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Editorial

The editors and staff of Pelviperineology would like to wish all our readers around the world a happy New Year and holiday season. Our readers are located in every part of the globe and include all ethnic and religious groups. Please accept our best wishes for whatever festival or celebration is appropriate. We are hoping that 2009 will be another successful year for our journal and associated societies.

This issue of Pelviperineology is the first published since our Congress in Padua and Venice which proved to be both a Scientific and Social success. AAVIS is raising the profile of multidisciplinary pelvic medicine as we seek out and welcome various opinions and views at our meetings. This policy is also represented by the papers accepted for publication in this journal.

In Venice and Padua a number of strong opinions were evident covering all the major controversies in pelvic medicine. In particular, the Venice meeting saw the publication of a major work by Petros, Swash et al which was printed in full and made up a complete issue of the journal. The magnitude of this work and the concepts that are presented are impressive at several levels but the conclusions are sure to be controversial. The current edition includes a detailed commentary on this work and the editors welcome any further opinions that might be forthcoming.

All around the world interest in pelvic medicine and surgery is increasing. This is especially so in the "other" specialties with more involvement by urologists and colorectal surgeons. Urogynecology is increasingly becoming "uro-colo-gynecology". This is quite a mouthful to pronounce but not quite as bad as "Pelviperineology".

Next year will see another International Pelviperineology Congress with the involvement of both the International Collaboration of the Pelvic Floor and the International Pelvic Floor Dysfunction Society. The 2009 meeting will be held at Noosa on the Sunshine Coast of Queensland, Australia, and in July we will welcome you this beautiful natural wonderland a few hours north of Brisbane. This meeting will involve the largest international faculty ever assembled for an Australian Pelvic Floor Meeting.

In the New Year we will be announcing an expansion of the Pelviperineology editorial advisory board. The main criterion to be involved in this journal is enthusiasm. We aim to providing a multidisciplinary journal with a special commitment to provide interesting articles from opinion leaders as well as documenting the experience of practicing clinicians. We seek the involvement of interested practitioners and submission of papers for publication is your opportunity to show your interest.

As always we are looking for quality papers to promote multidisciplinary medicine and report our experiences.

The Editors

Pelvic Floor Digest

*This section presents a small sample of the Pelvic Floor Digest, an online publication (**www.pelvicfloordigest.org**) that reproduces titles and abstracts from over 200 journals. The goal is to increase interest in all the compartments of the pelvic floor and to develop an interdisciplinary culture in the reader.*

FORUM

Meta-analysis: Its strengths and limitations. *Walker E, Hernandez AV, Kattan MW. Cleve Clin J Med. 2008;75:431.* A well-designed meta-analysis can provide valuable information for researchers, policymakers and clinicians, however there are many critical caveats in performing and interpreting them, and thus many ways in which meta-analyses can yield misleading information.

Scientific impact of women in academic surgery. *Housri N, Cheung MC, Koniaris LG, Zimmers TA. J Surg Res. 2008;148:13.* Although women comprise a small proportion of principal investigators on abstracts presented at the 2002-2004 conferences of the Association for Academic Surgery and Society of University Surgeons, the quality of their presented work is equal to or better than those of their male counterparts.

Regenerative biology and medicine. *Ferretti P. Regen Med. 2008;3:477.* Bioengineering and bionic intervention aim at achieving in mammals the functional repair that occurs spontaneously in lower vertebrates. Recent developments have hyped the prospects for regenerating tissues and organs, but the hurdles to be overcome are still considerable. An overview is given of both basic biological phenomena underlying repair and regeneration and of how this understanding could be used. In some instances it is already used.

Stem cell innovation in the USA: the benefits of the minimal state. *Salter B, Harvey O. Regen Med. 2008;3:597.* USA, UK, China, India, Australia and Singapore are developing strategies to enhance their competitive edge within the stem cell science and economy. Stem cell is an emerging global industry in which nation states compete fiercely for market advantage.

Advancing tissue engineering by using electrospun nanofibers. *Ashammakhi N, Ndreu A, Nikkola L et al. Regen Med. 2008;3:547.* Electrospinning is a versatile technique that enables the development of nanofiber-based scaffolds from a variety of polymers that may have drug-release properties. Combining fiber diameter, alignment and chemicals, offers new ways to control tissue engineering. There are already products based on electrospun nanofibers with drug-release properties for wound dressing in a Phase III clinical trial.

Informed consent and the law - an english legal perspective. *Hassan M. Dig Dis. 2008;26:23.* The 'patient-based' and the 'doctor-based' true informed consent approaches in relation to disclosure of risk are compared.

Payment by results and the surgeon: implications for current and future practice. *Jameson SS, Reed MR. Surgeon. 2008;6:133.*

1 – THE PELVIC FLOOR

Effects of pregnancy on pelvic floor dysfunction and body image; a prospective study. *Pauls RN, Occhino JA, Dryfhout V, Karram MM- Int Urogynecol J Pelvic Floor Dysfunct. 2008 Jun 20; epub.* Impact of pregnancy on pelvic symptom-related quality of life and body image was documented by Body Exposure During Sexual Activities Questionnaire, Urogenital Distress Inventory, Incontinence Impact Questionnaire and Fecal Incontinence Quality of Life Scale: poorest body image was noted in the postpartum period. Urinary symptoms worsen during pregnancy with recovery postpartum, while body image suffers most following pregnancy. Quality of life impact of fecal incontinence is stable.

2 – FUNCTIONAL ANATOMY

Histo-topographic study of the longitudinal anal muscle. *Macchi V, Porzionato A, Stecco C et al. Clin Anat. 2008;21:447.* The longitudinal anal muscle (LAM) is a vertical layer of muscular tissue interposed between the circular layers of the internal (IAS) and external (EAS) anal sphincters. From the anorectal junction it extends along the anal canal, receives fibers from the innermost part of the puborectalis and the puboanalis muscles, and terminates with seven to nine fibro-elastic septa, which traverse the subcutaneous part of the external anal sphincter, reaching the perianal dermis. It consists of predominantly outer striated muscle fibers and smaller numbers of inner smooth muscle fibers, respectively coming from the levator ani muscle and from the longitudinal muscular layer of the rectum. The helical course of striated and smooth muscle fibers between the EAS and IAS contribute not only to the narrowing but also to some shortening of the anal canal during sphincter contraction.

Purinergic and nitrergic junction potential in the human colon. *Gallego D, Gil V, Aleu J et al. Am J Physiol Gastrointest Liver Physiol. 2008 Jul 3; epub.* Single pulses elicit ATP release from enteric motor neurons that cause a fast inhibitory junction potential and a transient relaxation that is difficult to maintain over time. Nitric oxide is released at higher frequencies causing a sustained hyperpolarization and relaxation. These differences might be responsible for complementary mechanisms of relaxation being phasic (ATP) and tonic (NO).

Over expression of progesterone receptor b increases the sensitivity of human colon muscle cells to progesterone. *Cheng L, Pricolo VE, Biancani P, Behar J. Am J Physiol Gastrointest Liver Physiol. 2008 Jul 3; epub.* Colon muscle strips and cells from female patients with slow transit constipation (STC) exhibit impaired motility. Overexpression of progesterone receptors-B contributes to the motility and signal transduction abnormalities observed in female patients with STC with normal serum levels of progesterone.

3 – DIAGNOSTICS

Determining the cause of vulvovaginal symptoms. *Farage MA, Miller KW, Ledger WJ. Obstet Gynecol Surv. 2008;63:445.* Patients and clinicians may diagnose incorrectly vulvovaginitis symptoms and patients often self-treat with over-the-counter antifungals or home remedies, although they are unable to distinguish among the possible causes of their symptoms: infectious vulvovaginitis, allergic contact dermatitis, systemic dermatoses, rare autoimmune diseases, neuropathic vulvar pain syndromes.

Electronic pelvic floor symptoms assessment: tests of data quality of ePAQ-PF. *Jones GL, Radley SC, Lumb J, Jha S. Int Urogynecol J Pelvic Floor Dysfunct. 2008 Jun 14; epub.*

Three-dimensional endoanal ultrasound assessment of the anal sphincters during rest and squeeze. *Olsen IP, Augensen K, Wilsgaard T, Kiserud T. Acta Obstet Gynecol Scand. 2008;87:669.* After vaginal delivery the anal canal is shorter and the external sphincter smaller than 0-gravida. Active squeeze has no effect on the dimensions of the sphincter apart from a reduction of the internal sphincter in those who had undergone a complicated delivery, possibly due to a dislodging upwards during squeeze.

Three-dimensional endoanal ultrasound assessment of the anal sphincters: reproducibility. *Olsen IP, Augensen K, Wilsgaard T, Kiserud T. Acta Obstet Gynecol Scand. 2008;87:675.* 3D endoanal ultrasound is a technique for assessing the volume of the anal sphincters, but the reproducibility of the method is scarce, probably due to uncertainty in landmark identification.

4 – PROLAPSES

Feasibility and functional outcome of laparoscopic sacrocolporectopexy for combined vaginal and rectal prolapse. *Sagar PM, Thekkinkattil DK, Heath RM et al. Dis Colon Rectum. 2008 Jul 3; epub.* A laparoscopic procedure is described (10 patients) using a mesh fixation of the mid-compartment prolapsed vagina, with or without rectocele, to the sacrum with additional rectopexy to correct both the anatomical deformities and the dysfunction of the posterior compartment. The procedure corrects associated rectoceles and descent of the perineum on straining.

COL1A1 Sp1-binding site polymorphism as a risk factor for genital prolapse. *Rodrigues AM, Girao MJ, da Silva ID et al. Int Urogynecol J Pelvic Floor Dysfunct. 2008 Jun 13; epub.* The objective of this study was to verify the possible association between the Sp1-binding site polymorphism and genital prolapse, but there was not significant association.

Doppler-guided haemorrhoidal artery ligation: long-term outcome and patient satisfaction. *Wilkerson P, Strbac M, Reece-Smith H, Middleton S. Colorectal Dis. 2008 Jun 20; epub.* Doppler-Guided Haemorrhoidal Artery Ligation is a procedure relatively painless (6% of the 113 patients required analgesia), safe and effective (further surgery in 9%) for symptomatic stage I-III haemorrhoids, for which we have demonstrated long-term (30 months) durability and acceptability. Its role lies between office based procedures and more invasive operative interventions.

Life threatening sepsis and mortality following stapled hemorrhoidopexy. *Cirocco WC. Surgery. 2008;143:824.* Stapled hemorrhoidopexy has resulted in potential serious morbidity (perforation, sepsis, obstruction, Fournier's gangrene, rectovaginal fistula, intra-abdominal hemorrhage) and even mortality in the immediate postoperative period. These complications are often heralded by abdominal pain, urinary retention, and fever. Surgeons should be aware of all of the potential complications and associated warning signs and symptoms.

