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Multimodal Treatment of Constipation: Surgery, Rehabilitation or Both?

Luigi Brusciano et al.*

*XI Division of General and Obesity Surgery, Master in Coloproctology,
Second University of Naples
Italy*

1. Introduction

Constipation accounts for 20% in western world population. In absence of any organic aetiology, this disorder may be related to bad alimentary habits based on inadequate introduction of the three components of stool (fibres, probiotics and water) that are essential for the physiologic activity of colon. Chronic constipation may be also associated with either colic or rectal anatomo-functional alterations. Colonic constipation (slow transit constipation) is usually related to a motility disorder (inertia coli) associated with a reduction of propagating contraction waves and decreased Cajal' cells; on the other hand, rectal outlet dysfunction type constipation may be related to anatomical alterations (e.g. internal mucosal prolapse, rectocele) causing difficult rectal outlet and functional pelviperineal dyssynergia. The physiologic defaecatory act involves not only synchronism between rectum and anus, but even correct thoraco-abdominoperineal dynamics and vertebral position. This has to be carefully assessed by considering patient's ability to accomplish adequate thoraco-abdominoperineal muscle movements needed for both adequate defaecatory dynamics and urine and stool retention. Therefore, the ideal treatment should not only address anatomical alterations such as mucosal prolapse, rectocele, rectorectal intussusception and sphincter defects, usually requiring a surgical approach, but even functional disorders, often insidious and difficult to detect. Surgery is mandatory to treat pathological findings, that physically represent an obstacle to fecal transit in the rectum. Many surgical techniques have been developed for the treatment of outlet obstruction with conflicting results. STARR (stapled transanal rectal resection) is a new surgical procedure that was launched by Longo in 2001. It is a minimally invasive transanal operation for rectocele and mucosal/rectal prolapse using a double circular stapler. This procedure is indicated when rectal mucosal prolapse is thought to be the cause of difficult defecation, and appears to be a rational treatment. This treatment aims to normalize the anatomical relationship of the anal mucosa with hemorrhoidal piles and anal sphincters by restoring the prolapse and improving venous perfusion. The procedure pulls the anal

* Crescenzo Di Stazio, Paolo Limongelli, Gian Mattia Del Genio, Salvatore Tolone, Saverio Sansone, Francesco Lucido, Ignazio Verde, Antonio D'Alessandro, Roberto Ruggiero, Simona Gili, Assia Topatino, Vincenzo Amoroso, Pina Casalino, Giovanni Docimo and Ludovico Docimo
XI Division of General and Obesity Surgery. Master in Coloproctology. Second University of Naples, Italy

