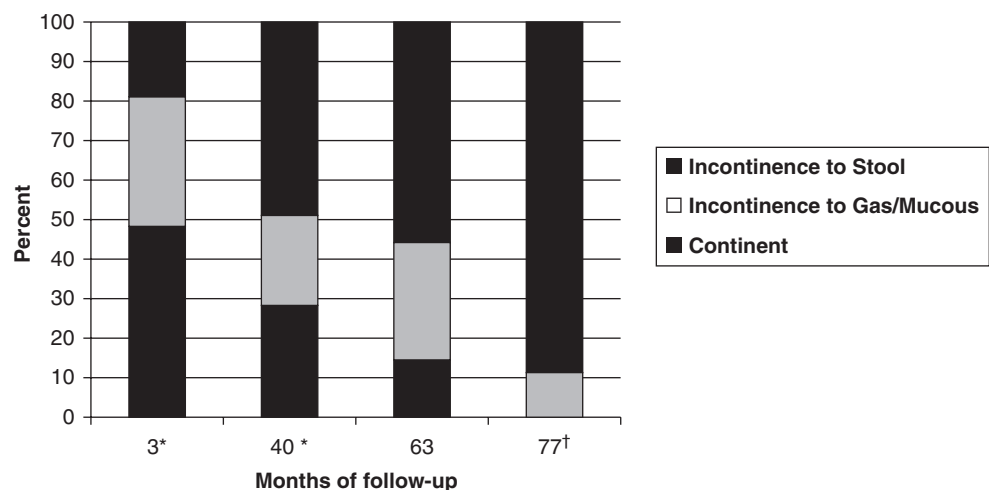
37.9 Sexual Function After Sphincteroplasty

Sexual function after anal sphincteroplasty has been evaluated in several studies [97, 93]. In a study by Riss et al. [98], sexual function was significantly diminished in patients who underwent overlapping sphincteroplasty in comparison to control group. No correlation with the severity of FI was found. On the other hand, in a study by Pauls et al. [97], sexual activity and function were similar following sphincteroplasty, despite more pronounced symptoms of FI. They found that solid stool FI and resulting depression were correlated with poorer sexual function. Similar results have been reported by Trowbridge et al. [93]. They found that anal continence rates 5 years after sphincteroplasty are disappointing and this adversely impacts quality of life, but not sexual function (Fig. 37.4).

37.10 Postanal Repair

Before the advent of EAUS, patients with FI were often categorized as having idiopathic or neurologic FI [99]. Patients were then frequently operated with postanal repair, described by Sir Alan Parks in the 1970s and popularized in the 1980s.

Postanal repair involves coaptation of the levator ani, puborectalis, and external anal sphincter posterior to the anal canal and the anorectal junction by approximating these muscles with nonabsorbable sutures. The anatomical result of this procedure is lengthening of the anal canal and a possible reduction of the anorectal angle [102]. The procedure was performed to restore the anorectal angle, increase anal pressure, and lengthen the anal canal [100].

The short- and long-term results of this procedure have not been shown to be better than sphincteroplasty (Tables 37.3 and 37.4). Some speculate that success appears to be

Fig. 37.4 Results from
published series examining
anal sphincter repair
outcomes over time. "Good"
outcome determined using
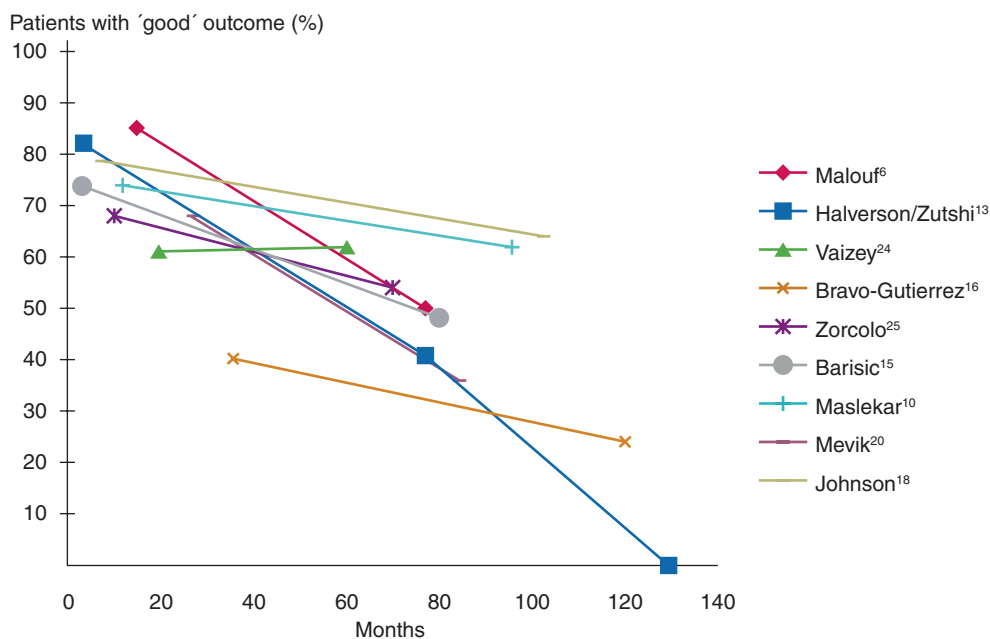definitions provided by the
authors of each article [101]

Table 37.3 Results of postanal repair: short term (<5 years)

Author	Year	N	Success (%)
Womack et al. [102]	1988	16	68
Orrom et al. [101]	1988	17	59
Braun et al. [103]	1991	31	84
Briel and Schouten [104]	1995	37	46
Athanasiadis et al. [105]	1995	31	52
Matsuoka et al. [106]	2000	21	35

Table 37.4 Results of postanal repair: long term (>5 years)

Author	Year	N	Success (%)
Yoshioka and Keighley [84]	1989	116	24
Setti-Carraro et al. [107]	1994	54	52
Rieger et al. [108]	1997	22	58
Abbas et al. [109]	2005	47	68
Mackey et al. [110]	2009	57	52

Take-Home Message

Overlapping sphincteroplasty, despite sometimes suboptimal long-term results, is a viable treatment option for treatment of FI in patients with an isolated, preferably anterior, sphincter defects. The surgery is usually performed in younger patients, and concomitant anatomical problems can be repaired at the same time. Physiological and other diagnostic tests are useful for preoperative planning, but they do not predict the quality of life in these patients postoperatively.

Various quality of life measures exist in order to evaluate the resolution of symptoms after overlapping sphincteroplasty, and patients' satisfaction remains high despite frequent deterioration of symptoms. Other treatment modalities, including SNS, are increasingly used in the treatment of this patient group.

related more to improve sphincter pressures and anal sensation. Others believe that the effect of postanal repair is due to local scarring and anal stenosis than restoration of the anorectal angle.

Postanal repair is rarely used, because of low success rates in moderate-quality studies [110–113]. Postanal repair should not be recommended for the treatment of anal sphincter defects.

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