5 – RETENTIONS

Is Botulinum Neurotoxin Type A (BoNT-A) a novel therapy for lower urinary tract symptoms due to benign prostatic enlargement? A review of the literature. *Oeconomou A, Madersbacher H, Kiss G et al. Eur Urol. 2008 Jun 13; epub.* Intraprostatic injection of botulinum neurotoxin type A (BoNT-A) provides improvement in patients with lower urinary tract symptoms due to benign prostatic enlargment refractory to medical treatment. So far the therapy is still experimental.

Dorsal buccal mucosal graft urethroplasty for anterior urethral stricture by Asopa technique. *Pisapati VL, Paturi S, Bethu S et al. Eur Urol. 2008 Jun 9; epub.* Buccal mucosal graft substitution urethroplasty has become popular in the management of intractable anterior urethral strictures with good long-term results. Excellent results have been reported by both dorsal and ventral onlay techniques. The ventral sagittal urethrotomy approach is easier to perform than the dorsal urethrotomy approach, and is useful in long anterior urethral strictures.

Connective tissue disorder. A new subgroup of boys with slow transit constipation? *Reilly DJ, Chase JW, Hutson JM et al. J Pediatr Surg. 2008;43:1111.* Generalized joint hypermobility is higher in slow transit constipation children, particularly males, suggesting that a disorder of connective tissue synthesis plays a role in the etiology of constipation.

Clinical presentation and patterns of slow transit constipation do not predict coexistent upper gut dysmotility. *Zarate N, Knowles CH, Yazaki E et al. Dig Dis Sci. 2008 Jul 4; epub.* Slow transit constipation is associated with esophageal and small bowel motor abnormalities in a subset of patients and this could influence the clinical approach, particularly in those rare cases where surgical management is considered, but prediction of the upper gastrointestinal tract dysmotility on the basis of clinical history and characteristics of colonic transit is problematic.

Aggressiveness and hostility in the family environment and chronic constipation in children. *Lisboa VC, Felizola MC, Martins LA et al. Dig Dis Sci. 2008 Jul 1; epub.* In children with constipation a higher prevalence of some emotional aspects was observed.

Successful physical therapy for constipation related to puborectalis dyssynergia improves symptom severity and quality of life. *Lewicky-Gaupp C, Morgan DM, Chey WD et al. Dis Colon Rectum. 2008 Jun 27; epub.* Physical therapy for patients with "anismus" is associated with improvements in constipation-related symptoms and in quality of life.

Clinical and morphologic correlation after stapled transanal rectal resection for obstructed defecation syndrome. *Dindo D, Weishaupt D, Lehmann K et al. Dis Colon Rectum. 2008 Jun 25; epub.* The clinical improvement of obstructed defecation syndrome after stapled transanal rectal resection (STARR performed in 22 women) seems to correlate with morphologic correction of the rectal redundancy and intussusception.

Mediastinal and retro-/intraperitoneal emphysema after stapled transanal rectal resection (STARR-operation) using the Contour Transtar(R) stapler in obstructive defecation syndrome. *Schulte T, Bokelmann F, Jongen J et al. Int J Colorectal Dis. 2008 Jul 2; epub.*

Neurogenic chronic intestinal pseudo-obstruction: antineuronal antibody-mediated activation of autophagy via fas. *De Giorgio R, Volta U, Stanghellini V et al. Gastroenterology. 2008 May 15; epub.* In 6/25 patients with established neurogenic chronic intestinal pseudoobstruction CIP (20 women, 5 men) circulating antineuronal antibodies to enteric neurons were found. Novel evidence was provided that such antibodies may contribute to neuronal dysfunction.

6 – INCONTINENCES

Anal sphincter defects and anal incontinence symptoms after repair of obstetric anal sphincter lacerations in primiparous women. *Vaccaro C, Clemons JL. Int Urogynecol J Pelvic Floor Dysfunct. 2008 Jun 12; epub.* After anal sphincter laceration repair, anal incontinence symptoms occur in 43% of women and remain chronic in 11%. Incontinence is associated with increasing internal anal sphincter defect size (>/=45 degrees).

The effects of antimuscarinic treatments in overactive bladder: an update of a systematic review and meta-analysis. *Chapple CR, Khullar V, Gabriel Z et al. Eur Urol. 2008 Jun 20; epub.* Antimuscarinic agents are currently the first-line pharmacotherapy for overactive bladder. They are efficacious, safe, and well-tolerated treatments that improve health-related quality of life. Dry mouth (mild, moderate, severe) was the most commonly reported adverse event (29.6% on treatment vs 7.9% on placebo), followed by pruritus (15.4% on treatment vs 5.2% on placebo). Profiles of each drug and dosage differ and should be considered in making treatment choices.

Tolterodine extended release with or without tamsulosin in men with lower urinary tract symptoms including overactive bladder symptoms: effects of prostate size. *Roehrborn CG, Kaplan SA, Jones JS et al. Eur Urol. 2008 Jun 17; epub.* Men with smaller prostates and moderate-to-severe LUTS including overactive bladder symptoms benefited from tolterodine extended release (ER). Therapy with tolterodine ER+tamsulosin was effective regardless of prostate size. Tolterodine ER, with or without tamsulosin, was well tolerated and not associated with increased incidence of acute urinary retention.

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Retrospective Review

The TVT-O Procedure with the cough test in theatre: Preliminary retrospective case series study in the first 25 women

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Abstract: This retrospective case series analyses the outcomes of the first 25 women with stress urinary incontinence (SUI) who were treated by the procedure of TVT-O under local anaesthesia and sedation with the cough test performed in theatre. The study addresses the intraoperative, immediate and medium term postoperative complications and cure rate in absence and presence of intrinsic sphincter deficiency (ISD). In this study all 25 procedures were performed successfully under local anaesthesia and sedation. There were no intraoperative complications or postoperative urinary retention. The short term complication was groin pain in two women (8%) which completely resolved by 6 weeks post surgery. Of the women who had their surgery in the morning 86% were discharged on the same day (within 10 hours). Regarding the only woman on the morning list that was discharged the following day, the delay in her discharge was planned preoperatively due to her medical history. There was only one woman (4%) with intermediate long term complications who developed pain in the vagina that required excision of a small part of the tape. This did not affect her cure from SUI. Two women (8%) developed mild urinary urgency that did not require any further management. 10 women (40%) in the study had ISD with or without hypermobile bladder neck and five out of them had maximum urethral closure pressure less than 20 cm H_2O. Only one woman was lost to follow up, all the remaining 24 women (with and without ISD) were cured from SUI in their last follow up (average 13.4 weeks).

Key words: TVT-O; Stress urinary incontinence; Intrinsic sphincter deficiency.

INTRODUCTION

Stress urinary incontinence (SUI) is a common problem in women. An epidemiological study has showed that 30% of women aged 50 years old have urinary incontinence and that of these up to 70% have complaints of SUI.[1] The tension-free vaginal tape procedure (TVT) has revolutionized the treatment of female stress urinary incontinence (SUI).[2] Five years later Delmore described an outside-in transobturator approach for the surgical placement of suburethral tapes.[3] This new approach aims to avoid the potential complications associated with the retropubic approach such as injury to bowel, or major blood vessels and reduce the risk of injury to bladder or urethra. In 2003, de Leval J described the inside-out transobturator approach to insert the tape (TVT-O) It is advocated that this inside-out approach results in a more precise placement of the tape and this may further minimize the potential risks of perforation of the bladder and urethra that may happen with outside-in approach.[4] Suburethral slings are the preferred surgical treatment of SUI in presence of intrinsic sphincter deficiency (ISD). This is a retrospective case series analyzing the first 25 cases of the TVT-O procedures performed under sedation and local anaesthesia at Royal Darwin Hospital and Darwin Private Hospital. The study described the outcome of the procedure by looking at the intraoperative, immediate and medium term post procedure periods with particular analysis on its effect on SUI with or without ISD. The results shall be compared with other studies.

STUDY DESIGN, MATERIAL AND METHODS

The study sample included the first 25 consecutive women who underwent the procedure of TVT-O (Gynecare) and cystoscopy performed under sedation and local anaesthesia December 2004 to October 2007 at two hospitals in Australia (Royal Darwin Hospital and Darwin Private Hospital). The main author (NG) performed 23 procedures and the remaining two were performed under his direct supervision.

The patients' notes were analyzed retrospectively on a purpose made master sheet. The data collected included referral source, age, parity, presenting symptoms, previous hysterectomy or surgery for SUI or pelvic organ prolapse (POP), presence or absence of POP or hypermobile bladder neck (HMBN) during pelvic examination.

The data of preoperative urodynamic assessment (UDA) which was performed preoperatively in all patients was also tabulated. The UDA included uroflowmetry and filling cystometry. Intrinsic sphincter deficiency were identified in the following conditions: urinary incontinence on Valsalva or cough leak point pressure less than 60 cm H_2O or maximum urethral closure pressure (MUCP) of 20 cm H_2O or less. On diagnosis of urodynamic stress incontinence (UDSI) all women were advised on pelvic floor exercises (PFE) preoperatively and referred for physiotherapy. Women who had either been performing PFE or had no improvement with the same, were offered TVT-O and cystoscopy under sedation and local anaesthesia with the cough test to be performed in theatre. Women were also advised to continue PFE postoperatively. In women with preoperative diagnosis of ISD, the procedure of TVT versus TVT-O was discussed with them. They were informed that women with preoperative diagnosis of ISD the TVT procedure may have a higher cure rate than TVT-O; on the other hand, TVT has the potential risk of bowel or major blood vessels injury compared to TVT-O. The choice of each woman was respected.

Intraoperative complications such as bladder or urethral perforation, blood loss greater than 200 mls, blood transfusion or any other significant adverse event were tabulated.

Immediate postoperative complications that were evaluated included urinary retention, infection, thromboembolic events, return to theatre, blood transfusion or any other specific complication.

The medium term post operative assessment was performed at about six weeks post procedure. This included a detailed history, with special reference to the effect of the procedure on preoperative urinary symptoms and a physical examination to assess potential complications such as mesh erosion and/or recurrence of SUI. In this study, the procedure was considered to have failed if the patient reported persistence of stress leak and/or there was demonstrable urinary leakage on performing the cough test. UDA was not used postoperatively to assess the outcome of the procedure. The results of this study were compared with that of international studies.