mucosa and perianal tissues upwards and decreases the friction and impact on the tissue surface, which is a cause of difficult defecation. In the mechanism of defecation, the movement associated with the anal sphincters is triggered by the sensory perception on the anal mucosa and anal skin. If the physiological functions of all the involved organs are under optimal conditions, then the mucosa and sphincters can maintain the normal anatomical relationship. In January 2006, the European STARR registry was initiated. According to the results published in 2009 on 2838 patients, the improvement in rectal function and quality of life was statistically significant. A multicenter study conducted in Spain between 2001 and 2006 concluded that this procedure is associated with low morbidity and short hospital stay and is an effective treatment option for obstructed defecation syndrome. According to a Milan study reported in 2008, STARR is safe and effective in the treatment of solitary rectal ulcer associated with internal rectal prolapse and has minimal complications and no recurrence after 2 years (Boccasanta et al., 2008). After operation functional outcome shows an improvement in defecation with reduction of the mean Constipation Score. Less pain during evacuation was reported by patients, also as a consequence of reduced pushing to defecate and reduced use of digital assistance. The frequency of complete defecation was increased, so the patient's satisfaction was favorable. Anorectal manometry reveals decrease in the maximum resting and squeezing pressure of the anal canal and in rectal compliance until one month after the operation, compared with the preoperative levels, but they recovered to preoperative levels at 6 months after the operation. This effect is probably the consequence of the anal stretching during operation. Patients show increase in basal sphincter pressure and maximal squeeze pressure, probably for the absence of inhibition that was acted by redundant rectal mucosa on the transitional zone. Recently, a new device the CCS-30 Contour Transstarr was developed by the same Professor Longo. A multicenter prospective study from Naples confirms that the device is effective and safe and has functional results similar to those of the conventional STARR (Renzi et al., 2008). This procedure (with both techniques), according to most authors, is effective; the postoperative pain is mild, and the procedure is very much accepted among colorectal surgeons for the treatment of rectocele as well as for internal rectal prolapse in patients with obstructed defecation. Yet, it should be emphasized that STARR is associated with complications such as postoperative bleeding, chronic proctalgia, rectovaginal fistula, stricture, and fecal incontinence (Gagliardi et al., 2008). Some of these are "learning curve" complications and can be avoided instead many authors stress that if this procedure is performed in selected cases by skilled specialists, most complications can be avoided. The use of an anastomotic stapler has been reported to result in a higher rate of anastomotic stricture formation. However, staples applied to the lower mucosal layer with few connecting tissues are eliminated during a short time, and do not form granuloma that might induce stenosis. In patients with enterocele and puborectalis dyssynergia, this procedure is contraindicated (unless the enterocele is repaired simultaneously on laparoscopy). In view of conflicting reports on the safety and efficacy of the STARR procedure, a European group of experts was founded in October 2006; and in June 2008, following a consensus conference with evidence-based conclusions, they published guidelines on inclusion and exclusion criteria as well as a diagnostic and therapeutic algorithm for the STARR procedure in ODS. These recommendations were based on the experience of 11 specialists in coloproctology and pelvic floor disease, pioneers in the STARR procedure, and it was concluded after a 100% consensus within the group. It was also concluded that this procedure can be performed with either of the devices, depending on the size of the prolapsed or rectocele and on the personal experience

of the surgeon. Patient selection is crucial, as is the use of the standardized diagnostic and therapeutic approach. A considerable example of this is given by the study of Zehler that compared functional and clinical short and long-term outcome after stapled transanal rectal resection and found results after 1 year comparable with the functional outcome even after 5 years. The median clinical score improved significantly already after 1 year in these patients and remained stable at 5-year follow-up. In contrast, those patients who failed treatment showing no improvement in the short term, remained symptomatic without improvement in OOS and SSS scores. Eighty per cent of the patients were still satisfied. The author concludes that short-term improvement after STARR predicts long-term outcome in obstructed defecation syndrome caused by a rectocele. The reason of such findings is probably the unaccomplished diagnosis of the disease with an omission of the functional aspect of the trouble. In those patients showing poor outcome, or unstable with time, the functional disturbance was probably prevalent compared to anatomical; diagnosis missed this aspect and consequently treatment was inadequate. Pelviperineal dyssynergia is a functional alteration, characterized by absence of puborectalis muscle relaxation, and inability to relax pelvic floor during attempted defecation. This can cause a delay of rectal stool transit, so that the rectum itself reabsorbs water and stools become harder, drier and difficult to evacuate. Clinically, this can result in painful effort, bleeding after defecation, long periods spent in bathroom, digitation, and sense of incomplete evacuation. In the long term patient may develop reduction of rectal sensitivity with larger volumes of faeces required to feel the need to evacuate (Brusciano et al., 2009). The frequent presence of concurrent alterations (anatomical and functional) causing the symptoms is the explanation of worse results than expected after treatment. This is particularly frequent in those with a thoraco-abdomino-perineal dyssynergia not adequately recognized and simultaneously treated. Supporting this theory Rao showed that systematically assessing anorectal physiology in patients with defecation disorders revealed new information in 88% of patients that led to a change in the management in 76% of cases. Pelviperineal rehabilitation, that teaches patients how to relax pelvic floor muscles, has showed good results by treating the functional aspect of pelvic floor disorders. Nowadays treatment comprises a series of rehabilitation techniques as physiokinesitherapy, biofeedback, electrostimulation and volumetric rehabilitation. Previously published studies reporting on the use of rehabilitation techniques such as biofeedback, muscular training and electrostimulation, have showed a success rate ranging between 47% and 100%. There is lack of agreement on a standard test to select patients who may benefit from such treatment. Particularly, although a clinical and instrumental work-up is commonly carried out by proctologists to characterize these patients, physiatriac assessment is not thoroughly accomplished. To correctly approach the problem each aspect of pathology must be detected and specifically treated, with surgery (when anatomical), rehabilitation (when functional) or both (when associated). While the anatomical aspect of the problem is commonly detected by standard clinical and instrumental work-up associated functional disorders are often neglected. A diagnostic protocol, including the evaluation of either physiatriac or instrumental findings, has been previously reported by our group to identify patients amenable for pelviperineal rehabilitation treatment (Brusciano et al., 2007). The protocol is based on proctologic examination, clinico-physiatriac assessment (puborectalis contraction, pubococcygeal test, perineal defence reflex, muscular synergies, postural examination) and instrumental evaluation (anorectal manometry, anal US and dynamic defaecography).