Description of the local anaesthesia and sedation and cough test

In all the 25 women the procedure was planned to be performed under sedation and local anaesthesia. Patients are to be sedated first using a bolus of 1-2 mg midazolam, followed by propofol 1%infusion at a rate of 20-40 mls/hour titrated to effect. Then administration of local anaesthesia to the area of the suburethral vaginal incision, paraurethral lateral dissection, expected tape passage through the Obturator foramen and muscles and the exit on the skin of the inner upper part of the thigh on both sides. The local anaesthetic agent used was a total of 80-100 ml of 0.25% prilocaine with adrenaline (1:200,000). A small bolus of propofol (10-30 mg) and/or alfentanil (100-200 mcg) may be used when required in some patients during penetration of Obturator membranes. Once the tape is inserted on both sides, this is followed immediately by cessation of all sedation while cystoscopy is being performed to rule out any bladder or urethral injury. The bladder is filled to a volume similar to the volume when SUI was demonstrated during the preoperative UDA. When the patient is awake enough, the operative table is tilted head up about 30 degrees, then the patient is instructed to cough strongly and the tape is very slowly adjusted to the point when the urinary leakage just stops. Once this is achieved the table is returned back to the horizontal plane and vaginal skin is sutured using 2 or 3 interrupted 3/0 vicryl suture material. Then bladder is emptied via an in-out catheter and the patient transferred from the theatre with no indwelling catheter. Patient discharge is on the same day when the procedure is performed in the morning or on the following day when performed in the afternoon. Postoperative review in the clinic at 6 weeks post surgery is arranged prior to discharge.

RESULTS

History

Seventy two per cent of the patients were performed at the private hospital and 20 % were referred by other gynaecologists. The average age of patients was 52 years (range 39-66) with average parity of 3 (range 1-6). All women had at least one vaginal delivery in the past. Two women had one caesarean section (CS) and one woman had 2 CS as well as vaginal deliveries. All 25 patients (100%) had symptoms of SUI. The other reported urinary symptoms were: urge incontinence in 5 (20%), urgency in 9 (36%), frequency in 6 (24%) and nocturia in 5 (20%) patients. Three patients (12%) had undergone previous transabdominal surgery for SUI, one of which was confirmed to have been a Burch colposuspension and in two others this could not be verified. Ten women (40%) had undergone a hysterectomy and 6 (24%) POP repair in the past (Tab. 1).

Physical examination and UDA

Fifteen patients (60%) had POP, mostly 1st degree. All 15 patients had cystocele which was either alone or combined with another type of prolapse: 3 women had cystocele alone, 8 had cystocele and rectocele, 2 had cystocele, rectocele and uterine prolapse and 2 had cystocele, rectocele and vaginal vault descent. Most of these women had no specific symptoms related to the POP they had.

Hypermobility of the bladder neck were seen in 21 women (84%). Ten women (40%) in this study had ISD, 6 (60%) of them were in association with HMBN and 4 (40%) of them were ISD alone. Of the ten women with diagnosis of ISD 5 women (50%) had MUCP < 20 cm H_2O, 4 women had leakage on valsalva and the remaining patient had leakage on valsalva and the cough leak point pressure was less than 60 cm H_2O, this patient was lost to follow up. Two women (8%) had Detrusor instability (DI) (Tab. 2).

TABLE 1. – *Patients History.*

	Number	***%***
Public	7	28%
Private	18	72%
GP referral	20	80%
Specialist Ref	5	20%
Age	39-66 years	
Parity	1-6	3
Presence of SUI	In all women	100%
Urgency	9/25	36%
Urge incontinence	5/25	20%
Frequency	6/25	24%
Nocturia	5/25	20%
Previous surgery for SUI	3/25	12%
Previous Hysterectomy	10/25	40%
Previous POP repair	6/25	24%

Intraoperative and short term Complications and Hospital Stay

In all 25 women the TVT-O and cystoscopy procedures were successfully completed under local anaesthesia and sedation. There were no intraoperative complications such as bladder or urethral perforation, excessive blood loss and none developed post-operative urinary retention. One woman experienced two episode of nocturnal enuresis on the 2nd and 7th postoperative and day that resolved after administration of 1 mg tolterodine orally for two weeks. When the patient was reviewed 5 weeks later she was asymptomatic with no nocturia or SUI. Two patients (8%) developed significant pain in the upper thigh that required inpatient stay for 48 hours. They were pain-free by 6 weeks post surgery.

Of the women who had their surgery in the morning 86% were discharged on the same day (within 10 hours). The only one in this group who was discharged the following day, was an elective delayed discharge based on her medical history: This patient was on warfarin due to multiple heart conditions including an artificial pace maker. She was switched to Clexane preoperatively, and an indwelling urinary catheter was left overnight. Residual urine was < 50 ml the following morning and she was discharged home without any complications. Two of the women on the afternoon list were discharged on the same day (within 6 hours). A total of 23/25 (92%) were discharged within 24 hours of their surgery with only 2 patients (8%) required admission for more than 24 hours because of significant pain in the upper thigh that required more analgesia & physiotherapy. Both were discharged within 48 hours (Tab. 3).

TABLE 2. – *Preoperative physical examination and UDA.*

	Number	***%***
Presence of POP	15	60%
HMBN	21	84%
ISD	10	40%
HMBN + ISD	6	24%
ISD alone	4	16%
DI	2	8%

HMBN = Hypermobile bladder neck; ISD = Intrinsic sphincter deficiency; DI = Detrusor instability.

TABLE 3. – *Intraoperative and short term complications and Hospital stay.*

	Number	*%*	*Comments*
Intraoperative complications	0	0%	
Short term Urinary retention	0	0%	
Short Term DI	0	0%	One woman had 2 episode of nocturnal enuresis on the 2nd and 7th postoperative and day that resolved by the time she was reviewed 5 weeks later
Short term postoperative complications	2	8%	2 patients (8%) developed significant pain in the upper thigh that resolved by 6 weeks post surgery
AM list	7	28%	
Discharge of AM list on same day	6/7	86%	
PM List	18	72%	
Discharged on the same day	2/18	11%	
Discharged next morning	14/18	78%	
Discharged within 48 hours	2/18	11%	

Follow Up

Most of the patients were reviewed about 6 weeks post surgery, however 15 patients (60%) were reviewed again after this routine six weeks post surgery check-up visit. These further follow up visits were for either further reviews or due to consultations for other unrelated gynaecological conditions. Only one woman was lost to follow up. The average duration of follow-up was 13.4 weeks and the range was 4-52 weeks. The average duration between procedure and time of audit was 53 weeks and the range was 7-156 weeks. As early cases performed nearly 3 years ago, the absence of re-referral supports the assumption of a longer term successful post operative outcome right up to the time of audit.

In all these visits patients were assessed by history taking and pelvic examination to check for recurrence of SUI or other urinary symptoms and also to examine for any evidence of mesh erosion. Two patients were assessed by their referring gynaecological specialist who updated our records by the clinical assessment of the patient. Cure was diagnosed when patients express no further SUI and also in most patients negative cough test was performed in the outpatient clinic. One patient was lost to follow up; all the remaining 24 patients had no further SUI in their last consultation and were considered cured (Tab. 4).

There were two women (8%) who developed mild urgency and both patients did not wish to have repeat UDA nor any medication for the same. The only significant complication in this series happened to a patient who had TVT-O seven months following a total Prolift procedure.[5] She presented herself about 3 months following the TVT-O complaining of pain inside the vagina. There was no recurrence of her SUI. Clinical examination revealed a tender spot on the right side of the lower anterior vaginal wall where the TVT-O mesh penetrates the Obturator membrane; there was no evidence of mesh erosion, granuloma formation or recurrence of the prolapse. The patient was admitted as a day procedure where she was examined under anaesthesia; there was no evidence of mesh erosion. The vaginal skin was incised over the tender spot described above and about 1 cm of the TVT-O mesh was excised up to where it penetrates the Obturator membrane. The vaginal skin was then well mobilized before it was sutured. When she was reviewed in the out patient clinic, the patient was asymptomatic with no further pain or recurrence of SUI. On further review 6 weeks later there was no recurrence of pain in the vagina, but occasional pain in right lower quadrant when bending over. She is due for a further review in 6 months time from her last visit.

DISCUSSION

The TVT procedure has recently replaced Burch colposuspension as the gold standard surgical procedure for treatment of SUI. A systematic review of seven randomized trials of TVT or laparoscopic Burch colposuspension for treatment of SUI showed no significant difference for the two procedures in the rate of complications and subjective cure rates at 18 months but the objective cure rates was in favour of the TVT procedure. The TVT was associated with a shorter operative time and hospital stay.[6] Several studies have noted that transobturator approaches had similar success rates to TVT. Bladder injuries and voiding difficulties were more common with TVT, but vaginal injuries and mesh erosion were more common with transobturator approaches.[7] Several studies have shown that TVT-O has a shorter operative time than TVT.[8-10]

In this study all 25 procedures were performed successfully under local anaesthesia and sedation. There were no any intraoperative complications or postoperative urinary retention. The short term complication was groin pain in two women (8%) which completely resolved by 6 weeks post surgery. Of the women who had their surgery in the morning 86% were discharged on the same day (within 10 hours). The only woman on the morning list that was discharged the following day, the delay in her discharge was planned preoperatively due to her medical history. There was only one woman (4%) with intermediate long term complications who developed pain in the vagina that required excision of small part of the tape. This did not affect her cure from SUI. Two women (8%) developed mild urinary urgency that did not require any further management. One woman was lost to follow up and the remaining 24 women in the study were cured from SUI following the TVT-O procedure.

In a recent prospective observational study of 44 women who underwent TVT-O and had follow up visits at 3 and 12 months after surgery, 42.8% were cured, significant improvement in 17.1%, no improvement in 20% and deterioration in 8.7%. There was one bladder perforation. Significant haemorrhage occurred in 2 patients that required intervention. Three

TABLE 4. – *Follow up and intermediate-term outcome.*

	Number	*%*	*Comments*
Duration of FU			Average = 13.4 weeks Mean = 4-2 weeks
Duration to Audit			Average = 53 weeks Mean = 7-156 weeks
Intermediate-term urinary retention	0	0%	
Intermediate-term urgency	2	8%	Two woman developed mild urgency
Other intermediate-term complications	1	4%	Pain in the vagina required excision of part of the tape (see text)
No further USI at follow up	24	100%	One woman was lost to follow up

women (6.8%) had high residual urine >150 ml after removal of the urethral catheter, so it had to be re-inserted for one more day. The mean hospitalization was 3.75 days. The incidence of de novo urge incontinence was 13.5%. Five patients (11.4%) complained of groin pain but this was resolved at follow up at 3 and 12 months. It was described in this study that in 39 cases the operation was performed under subarchnoid anaesthesia, in 4 cases under extradural anaesthesia and in one patient under general anaesthesia.[11]

In another prospective observational study from Belgium 102 women had TVT-O procedure and followed up for at least one year. 70.6%, 28.4% and 1% received spinal, general and local anaesthesia respectively. The woman who had local anaesthesia had sedation also. There was no urethral or bladder injury. One patient had vaginal sulcus laceration. There was no mesh erosion. Some patients complained of transient groin pain. The range of hospital stay was 1-4 days with a median of 1 night. Two patients had high residual urine that required placement of suprapubic catheter in one patient and intermittent self catheterization in the other one. It was reported that at their last visit the 2 women were cured of SUI with absent high residual urine and no de novo urge symptoms. Two women who underwent concomitant surgery for pelvic organ prolapse developed complete urinary retention that required immediate tape release. The tape was sectioned in another 2 women because of recurrent urinary tract infection and/or urgency associated with chronic retention 4 and 7 months after the TVT-O respectively. The cure rate in this study was reported as 91%.[12] The authors of the above study followed the same patients for a minimum of 3 years. There was no erosion or persistent pain noted, disappearance and improvement of SUI were observed in 88.4% and 9.3% respectively.[13]

In a study comparing the Monarc versus the TVT-O procedure in 50 patients in each group, all the procedures were performed under sedation and local anaesthesia. In the TVT-O group the post operative complications were: 1 case of urinary tract infection, another woman had transient urinary retention, 4 patients had pain in the thigh and one patient had de novo urgency. The overall cure rate at one year was 94%.[14]

Prior studies show that low MUCP has a negative effect on the cure rate after continence surgery.[15]

In our study 10 patients (40%) had ISD with or without HMBN. Five (50%) of them had MUCP less than 20 cm H_2O, 4 had leakage on Valsalva, the remaining patient (who was lost to follow up) had leaking on Valsalva and cough leak point pressure less than 60 cm H_2O. All nine patients who attended their follow up were cured by the procedure of TVT-O and cough test performed in theatre.