2. Diagnostic protocol

Clinical and functional evaluation was based on the analysis of the following parameters:

Puborectalis relaxation (relaxation pattern), searching for a paradox muscle's contraction and absence or incomplete relaxation, by rectal examination.

Pubococcygeal (PC) test (puborectalis contraction pattern) evaluating either the phasic contraction, subjectively classified as good, moderate or fair, or the tonic contraction by asking patient to contract the anus, for the longest period of time (classified as good when >9 sec; moderate when ranging between 2 and 9 sec; or fair when < 2sec). The muscular fatigue is also assessed by asking patient to contract the anus as many times as possible for at least 5 seconds, and to rest for 10 sec (classifying it as good when more than 9 times; moderate when ranging between 2 and 9 times; fair when <less than 2 times).

Perineal defence reflex consisted in the assessment of pelvic floor and abdominal muscles' action, following an intra-abdominal pressure's increase. Patient is asked to cough, so that the physician can notice the perineal muscles' contraction, resulting either in a physiological rising (reflex present) or a pathological descending (reflex absent) that, if marked, can be associated with emission of urine and flatulence.

Muscular synergies, i.e. the activity of both agonist (glutei and abductors) and antagonist muscles (abdominals, diaphragm), were evaluated in Sims' position by asking the patient to contract the anus, after placing a hand over the abdominal wall while observing gluteus and abductor contraction.

Muscle synergy was defined as agonist, by the simultaneous contraction of anus and either glutei or abductors, whereas antagonist by the simultaneous contraction of anus and abdominal muscle.

Postural examination was based on the evaluation of lumbar lordosis by using a "plumb line". This is a straight line formed by a string attached to a hanging weight. It establishes a vertical line which is straight up and down the spine. The distance between the "plumb line" and the spinous process of L3 is measured by a ruler considering a range between 25 and 35 mm as normal.

2.1 Instrumental assessment

Anorectal manometry evaluated a series of distinct parameters:

anal resting pressure (ARP) (normal value between 55 and 75 mmHg; hypertonic if > 75 mmHg; hypotonic if < 50 mmHg);

maximal voluntary contraction (MCV) (amplitude normal value if > 120 mmHg; duration normal value if > 22 sec);

rectal sensory included conscious rectal sensory threshold (CRST) (normal value 25-45 ml), and maximum tolerated volume (MCV) (normal value 80-160 ml), defining either hyposensitivity (MTV > 160 or CRST > 40) or hypersensitivity (CRST < 40);

rectoanal inhibitory reflex (RAIR) by considering both the percentage of relaxation (normal values $\geq 85\%$) and the balloon expulsion test (the balloon was filled up with air until the

subject reported desire to defecate: the balloon was considered not expelled if the time required by the patient overcame 1 minute).