Miller et al., compared the transobturator procedure (Monarc, American Medical System) with that of TVT in patients with borderline MUCP. In this study MUCP of 20 cm H_2O or less was exclusion criteria for transobturator tape (Monarc) but not TVT. The borderline MUCP was considered as 42 cm H_2O or less. The study conclusion was: In women with preoperative MUCP of 42 cm H_2O or less, the MONARC was nearly 6 times more likely to fail than TVT at 3 months after surgery.[16]

CONCLUSION

TVT-O under local anaesthesia and sedation is very effective and safe surgical treatment of SUI in women with or without ISD. Our results achieved 100% cure rate with limited complications which compares very favourably with other studies.

We acknowledge the small number of the patient in this study and the relatively short term follow up period. We are looking forward to a large prospective randomized controlled study to compare the outcome in women with SUI in whom the TVT-O procedure is to be performed with and without the cough test in theatre. Also within each group, the outcome is compared in women with and without ISD.

REFERENCES

1. Hannestad YS, Rortveit G, Sandvik H, Hunskaar S, Norwegian EsEolit-CoN-T. A community-based epidemiological survey of female urinary incontinence in the County of Nord-Trondelag. J Clin Epidemiol 2000; 53: 1150-7.
2. Ulmsten U, Henriksson L, Johnson P and Varhos G. An ambulatory surgical procedure under local anaesthesia for treatment of female urinary incontinence. Int Urogynecol J Pelvic Floor Dysfunction 1996; 7: 81-5.
3. Delorme E. Transobturator urethral suspension: mini-invasive procedure in the treatment of stress urinary incontinence in women. Prog Urol 2001; 11: 1306-13.
4. de Leval J. Novel surgical technique for the treatment of female stress urinary incontinence: transobturator vaginal tape inside-out. Eur Urol 2003; 44: 724-30.
5. Gad N, Moller M. Preliminary retrospective case series study of the outcome of Prolift technique in thirty women with pelvic organ prolapse including its effect on stress urinary incontinence. Pelviperineology 2007; 26: 156-60.
6. Dean N, Herbison P, Ellis G, Wilson D. Laparoscopic colposuspension and tension-free vaginal tape: a systemic review. BJOG 2006; 113: 1345-53.
7. Latthe P, Foon R,Toozs-Hobson P.Transobturator and retropubic tape procedures in stress urinary incontinence: a systematic review and meta-analysis of effectiveness and complications. BJOG 2007; 114: 522-31.
8. Liapis A, Bakas P, Giner M, Creatsas G. Tension-free vaginal tape versus tension-free vaginal tape Obturator in women with stress urinary incontinence. Gynecol Obstet Invest 2006; 62: 160-4.
9. Neuman M. TVT and TVT-Obturator: Comparison of two operative procedures. Eur J Obstet Gynecol Reprod Biol 2007; 131: 89-92.
10. Lee KS, Han DH, Choi YS, et al. A prospective trial comparing tension-free vaginal tape and transobturator vaginal tape inside-out for the surgical treatment of female stress urinary incontinence: 1- year follow up. J Urol 2007; 177: 214-8.
11. Jakimiuk AJ, Maciejewski T, Fritz A, et al. Surgical treatment of stress incontinence using tension-free vaginal tape-obturator system (TVT-O) technique. Eur J Obstet Gynecol Reprod Biol 2007; 135: 127-31.
12. Waltregny D, Reul O, Mathantu B, et al. Inside Out Transobturator Vaginal Tape for the Treatment of Female Stress Incontinence: Interim Results of a Prospective Study After a 1-Year Minimum Followup. J Urol 2006; 175: 2191-95.
13. Waltregny D, Gasper Y, Reul O. et al. TVT-O for the Treatment of Female Stress Incontinence: Results of a Prospective Study after a 3-Year Minimum Follow-Up. Eur Urol 2008; 53: 401-8.
14. Debodinance P. Trans-obturator urethral sling for surgical correction of female stress urinary incontinence: outside-in (Monarc) versus inside-out (TVT-O). Are both ways safe? Euro J of Obstet Gynecol Reprod Biol 2007; 133: 232-8.
15. Sand PK, Bowen LW, Panganiban R, Ostegard DR. The low pressure urethra as a factor in failed retropubic urethropexy. Obstet Gynecol 1987; 69: 399-402.
16. Miller JJ, Botros SM, Aki MN, et al. Is transobturator tapes as effective as tension-free tape in patients with borderline maximum urethral closure pressure? Am J Obstet Gynecol 2006; 195: 1799-804.

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Review

Modern surgical management of haemorrhoids

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Abstract: Haemorrhoidal disease is one of the commonest anorectal disorders. Treatment options are dependent upon the severity of symptoms and the extent of haemorrhoidal prolapse with up to 10% of patients requiring surgical intervention. The traditional surgical treatment for haemorrhoids is excisional haemorrhoidectomy. The Milligan Morgan technique, first described in 1937, is the most popular technique and remains the gold standard for surgical intervention. However haemorrhoidectomy is recognised as a painful procedure with a risk of significant complications and remains unpopular with the general population. Using advances in medical equipment and an understanding of the pathophysiology of haemorrhoidal disease new approaches to the surgical treatment of haemorrhoids have now been developed. Stapled haemorrhoidopexy reduces haemorrhoidal tissue prolapse by excising a ring of the prolapsed anal mucosa above the dentate line, using a specific circular stapling device. Haemorrhoidal artery ligation (HAL) uses a Doppler transducer to identify haemorrhoidal arteries which can then be ligated, reducing haemorrhoidal venous plexus pressures and haemorrhoidal artery ligation with recto anal repair (HAL-RAR) combines HAL with a procedure to plicate and draw up prolapsing haemorrhoidal tissue. This article reviews the evidence for the different surgical techniques; focussing on treatment outcomes including rates of recurrent disease and post operative complications.

Key words: Internal haemorrhoids; Haemorrhoidectomy; Stapled haemorrhoidopexy; Doppler-guided hemorrhoidal artery ligation; Recto-anal repair.

INTRODUCTION

Haemorrhoidal tissue is a normal component of the anal canal and is composed predominantly of vascular tissue, supported by smooth muscle and connective tissue. It's function is to provide complete closure to the anus at rest and protection of the underlying muscle during defaecation.[1] Haemorrhoidal disease is one of the most common anorectal conditions[2] although the exact incidence is difficult to determine because many people are reluctant to seek medical advice due to various personal, cultural and socioeconomic reasons.[3] Estimates of the proportion of the UK population affected range from 4.4% to 24.5%[4] whilst more than 15 million people are believed to be affected annually within the United States.[5]

Internal haemorrhoids result from chronic engorgement of the three submucosal venous plexi of the anal canal and originate above the dentate line.[6] With the weakening or fragmentation of the supportive connective tissue framework combined with the repeated passage of hard stool and straining producing a shearing force, these vascular cushions descend and prolapse.[3] The degree of resultant prolapse is used to grade internal haemorrhoids using Goligher's classification system: Grade I: haemorrhoids non prolapsing; Grade II: haemorrhoids prolapse on straining but reduce spontaneously; Grade III: haemorrhoids require manual reduction; Grade IV haemorrhoids are non-reducible.[7] Symptoms resulting from internal haemorrhoids are commonly bright red bleeding per rectum, mucosal prolapse or protrusion, and puritus ani.[6] Pain is not characteristic unless there has been thrombosis or strangulation of the haemorrhoid which possibly can lead to gangrene[8] and it should be noted that severity of symptoms do not necessarily correlate with the degree of haemorrhoidal prolapse.[9]

Conservative treatment has traditionally been recommended for the treatment of Grade I and II haemorrhoids including; changing bowel habit through dietary and lifestyle changes, increased oral hydration and the use of stool softeners and laxatives. Increased dietary fibre has been demonstrated to be consistently beneficial in relieving overall symptoms and bleeding.[10] Non surgical interventions include rubber band ligation, injection sclerotherapy, cryotherapy, laser therapy, diathermy coagulation and infrared coagulation.[9] These can be performed in an outpatient setting and are considered to be primary options in the treatment of grade I-III haemorrhoids.[11] Meta analysis of outcomes from these interventions has demonstrated rubber band ligation to be the most effective in terms of response to treatment and reduced requirements for further intervention.[11]

Surgical intervention is usually the treatment of choice for grade III-IV haemorrhoids, prolapsed grade II haemorrhoids that have failed to respond to non surgical treatments, and circumferential grade II haemorrhoids.[4] This is estimated to be approximately 10 % of all patients 12 and in 2004-5 of approximately 23,000 haemorrhoidal procedures carried out in England, 8,000 were surgical excisional interventions.[4]

SURGICAL HAEMORRHOIDECTOMY

Surgical haemorrhoidectomy involving excision of the haemorrhoidal cushions is the traditional surgical approach used for treating haemorrhoids.[13] It is a technique that has been demonstrated to have successful long-term results and has been previously stated as the only effective treatment for large external haemorrhoids.[14] There are two popular, well established, methods of surgical excision: the "open" Milligan Morgan excision and the "closed" Ferguson method.[2] The Milligan Morgan technique was first described in 1937 and involves dissection of the haemorrhoid off the underlying anal sphincter complex and ligation of the vascular pedicle.[15] The resulting mucosal defects are left open to granulate by secondary intention.[3] The Ferguson operation, described in 1959, is essentially a modification of the Milligan Morgan procedure in which the mucosal defect edges and skin are closed with a continuous suture.[16] The Milligan Morgan procedure is the most widely practiced technique and is considered the current 'gold standard' for surgical management[17] although it should be noted the closed technique is more popular in the United States.[3] Both operations have been demonstrated to be equally effective and safe, however, the closed technique has been demonstrated to result in faster wound healing[18] and one randomised controlled trial demonstrated improved long term patient anal continence following closed surgery.[19]