Defaecography evaluated the pelvic floor descent. This was defined as the vertical distance between the pubococcygeal line and the ano-rectal junction in straining (expressed in millimetres). A distance greater than 4 cm was considered as pathologic perineal descent.

Anal ultrasonography assessed the puborectalis relaxation. The absence of relaxation of the puborectalis muscle was defined when no increase of the distance between the inner edge of the muscle posteriorly and the probe measured at rest and on straining was detectable. In female patients the puborectalis relaxation was also evaluated by vaginal US that leaves the puborectalis sling relatively undisturbed and therefore more free to relax.

To assess potential implications of these parameters, considered responsible of constipation, in the functional aspects of these disorders we compared them in a large number of patients with constipation and incontinence as well as in healthy controls.

Several altered parameters were identified in patients with constipation or incontinence compared to HC demonstrating strong correlations between psychiatric disorders and the symptoms.

We, moreover, recently performed further studies that show how successful specific treatment of the psychiatric disorders, in patients with altered psychiatric parameters, improves proctologic symptoms.

These results allow to suppose a causal relationship between psychiatric parameters, functional alteration and clinical symptoms.

A rehabilitation scheme based on different techniques (biofeedback, electrostimulation, physiokinesitherapy, and volumetric rehabilitation) should seek to correct those functional alterations. For instance, the finding of lumbar lordosis needs to be treated by postural physiokinesitherapy, whereas the absence of perineal defense reflex needs physiokinesitherapy to synchronize the muscular function of the thoracic, abdominal, and pelvip erineal muscle district. On the other hand, an absence of puborectalis muscle relaxation and a decrease in the maximum voluntary contraction of external anal sphincter should be managed by biofeedback and electrostimulation therapy.

Another example, in the case of a constipated patient with a rectocele, and with concurrent abnormal rectal sensation or non-relaxing puborectalis muscle on straining and alteration of recto anal inhibitory reflex (RAIR), although surgical correction will improve rectal emptying, therapy could not be considered appropriate without addressing the functional component of the syndrome.

Similarly, the mere treatment of the functional disorders without correcting anatomical alteration is a sketchy therapy. Concerning this, we also assessed the outcome of rehabilitation treatment, using the rehabilitation diagnostic protocol, in patients with or without previous surgery for rectal outlet obstruction.

All patients selected for rehabilitation treatment were divided into two groups:

group A consisted of patients with rectal outlet obstruction never submitted to previous surgical treatment;

group B consisted of patients operated of STARR procedure for rectal outlet obstruction (with a rectocele > 4 cm, rectal internal mucosal prolapse, and recto-rectal and recto-anal intussusceptions).

We observed in both groups significant improvement of physiatriic parameters while operated patients showed better clinical outcome at six months follow-up. These results support the theory of a multifactorial pathogenesis of such disorders and show that specific treatment of different components causing the same symptoms is the best approach with the best outcome.

3. Pelvi-perineal rehabilitation programme

Patients were offered one session of treatment, lasting an average of 45 minutes, every 5 days for a minimum of 10-12 overall sessions. The rehabilitation treatment aims to correct the thoraco-abdomino-perineal dyssinergia by using different means as physiokinesytherapy (by operator's hands), biofeedback and electrostimulation (by specific probes) and volumetric rehabilitation (by enema). Although the sequential use of these different tools may differ among patients, all techniques are indispensable for a thorough rehabilitation treatment as following described. Firstly, patients were informed on the anatomical and physiological principles of pelvic floor district, stressing on the importance of the re-educational aspect of rehabilitation. Thus, patients should be knowledgeable in terms of anatomical and physiological notions on which body area is to be treated, in order to best interact during rehabilitation. By performing anal and/or vaginal digital exploration, physician highlights puborectalis anatomical position, inviting patients either to pushing out or squeezing to respectively simulate evacuation or stool retention. Moreover, patients were informed about the role of thoraco-abdominal and perineal muscles districts, whose synergy is determinant for an adequate defaecation act; one way to let patient learn this harmony between thoraco-abdominal-perineal districts is to show the distinction between thoracic and abdominal breathing. Rehabilitation treatment was based on four different techniques:

1. Physiokinesitherapy, obtained throughout thoraco-abdomino-perineal muscles coordination training, as previously described. According to Bourdiol-Bortolin technique, patients were taught to direct propulsive force into the pelvis by taking a deep breath, contracting the upper abdominal and diaphragmatic muscles (diaphragmatic breathing exercises), and simultaneously relaxing and protruding the lower abdomen. A visible protrusion of the latter, indicated a correct performance. Unlike other rehabilitation techniques specifically focused on pelvic floor dyssinergia, physiokinesotherapy aims to treat postural defects and limitation of hips motion as well as improve respiratory dynamics required for the stability of thoraco-abdominal and perineal muscles districts. The need for such a treatment have to be highlighted with a general evaluation (while often attention is focused on pelvic district) to identify postural defects, articular blocks (specially lumbo-sacral) or anomaly in respiratory dynamics.

2. external electrical stimulation was used to help patients to be conscious of the perineal district and then improve its muscles performance. It was performed using an anal probe with pulse generator (Pelveen Care, Coloplast, Bologna Italia). Indeed, an adequate electrical stimulation method, along with standard values of different parameters, have not yet been determined in patients with defaecatory disorders. Prior to therapy the electrical stimulation level fit for each patient, was evaluated by fixing it just below the point where

patient started to feel either discomfort or pain. Stimulation therapy was performed once a day, for 20 min over 10–12 sessions either at outpatient clinic or home.

3. Biofeedback (BFT) was performed using the electromyographic (EMG) biofeedback system (Pelveen Care, Coloplast, Bologna Italy). The visual feedback was provided by observing changes in pressure activity on a monitor screen. The patients were taught to practice mainly contraction and relaxation manoeuvres of the anal canal, meanwhile evaluating the activity of abdominal muscles or glutei/abductors muscles, by using the surface electromyography. Each session lasted 30–50 min over 10–14 sessions.

4. The principles of volumetric rehabilitation (VR) are based on the mechanical distension of the rectum (enema)

The aim of this technique is to restore the impaired rectal sensation. The technique involves the administration, twice daily, of a tepid water enema. The initial volume equals the manometric maximum tolerated volume (MTV) or conscious rectal sensitivity threshold (CRST) on the basis of the underlined defaecatory disorders. The subject is asked to hold the liquid after perceiving it in the rectum, by strongly contracting the anus for no more than 30 seconds. The last step is to expel the water through a relaxation of the pelvic floor and an effective abdominal straining. The goal of this rehabilitation technique is to let patient understand the three basic phases of the defaecatory act (perception; retaining; passing), in order to become aware of the pelvipерineal muscular activity. Thus, patients may improve their own rectal sensibility. Patients are instructed to self-administer the enemas at home.