Unfortunately there is significant morbidity associated with surgical haemorrhoidectomy. In particular it has a reputation for being an extremely painful procedure for a fairly benign condition.[20] Other significant short term complications include; urinary retention (20.1%), bleeding (secondary or reactionary) (2.4%- 6%), and subcutaneous abscesses (0.5%) whilst documented long term complications include anal fissure (1%-2.6%), anal stenosis (1%), incontinence (0.4%), fistula (0.5%) and recurrent haemorrhoidal symptoms (20%).[9]

Modifications to the original Milligan Morgan technique have been described including diathermy haemorrhoidectomy as opposed to scissor dissection[21] and more recently the use

of ultrasonic scalpel, laser and bipolar electrothermal device in an attempt to reduce post operative pain and blood loss and to permit faster wound healing and a quicker return to normal activities.[22] However a meta-analysis of the use of Ligasure (a bipolar electrothermal device) demonstrated a reduction in operative time and blood loss but no advantages in terms of pain or recovery of normal activity [2] and a literature review by Cheetham and Phillips concluded there was no evidence to support the practice of laser haemorrhoidectomy and whilst diathermy haemorrhoidectomy achieves good haemostasis it is not superior to conventional techniques.[23]

Spasm of the internal anal sphincter appears to play a significant role in the origin of pain following haemorrhoidectomy.[24] To relieve this spasm techniques have included surgical sphincterotomy,[25] reversible chemical sphincterotomy using topical application of 0.2% glycerol-trinitrate (GTN) ointment or 2% Diltiazem cream and injection of botulinum toxin.[24] Lateral sphincterotomy can be performed through one of the haemorrhoidectomy wounds [26] but is associated with a risk of significant long-term sequelae including symptoms of incontinence of flatus and difficulty with perianal hygiene after defaecation in up to 20% of patients.[14] Chemical sphincterotomy using topical creams has the advantage of causing only a temporary sphincter relaxant and is thus much safer for patient continence. However, despite inducing enhanced wound healing, application of GTN or diltiazem, results in only limited reduction of pain symptoms [27, 28] and there have been problems with side effects, most notably headaches.[29] A single intra operative injection of Botulinum toxin into the internal anal sphincter has been demonstrated to reduce post operative anal canal resting pressures but resulted in similar levels of pain upon defaecation as compared to using GTN ointment.[30]

Other techniques to reduce post operative pain following haemorrhoidectomy have included the use of laxatives pre and post operatively, perioperative use of local anaesthetics and analgesics [3] and the prophylactic use of oral metronidazole following surgery to prevent secondary infection.[14] Despite all of these practices, even when used in conjunction, there has still only been a limited reduction in post operative pain. There are also continuing concerns regarding the risk, if small, of significant complications for the treatment of a benign condition and recurrent disease remains a problem. In an attempt to elevate these issues alternative surgical techniques have been developed.

STAPLED HAEMORRHOIDOPEXY

Stapled haemorrhoidopexy, also known as 'procedure for prolapse and haemorrhoids' (PPH), stapled anopexy, stapled prolapsectomy and stapled mucosectomy, was first described in 1998 by Longo as an alternative to conventional excisional haemorrhoidectomy.[31] It is a technique that reduces the prolapse of the haemorrhoidal tissue by excising a ring of the prolapsed anal mucosa above the dentate line, using a specific circular stapling device that results in a mucosa to mucosa anastomosis. This both reduces the potential for available rectal mucosa to prolapse and interrupts the blood supply to the haemorrhoids.[4] As a result of the excision occurring above the dentate line it is believed to avoid the painful wound in the somatically innervated anoderm.[32] Early small randomised controlled trials comparing stapled haemorhoidopexy to traditional surgery reported it to be less painful, to have better patient acceptance with quicker post operative recovery times plus be more compliant for use in a day surgical setting making in more economical.[17] These encouraging reports combined with continuing concerns regarding pain associated with excisional surgery ensured that stapled haemorrhoidopexy has rapidly become a popular alternative surgical therapy.

The initial enthusiasm for stapled haemorrhoidopexy was however tempered by reports of serious surgical complications including; pelvic sepsis, rectal obstruction, rectal perforation and staple line dehiscence.[33, 34] New post operative symptoms including faecal urgency and anal pain were described following the procedure [33] and there were continuing questions concerning the long term effectiveness of the technique. Meta analysis of randomised trials performed comparing the two surgical techniques have subsequently demonstrated that whilst stapled hamorrhoidopexy is quicker to perform, less painful post operatively and with similar complication rates to conventional haemorrhoidectomy; patients are significantly more likely to have recurrent disease with increased problems of symptom recurrence and prolapse in long term follow up.[17, 35] It was also stated that there was insufficient evidence to advocate performing the stapled procedure in a day case setting.[35] The studies concluded that conventional surgery offers a more effective cure for grade IV haemorrhoids and remains the 'gold standard' in the surgical treatment of haemorrhoids particularly if recurrence and prolapse are the most important clinical outcomes.[17, 35] It should however be noted that the National Institute for Health and Clinical Excellence (NICE) which appraises new medical technologies for use in the NHS of England and Wales (in terms of proven clinical and cost-effectiveness) recommended in September 2007 the use of stapled haemorrhoidopexy for the treatment of prolapsed internal haemorrhoids as it concluded that the level of post operative pain and the length of the recovery period would be the deciding factors in the choice for procedure rather than any increased risk of prolapse or the need for re-intervention.[4] This highlights the potential and need for alternative, painless surgical techniques that can also reduce symptomatic recurrence rates.

HAEMORRHOIDAL ARTERY LIGATION

Haemorrhoidal artery ligation (HAL) is a novel non-invasive surgical treatment for haemorrhoids that was developed by the Japanese surgeon Morinaga in 1995.[36] It is a technique that is based upon an understanding of the pathogenesis and arterial inflow to haemorrhoids and can potentially be performed under sedation and/or local anaesthesia. The procedure entails precise identification of the superior rectal arteries supplying haemorrhoids using a Doppler transducer located in the side wall of a special proctoscope. Using an applied frequency of 8.2 Mhz and an introduction angle of approximately 60° a screening depth of approximately 7 mm is provided.[37] This enables identification of the haemorrhoidal arteries which are then selectively suture ligated 2-3 cm above the dentate line through a lateral ligation window within the proctoscope (situated proximally to the transducer). Ligation of these arteries prevents inflowing blood to the haemorrhoidal venous plexi. This causes a reduction in plexi internal pressures and subsequently results in both a cessation of haemorrhoidal bleeding and shrinkage of haemorrhoidal tissues.[36] Various centres across Europe and America have adopted this technique with minor modifications and using different names (including: Doppler guided Haemorrhoidal artery ligation (DG-HAL) and Transanal haemorrhoidal dearterialisation (THD)); however the basic principle has remained the same.

Morinaga et al's initial study reported promising results using the HAL on 116 patients. One month post the procedure symptoms of bleeding had stopped in 96% of the patients, 95% had pain relief and 78% had improvement in prolapse symptoms.[36] These results have been replicated by several other single centre studies of larger sample sizes.[37-39] These studies also demonstrated that the technique is well

tolerated, is a relatively painless procedure and is able to be performed with reduced anaesthetic intervention using sedation and/or local anaesthesia. To date there is only one published randomised trial comparing conventional haemorrhoidectomy to haemorrhoidal artery ligation.[40] It reported both techniques to be equally effective in terms of the treatment of symptoms and recurrence rates one year follow up, but found HAL to be initially less painful and result in reduced length of hospital admission. It must however be noted that this study is small with only thirty patients in each group and the results of larger randomised trials are awaited.

Morinaga documented concerns regarding potential injury to the urethra, vagina and prostate when performing the arterial ligation however his initial group had no major complications [36] and the risk of major complication has found to be only minimal in all studies to date. Scheyer et al reported in their study of three hundred and eight patients that one patient developed proctitis and one other a submucosal fistula.[37] Other complications they recorded included; bleeding, thrombosis, defaecation pain, anal fissures, urinary retention, urinary infections and stool retention [37] but at reduced rates when compared to studies for conventional haemorrhoidectomy.[9] Similar complication rates were found in Dal Mante et al's study.[38]

The majority of patients treated by the HAL technique in studies to date have suffered with grade II or III haemorrhoids with only small numbers of grade IV patients. Whilst the technique clearly appears effective in treating symptoms of bleeding (which makes physiological sense given that the haemorrhoidal arterial branches are ligated) it potentially is not so beneficial for prolapsing symptoms. Scheyer et al reported post operative complications rates of residual protrusion at almost 60% in Grade IV patients compared to only 6.7% in Grade II patients and questioned whether the technique is indicated for Grade IV haemorrhoids.[37] The problem appears to be that the symptomatic redundant haemorrhoidal tissue often does not completely shrink back.

HAEMORRHOIDAL ARTERY LIGATION AND RECTO ANAL REPAIR (HAL-RAR)

In order to resolve the problem of symptomatic redundant haemorrhoidal tissue remaining following HAL; the technique was modified at the end of 2005 to additionally include a Recto Anal Repair (HAL-RAR). The HAL-RAR procedure involves haemorrhoidal artery ligation followed by plication of the redundant haemorrhoidal tissue, drawing it back up into the anus where the tissue scars over and integrates back into the anal tissue. Thus there is both a disruption of arterial blood into the venous plexi and a reduction of the prolapsing tissue. The RAR portion of the procedure enables symptoms resulting from prolapse such as mucus, puritus and occasional seepage of stool to be resolved making it potentially more beneficial for those patients with Grade III or IV disease. The inclusion of the RAR does however appear to make the procedure more painful than a HAL alone but it is still able to be performed under conscious sedation and has been documented to provide significant symptomatic relief.[41] To date there are no published studies to demonstrate long term outcomes and complication rates from HAL-RAR procedure.

CONCLUSION

Although haemorrhoidectomy is currently the 'gold standard' surgical treatment for haemorrhoids, because of its' proven effectiveness, there is a rapid expansion in the use of modern, new techniques. Post operative pain following haemorrhoidectomy appears to be the most important motivating factor in the drive to acquire better treatment options. stapled haemorrhoidopexy has been found to significantly reduce post operative pain and appears to be well tolerated by patients. It has been demonstrated to be an effective haemorrhoidal treatment however there are still concerns if recurrence and prolapse are the most important clinical outcomes and there remains a small risk of serious post operative complications. Overall HAL has so far proven to be a painless, safe and efficacious method to treat haemorrhoids particularly if bleeding is the main complaint. The techniques effectiveness in treating prolapse symptoms is not clear. Combining HAL with a recto anal repair (HAL-RAR) potentially resolves this issue and still enables the procedure to be relatively pain free although at present there is no supporting published data. To provide the most effective surgical treatment it is necessary to choose the appropriate technique tailored to the individual patients' clinical symptoms.

REFERENCES

1. Kodner IR, Fry RD, Fleshman JW, Binbaum EH. Colon, Rectum, and Anus. In: Schwartz SI, Shires GT, Spencer FC, editors. Principles of Surgery. 1994. 1191-1318.
2. Tan EK, Cornish J, Darzi AW, Papagrigoriadis S, Tekkis PP. Meta-analysis of short-term outcomes of randomized controlled trials of LigaSure vs conventional hemorrhoidectomy. Arch Surg 2007; 142: 1209-1218.
3. Acheson AG, Scholefield JH. Management of haemorrhoids. BMJ 2008; 336: 380-383.
4. NICE technology appraisal guidance 128 stapled haemorrhoidopexy for the treatment of haemorrhoids. 1-9-2007. Ref Type: Report.
5. Johanson JF. Nonsurgical treatment of hemorrhoids. J Gastrointest Surg 2002; 6: 290-294.
6. Thomson WH. The nature of haemorrhoids. Br J Surg 1975; 62: 542-552.
7. Sardinha TC, Corman ML. Hemorrhoids. Surg Clin North Am 2002; 82: 1153-67, vi.
8. Milson JW. Hemorrhoidal Disease. In: Beck DE, Wexner S.D, editors. Fundamentals of Anorectal Surgery. 1992. 192-214.
9. Shanmugam V, Thaha MA, Rabindranath KS, Campbell KL, Steele RJ, Loudon MA. Rubber band ligation versus excisional haemorrhoidectomy for haemorrhoids. Cochrane Database Syst Rev 2005; 3: CD005034.
10. Onso-Coello P, Guyatt G, Heels-Ansdell D, Johanson JF, Lopez-Yarto M, Mills E et al. Laxatives for the treatment of hemorrhoids. Cochrane Database Syst Rev 2005; 4: CD004649.
11. MacRae HM, McLeod RS. Comparison of hemorrhoidal treatment modalities. A meta-analysis. Dis Colon Rectum 1995; 38: 687-694.
12. Bleday R, Pena JP, Rothenberger DA, Goldberg SM, Buls JG. Symptomatic hemorrhoids: current incidence and complications of operative therapy. Dis Colon Rectum 1992; 35: 477-481.
13. Polglase AL. Haemorrhoids: a clinical update. Med J Aust 1997; 167: 85-88.
14. Carapeti EA, Kamm MA, McDonald PJ, Phillips RK. Double-blind randomised controlled trial of effect of metronidazole on pain after day-case haemorrhoidectomy. Lancet 1998; 351: 169-172.
15. Milligan E, Morgan C. Surgical anatomy of the anal canal and operative treatment of hemorrhoids. Lancet 1937; 2: 1119-1124.
16. Ferguson JA, Heaton JR. Closed hemorrhoidectomy. Dis Colon Rectum 1959; 2: 176-179.
17. Jayaraman S, Colquhoun PH, Malthaner RA. Stapled versus conventional surgery for hemorrhoids. Cochrane Database Syst Rev 2006; 4: CD005393.
18. Ho YH, Buettner PG. Open compared with closed haemorrhoidectomy: meta-analysis of randomized controlled trials. Tech Coloproctol 2007; 11: 135-143.

19. Johannsson HO, Pahlman L, Graf W. Randomized clinical trial of the effects on anal function of Milligan-Morgan versus Ferguson haemorrhoidectomy. Br J Surg 2006; 93: 1208-1214.
20. Mehigan BJ, Monson JR, Hartley JE. Stapling procedure for haemorrhoids versus Milligan-Morgan haemorrhoidectomy: randomised controlled trial. Lancet 2000; 355: 782-785.
21. Andrews BT, Layer GT, Jackson BT, Nicholls RJ. Randomized trial comparing diathermy hemorrhoidectomy with the scissor dissection Milligan-Morgan operation. Dis Colon Rectum 1993; 36: 580-583.
22. Muzi MG, Milito G, Nigro C, Cadeddu F, Andreoli F, Amabile D et al. Randomized clinical trial of LigaSure and conventional diathermy haemorrhoidectomy. Br J Surg 2007; 94: 937-942.
23. Cheetham MJ, Phillips RK. Evidence-based practice in haemorrhoidectomy. Colorectal Dis 2001; 3: 126-134.
24. Patti R, Almasio PL, Muggeo VM, Buscemi S, Arcara M, Matranga S et al. Improvement of wound healing after hemorrhoidectomy: a double-blind, randomized study of botulinum toxin injection. Dis Colon Rectum 2005; 48: 2173-2179.
25. Asfar SK, Juma TH, la-Edeen T. Hemorrhoidectomy and sphincterotomy. A prospective study comparing the effectiveness of anal stretch and sphincterotomy in reducing pain after hemorrhoidectomy. Dis Colon Rectum 1988; 31: 181-185.
26. Mathai V, Ong BC, Ho YH. Randomized controlled trial of lateral internal sphincterotomy with haemorrhoidectomy. Br J Surg 1996; 83: 380-382.
27. Silverman R, Bendick PJ, Wasvary HJ. A randomized, prospective, double-blind, placebo-controlled trial of the effect of a calcium channel blocker ointment on pain after hemorrhoidectomy. Dis Colon Rectum 2005; 48: 1913-1916.
28. Tan KY, Sng KK, Tay KH, Lai JH, Eu KW. Randomized clinical trial of 0.2 per cent glyceryl trinitrate ointment for wound healing and pain reduction after open diathermy haemorrhoidectomy. Br J Surg 2006; 93: 1464-1468.
29. Kocher HM, Steward M, Leather AJ, Cullen PT. Randomized clinical trial assessing the side-effects of glyceryl trinitrate and diltiazem hydrochloride in the treatment of chronic anal fissure. Br J Surg 2002; 89: 413-417.
30. Patti R, Almasio PL, Arcara M, Sammartano S, Romano P, Fede C et al. Botulinum toxin vs. topical glyceryl trinitrate ointment for pain control in patients undergoing hemorrhoidectomy: a randomized trial. Dis Colon Rectum 2006; 49: 1741-1748.
31. Treatment of hemorrhoids disease by reduction of mucosa and hemorrhoidal prolapse with a circular suturing device; a new procedure. 1998.
32. Correa-Rovelo JM, Tellez O, Obregon L, Duque-Lopez X, Miranda-Gomez A, Pichardo-Bahena R et al. Prospective study of factors affecting postoperative pain and symptom persistence after stapled rectal mucosectomy for hemorrhoids: a need for preservation of squamous epithelium. Dis Colon Rectum 2003; 46: 955-962.
33. Cheetham MJ, Cohen CR, Kamm MA, Phillips RK. A randomized, controlled trial of diathermy hemorrhoidectomy vs. stapled hemorrhoidectomy in an intended day-care setting with longer-term follow-up. Dis Colon Rectum 2003; 46: 491-497.
34) Ripetti V, Caricato M, Arullani A. Rectal perforation, retropneumoperitoneum, and pneumomediastinum after stapling procedure for prolapsed hemorrhoids: report of a case and subsequent considerations. Dis Colon Rectum 2002; 45: 268-270.
35. Shao WJ, Li GC, Zhang ZH, Yang BL, Sun GD, Chen YQ. Systematic review and meta-analysis of randomized controlled trials comparing stapled haemorrhoidopexy with conventional haemorrhoidectomy. Br J Surg 2008; 95: 147-160.
36. Morinaga K, Hasuda K, Ikeda T. A novel therapy for internal hemorrhoids: ligation of the hemorrhoidal artery with a newly devised instrument (Moricorn) in conjunction with a Doppler flowmeter. Am J Gastroenterol 1995; 90: 610-613.
37. Scheyer M, Antonietti E, Rollinger G, Mall H, Arnold S. Doppler-guided hemorrhoidal artery ligation. Am J Surg 2006; 191: 89-93.
38. Dal Monte PP, Tagariello C, Sarago M, Giordano P, Shafi A, Cudazzo E et al. Transanal haemorrhoidal dearterialisation: nonexcisional surgery for the treatment of haemorrhoidal disease. Tech Coloproctol 2007; 11: 333-338.
39. Lienert M, Ulrich B. Doppler-guided ligation of the hemorrhoidal arteries. Report of experiences with 248 patients. Dtsch Med Wochenschr 2004; 129: 947-950.
40. Bursics A, Morvay K, Kupcsulik P, Flautner L. Comparison of early and 1-year follow-up results of conventional hemorrhoidectomy and hemorrhoid artery ligation: a randomized study. Int J Colorectal Dis 2004; 19: 176-180.
41. Middleton SB, Lovegrove RE, Reece-Smith H. Management of haemorrhoids: Symptoms govern treatment. BMJ 2008; 336: 461.

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Temperature-controlled radio frequency energy delivery (Secca(R) procedure) for the treatment of fecal incontinence: results of a prospective study. *Lefebure B, Tuech JJ, Bridoux V et al. Int J Colorectal Dis. 2008 Jul 2; epub.* Secca procedures were performed in 15 patients. The mean Wexner score improved from 14.07 (+/-4.5) at baseline to 12.33 (+/-4.6) at 1 year (p = 0.02). There were no changes in endoanal ultrasound and anorectal manometry. Although we demonstrated a significant improvement in the score, most patients remained in the moderate incontinences category as defined by the scoring system and did not improved their quality of life excepted in the depression subscore.

Clinical and cost effectiveness of sacral nerve stimulation for faecal incontinence. *Munoz-Duyos A, Navarro-Luna A, Brosa M et al. Br J Surg. 2008 Jun 23; epub.* In 47 patients 57 percutaneous nerve evaluations for SNS were performed between 1999 and 2006; 29 patients underwent permanent implantation. After a median follow-up of 34.7 (range 2.3-81.2) months, 25 had a significant reduction in incontinence episodes; 14 patients were in complete remission. At 3-year follow-up, the mean reduction in incontinence episodes was 89 per cent. No change was observed in anal manometric values. Patients reported a significant improvement in quality of life.

7 – PAIN

Chronic pelvic pain in women. *Ortiz DD. Am Fam Physician. 2008 1;77:1535.* Some common diagnoses include endometriosis, adhesions, irritable bowel syndrome, interstitial cystitis, but a specific etiology is usually not found. A limited laboratory and ultrasound evaluation can rule out serious disease and reassure the patient. Few treatment modalities have demonstrated benefit. The evidence supports the use of oral medroxyprogesterone, goserelin, adhesiolysis for severe adhesions, and a multidisciplinary treatment approach for patients without a specific diagnosis, less supporting evidence for oral analgesics, combined oral contraceptive pills, gonadotropin-releasing hormone agonists, intramuscular medroxyprogesterone, trigger point and botulinum A toxin injections, neuromodulative therapies, and hysterectomy.