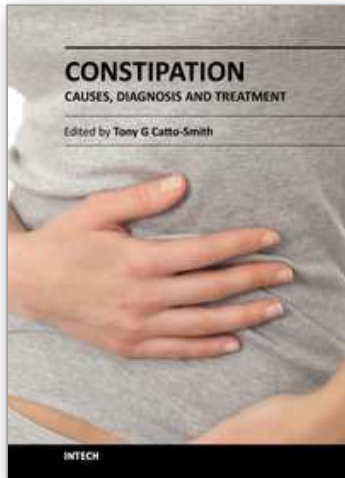
4. Results

In our study the diagnostic protocol revealed abnormal values in symptomatic patients compared to Healthy Controls. Particularly they showed significantly higher values of lumbar lordosis values as well as lower rate in the presence of both perineal defence reflex and puborectalis relaxation. Furthermore patients performed a worse PC tests and showed a higher rate of muscle synergies presence (either agonist or antagonist) as compared to controls. Instrumental diagnostic examination also evidenced important differences between groups for all analyzed parameters; both manometric and defecographic patterns resulted pathologically skewed in terms of values or percentage comparing patients with Healthy Controls. Rehabilitation treatment acted positively on symptoms and exerted a tangible action on all evaluated clinical-instrumental parameters. Along with the Wexner score, all clinico-physiatric parameters (lumbar lordosis, perineal defence reflex, pubo-rectalis relaxation, PC test and agonist and antagonist muscular synergies) significantly improved after treatment. Some parameters received a particularly positive influence by rehabilitation: correction of lumbar lordosis was rapidly achieved with restoration of physiologic posture by means of physiatric exercises and this allows to reach a correct extension of pubo-rectalis muscle and, consequently, a better function with an improved grade of relaxation. Also Pubococcygeal (PC) test (puborectalis contraction pattern) recorded a great improvement after treatment, both about the entity than about the duration of contraction and the muscular fatigue. This effect is clearly consequence of muscular exercise, as for any other skeletal muscle, and is associated to hypertrophy. For the same reason this effect is strictly dependent by exercise and in the long term, with a reduction of interest by patient, it tends to decrease. To the contrary improvement of agonist antagonist muscular synergies tends to be stable with time; rehabilitation produced a strong impact on this parameter by teaching

patients to correctly recruit muscles involved in one action and to selectively relax those opponents. This learned pattern of muscular contraction and relaxation involves many different anatomical structure, and his target is the instauration of an harmonic interaction between thoracic abdominal and pelvic districts. Clinical improvements reflexes on instrumental findings; particularly manometrics parameters showing positive modification were anal resting pressure, rectal sensation, recto-anal inhibitory reflex and duration of MCV, and balloon expulsion test. Those are expression of muscular reinforcement and coordination but also of sensitive improvement and consciousness. Finally both groups showed improvement in PAC-QOL after rehabilitation treatment. Scanty reports have been published in literature regarding the assessment of patients affected by rectal outlet obstruction and amenable for pelviperineal rehabilitation treatment. Our results seem to justify the need for conducting in patients with defaecatory disorders, an extensive diagnostic protocol based on the evaluation of 14 different parameters aiming to identify muscle dyssynergia. In our opinion, it would not seem fair to select patients on the basis of a single modified parameter (e.g. absence of puborectalis muscle relaxation) as usually reported by the majority of proctologists, whereas a thorough pre-treatment study protocol may help to better understand the physiopathologic mechanisms underlying each patient's clinical picture and to predict the impact of rehabilitation on outcome. The frequent finding of anatomical alterations in patients with constipation is probably the reason of the great rate of unrecognized functional disorders. Those anatomical abnormality are commonly considered the only responsible of symptoms and often the therapy is focused selectively on their correction with a complete omission of functional aspects also composing the clinical picture. Consequently surgical therapy of such a patient will be only a partial correction of the problem, with incomplete resolution of symptoms and predisposing to recurrence. A systematic evaluation of those patients, with particular attention to functional patterns, should be considered as a routine diagnostic protocol to clearly understand each aspect of the pathology and to allow a tailored surgical, rehabilitative or combined treatment.

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Constipation is common in both adults and children. Estimates would suggest a median prevalence of around 12-16% in the general population. While regarded as a minor nuisance in some cases, its consequences can be severe, with a substantial impact on quality of life. Secondary faecal soiling has a profound psychological effect at all ages. This book provides contributions from authors with a range of backgrounds which clarify the pathogenesis, diagnosis, and therapy of constipation for the general population and also for certain high risk groups.

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University Campus STeP Ri
Slavka Krautzeka 83/A
51000 Rijeka, Croatia
Phone: +385 (51) 770 447
Fax: +385 (51) 686 166
www.intechopen.com

InTech China

Unit 405, Office Block, Hotel Equatorial Shanghai
No.65, Yan An Road (West), Shanghai, 200040, China
中国上海市延安西路65号上海国际贵都大饭店办公楼405单元
Phone: +86-21-62489820
Fax: +86-21-62489821

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