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Original article

Neurophysiological modification of pelvic floor parameters during sacral nerve neuromodulation

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Abstract: Significant changes in function of perineal innervation have been observed in 27 patients treated with sacral nerve neuromodulation. Using electrodiagnostic techniques, performed with an Interstim implantable pulse generator switched on and off, we observed that sacral nerve neuromodulation increases the amplitude of voluntary contraction of the urethral sphincter, decreases the duration of motor unit potentials at rest in both sphincters and reduces latencies of pudendal nerve terminal motor bilaterally. These results suggest a greater recruitment of pelvic muscular fibers and a better synchronization of the fibers firing. Sacral nerve neuromodulation probably increases the motor conduction velocity of pudendal nerves and so suppresses integration between peripheral innervation and spinal cord.

Key words: Sacral nerve stimulation; Pelvic floor; IPG; Perineal innervation.

INTRODUCTION

Sacral neuromodulation (SNM) works on the neural reflexes that influence the bladder, rectum and pelvic floor. Since the initial experience of the nineteen eighties SNM has been widely used to treat both bladder and rectal dysfunction but the exact mechanism of action is still unknown. The aim of this study was to investigate the functional modifications of peripheral perineal innervation using SNM.

MATERIALS AND METHODS

The study involved 27 patients (3 males, 24 females) affected by urinary incontinence (44%), urinary retention (30%), obstructed defecation (18%), fecal incontinence (4%), and chronic pelvic pain (4%). The average treatment time – using Interstim implantable pulse generator (IPG) – was 56 months (range 19-88) and all patients experienced full remission of symptoms with the electrical parameters individually programmed. The following tests were performed: 1) Electromyography (EMG) of the external anal sphincter (EAS); 2) EMG of the urethral sphincter (US) at rest, in voluntary contraction and in reflex contraction; 3) Somatosensory evoked potentials (SEPs); 4) Pudendal nerve terminal motor latency (PNTML). The tests were performed with IPG on and off and data were statistically analyzed using the Student's t-test.

RESULTS

We observed the following significant changes: *EMG* 1) A rise in amplitude of motor unit potentials (MUPs) during maximal contraction in the US with IPG on - average 31.5 ± 24.4 uV compared to IPG off average 25.5 ± 25.8 uV - ($p = 0.058$). 2) Duration of MUPs at resting was decreased with IGP switched on and this decrease was greater for US - average 4.2 ± 0.9 msec compared to IPG off average 4.6 ± 1.1 msec ($p = 0.010$) - as well as for EAS - average 3.4. ± 0.9 ms compared to IPG off average 4.2 ± 1.2 ms ($p = 0.049$). (Figs. 1, 2, 3) *PNTML*. After the IPG was turned on, examination of PNTML revealed a decrease in latencies on both sides. The data collected were: average 1.8 ± 0.36 msec compared to IPG off average 1.9 ± 0.37 msec ($p = 0.036$) on stimulated side and average 1.85 ± 0.6 msec compared to IPG off average 2.1 ± 0.9 msec ($p = 0.024$) on the unstimulated side (Fig. 4).

The remaining examinations and parameters were unchanged.

DISCUSSION

Some Authors [1, 2, 3] suggested the use of electrodiagnostic techniques in order to better or to reprogram SNM but nobody has reported improve studies about the effects of SNM on perineal responses.

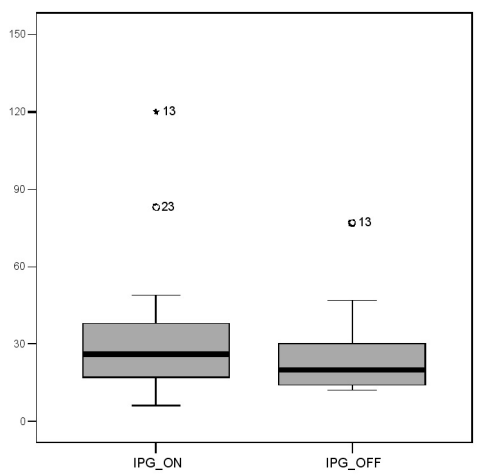

Fig. 1. – Amplitude in vulontary contraction in the US.

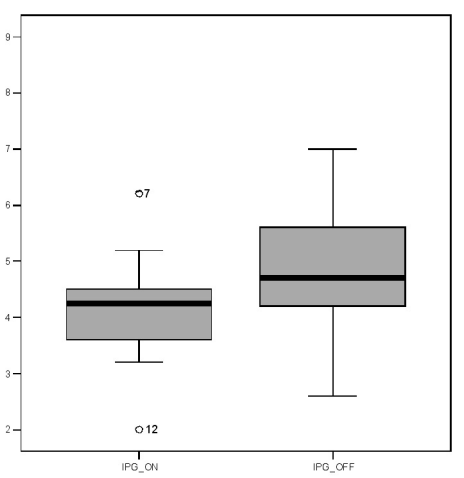

Fig. 2. – Duration of MUP at resting in the US.

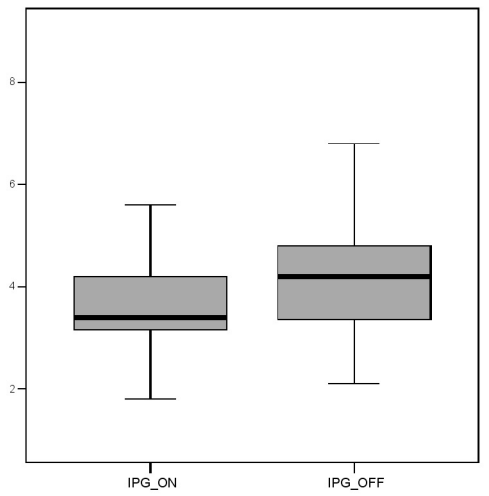

Fig. 3. – Duration of MUP at resting in the EAS.

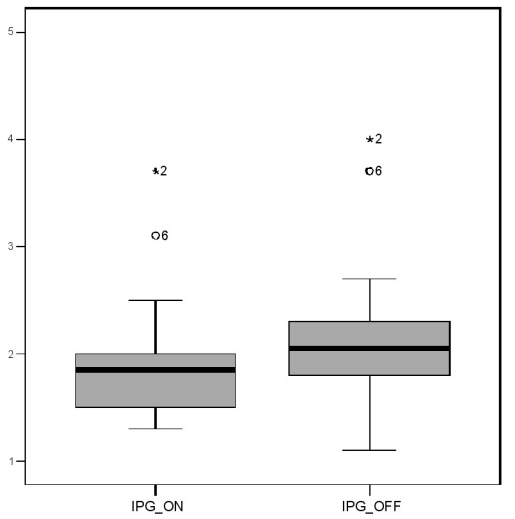

Fig. 4. – PNTML latencies unstimulated side.

We have observed that SNM produces significant changes in EMG and in PNTML. With regard to EMG, SNM has increased the amplitude of activation pattern in US and has decreased the MUPs duration at rest in both sphincters. These results suggest a greater recruitment of pelvic muscular fibers and a better synchronization of fibers firing, moreover lasting in time. The decrease of latencies in PNTML, observed on both sides, probably means that SNM stimulates motor conduction velocity of pudendal nerves and suppresses integration between peripheral innervation and spinal cord.

CONCLUSIONS

SNM produces significant modifications in function of peripheral perineal innervation. We observed an increase of amplitude of voluntary contraction in SU-EMG, a decrease of duration of MUP at rest in sphincters and a decrease of latencies of PNTML on both sides.

REFERENCES

1) Benson JT. Sacral nerve stimulation results may be improved by electrodiagnostic techniques. Int Urogynecol J 2000; 11: 352-7.
2) McLennan MT. The role of electrodiagnostic techniques in the reprogramming of patients with a delayed suboptimal response to sacral nerve stimulation. Int Urogynecol J 2003; 14: 98-103.
3) Malaguti S, Spinelli M, Giardiello G, Lazzeri M, Van Den HomberghU. Neurophysiological evidence may predict the outcome of sacral neuromodulation. J Urol 2003; 170: 2323-2326.

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Resiniferatoxin in the treatment of interstitial cystitis: a systematic review. *Mourtzoukou EG, Iavazzo C, Falagas ME. Int Urogynecol J Pelvic Floor Dysfunct. 2008 Jun 19; epub.* Six studies provided contradictory results regarding the effectiveness of resiniferatoxin treatment (based on the physiopathological concept of the involvement of C fibers and transient receptor potential vanilloid 1 in the transmission of pain), so its value in the treatment of this condition remains unknown.

A mixture of Escherichia coli (DSM 17252) and Enterococcus faecalis (DSM 16440) for treatment of the irritable bowel syndrome - A randomized controlled trial with primary care physicians. *Enck P, Zimmermann K, Menke G et al. Neurogastroenterol Motil. 2008 Jun 17; epub.* Therapy trials with bacterial compounds in irritable bowel syndrome (IBS) have produced conflicting results. This study, performed in 1989 on 297 patients, was re-analysed according to current IBS standards. Responders had at least a 50% decrease in global symptom score and in abdominal pain score reports. The responder rate was 68.5% in comparison to placebo 37.8% ($P < 0.001$).

8 – FISTULAE

Gracilis muscle interposition for the treatment of rectourethral, rectovaginal, and pouch-vaginal fistulas: results in 53 patients. *Wexner SD, Ruiz DE, Genua J et al. Ann Surg. 2008;248:39.* The gracilis muscle transposition is a safe and effective method of treating complex perianal fistulas. It was was performed in 53 patients, 17 women with 19 interpositions for 15 rectovaginal and 2 pouch-vaginal fistulas; 8 experienced at least one postoperative complication, 2 required a second interposition. Thirty-three percent of the Crohn's disease-associated fistulas successfully healed; 75% without Crohn's successfully healed.The interposition was done in 36 males for rectourethral fistulas, mainly due to prostate cancer treatment, 17 with postoperative complications and an initial success rate of 78%. After successful second procedures in 8 patients the overall clinical healing rate was 97%.

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Original article

Comparison of accuracy of functional measurements of the urethra in transperineal vs. endovaginal ultrasound in incontinent women

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Abstract: Transperineal dynamic ultrasound (TPUS) and endovaginal dynamic ultrasound enable evaluation of the anatomical relationships and mobility of the urethral complex. However, endovaginal access may influence the resting position and anatomy of the pelvic floor structures. The objective of the study was to compare the accuracy of functional measurements of the female urethral complex in incontinent women performed by TPUS and novel 3-D endovaginal ultrasound (3D-EVUS). Twenty-five incontinent female patients underwent TPUS and 3D-EVUS examinations (median age: 56.28 years, range: 28.93 - 76.47). The bladder-symphysis distance (BSD) and the length of urethra were measured at rest, during Valsalva manoeuvre and squeeze to assess the mobility of the urethra. In the group of 10 (40%) incontinent patients with no coexisting anatomical disturbances there were no statistical differences between the two ultrasonographic techniques. In the group of 15 (60%) incontinent patients with associated pelvic organ prolapse (POP) the measurements of the length of urethral complex and BSD differed significantly. Assessment of length and mobility of urethral complex in incontinent patients with POP using EVUS is inaccurate due to alterations of anatomical relations caused by the introduction of the transducer into the vagina, which makes the squeeze test impossible to perform properly. However in incontinent patients with no coexisting anatomical disturbances both TPUS and EVUS methods have the same accuracy.

Key words: Dynamic transperineal ultrasound; Endovaginal ultrasound; Stress urinary incontinence; Pelvic Organ Prolapse.

INTRODUCTION

Female urinary incontinence (UI) and pelvic organ prolapse (POP) are conditions with severe economic and psychosocial impact affecting millions of women. It is estimated that almost 30% of women older than 35 years suffer from POP and/or UI.[1] The etiology of PFD is multifactorial and includes surgical interventions, number and type of deliveries, hormones' profile, aging, obesity.[1-3] The diagnosis of these conditions is based on physical examination and imaging, mostly on ultrasound examination. Transperineal ultrasound (TPUS) and endovaginal ultrasound (EVUS), which are widely used, give only general information on anatomy, anatomical relationships and mobility of pelvic floor structures, but are insufficient to give a highly detailed assessment. Recently introduced high resolution three-dimensional (3D) EVUS seems to be a very promising modality to improve the imaging of female pelvic floor dysfunctions.

Aim of this study was to compare the diagnostics methods TPUS and EVUS in the assessment of urethral mobility in female patients suffering from stress urinary incontinence.

MATERIALS AND METHODS

Twenty-five females suffering from stress urinary incontinence (SUI) were enrolled in this study (median age: 56 years, range: 28-76 years) and underwent TPUS and 3D-EVUS examinations. Transperineal US was performed with a 6 MHz convex transducer (tape 8802, B-K Medical, Herlev, Denmark), while EVUS was performed with a 6.5-9 MHz multiplanar transducer (tape 8848, B-K Medical, Herlev, Denmark) with perpendicular and transverse beam formation to the urethra and 3-D acquisition system. All the examinations were performed using the same ultrasound scanner (ProFocus 2202, B-K Medical, Herlev, Denmark). Three-D application was used for the assessment of the morphology of the urethra and surrounding structures. Transperineal US was performed by positioning the transducer tenderly onto the perineum, in midsagittal line, to visualize pubic symphysis, urethra and bladder, vagina and anal canal (Fig. 1). Endovaginal US was performed by inserting the transducer into vagina in a neutral position with no compression on the urethral complex and surrounding structures. It was mandatory to visualize the pubic symphysis and entire urethra from bladder neck to external meatus (Fig. 2).

We divided females in two groups: patients suffering only from SUI (first group: 10 patients - 40%) and patients with SUI and coexisting POP (second group: 15 patients - 60%; 7 cystocele, 8 recto/enterocele). Mobility of the urethra was evaluated by measuring the bladder-symphysis distance (BSD - distance from bladder neck to the lowest margin of the pubic symphysis) and the length of urethral complex. These measurements were taken at rest, during Valsalva manoeuvre and squeeze. For each patient 12 measurements were taken: urethral length and BSD at rest, during Valsalva and squeeze manoeuvre by using both TPUS and EVUS. For the statistical analysis the mean values, standard deviation (SD) and

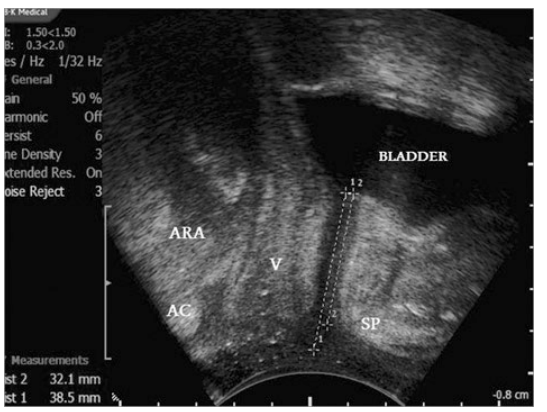

Fig. 1. – Transperineal ultrasound of pelvic floor. AC- anal canal, SP- pubic symphysis, V - vagina, ARA - anorectal angle. The measurements of urethral length is 38.5 mm and BSD is 32.1 mm in this 30 Y incontinent patient.

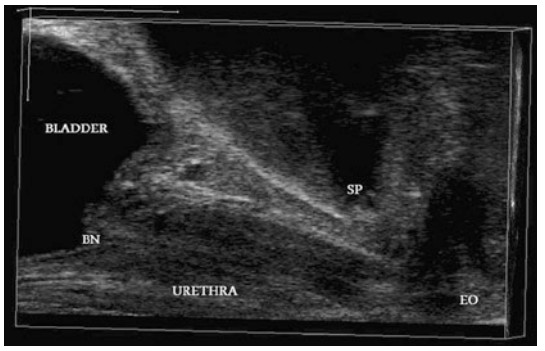

Fig. 2. – Longitudinal view of the urethral complex obtained by a 180° rotational transducer with perpendicular beam formation, 9-12 MHz frequency and with "free-hand" 3-D acquisition. BN - bladder neck, SP - pubic symphysis, EO - external orifice of the urethra.

Fig. 3. – TPUS. BSD 22 mm, urethral length 39,5 mm; 48 Y incontinent patient with coexisting cystocele.

t-Student test were used. Five percent inference error was assumed as statistically significant ($p < 0.05$).

RESULTS

Mean values of the measurements taken in the first group of patients are presented in table 1, whilst the measurements obtained in the second group of patients are presented in table 2. In the first group of 10 (40%) incontinent patients with no coexisting anatomical disturbances there were no statistical differences in the length of urethral complex at rest and during Valsalva manoeuvre and squeeze between TPUS and EVUS. The values of BSD taken at rest and during Valsalva manoeuvre were also similar. In the second group of 15 (60%) incontinent patients suffering from POP the measurements of the length of urethral complex taken by TPUS and EVUS differed significantly in all three tests ($p < 0.001$). Measurements of BSD at rest and during squeezing were also significantly different ($p < 0.01$ at rest and $p < 0.05$ during squeezing). The values of BSD during Valsalva manoeuvre varied between TPUS and EVUS although the difference was not statistical.

DISCUSSION

Transperineal ultrasound is a cheap, available and relatively easy to perform technique for the assessment of urethral morphology and relationship of the urethra with bladder and pubic symphysis. The lowest margin of pubic symphysis represented the point of reference for measurements. A huge disadvantage of TPUS is the inaccurate urethral assessment due to an extensive compression of the transducer onto the perineum. Moreover, this examination is not adequately precise in the evaluation of the urethra because it is not possible to distinguish the layers of the urethral wall or to visualize the urethral support. This could be due to the use of the low frequency convex transducer routinely used for abdominal ultrasound which is not dedicated for the assessment of pelvic floor. However, TPUS allows an easily assessment of urethral mobility during dynamic tests.[3] Transperineal ultrasound is reliable in the diagnostics of POP,[5] being accordant with ICS-POPQ scale, as confirmed by the study of 140 patients with POP performed by Dietz and al.[4]

Endovaginal ultrasound with novel high frequency transducer (9-16 MHz) as well as 3-dimensional data acquisition represents a more precise method in the assessment of urethra as well as other pelvic floor structures. This transducer was initially used in proctology for the evaluation of the anal canal, morphology of the anal sphincters, fistulas and staging of the rectal cancer,[9, 10] as well as in urology for prostate brachytherapy. The biplane transducer with perpendicular and transverse beam formation allows visualization of the structures on the axial plane, as well as on the sagittal plane, and 3D data acquisition allows their reconstruction on the coronal plane. Untill now it was achievable only by CT or MRI not by ultrasound. To perform EVUS correctly, it is extremely important to insert the transducer into the vagina in a neutral position and not to compress

TABLE 1. – *Mean values (M) and standard deviation (SD) of the urethral length and BSD obtained by TPUS and EVUS in the group of 10 patients with only stress urinary incontinence.*

	Urethral length at rest	*Urethral length at Valsalva*	*Urethral length at squeezing*	*BSD at rest*	*BSD at Valsalva*	*BSD at squeezing*
TPUS	M: 32,5 mm	30,1 mm	33,3 mm	18,9 mm	6,2 mm	19,9 mm
	SD: 2,87 mm	2,5 mm	3,7 mm	5,1 mm	11,4 mm	6,78 mm
EVUS	M: 32,6 mm	29,7 mm	33,1 mm	18,9 mm	6,3 mm	21,1 mm
	SD: 3,49 mm	3,5 mm	3,3 mm	2,8 mm	8,1 mm	5,7 mm

TABLE 2. – *Mean values (M) and standard deviation (SD) of the urethral length and BSD obtained by TPUS and EVUS in the group of 15 patients with stress urinary incontinence and pelvic organ prolapse.*

	Urethral length at rest	*Urethral length at Valsalva*	*Urethral length at squeezing*	*BSD at rest*	*BSD at Valsalva*	*BSD at squeezing*
TPUS	M: 34,7 mm	31,3 mm	33,6 mm	21,2 mm	13,9 mm	20,9 mm
	SD: 3,76 mm	2,84 mm	3,68 mm	7,5 mm	11,4 mm	9,3 mm
EVUS	M: 36,8 mm	28,7 mm	31,8 mm	23,1 mm	13,5 mm	22,1 mm
	SD: 3,64 mm	2,02 mm	3,5 mm	6,4 mm	7,7 mm	7,4 mm

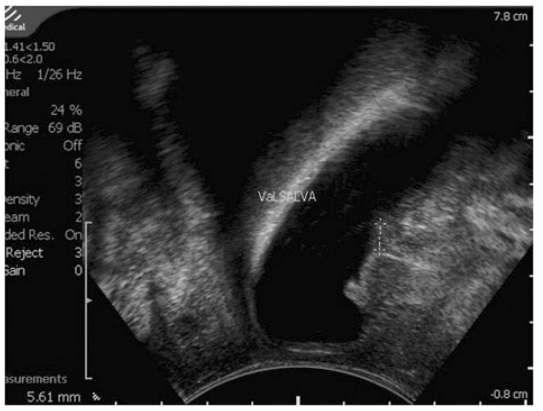

Fig. 4. – TPUS. BSD during Valsalva manouvre 5.6 mm in 48 Y incontinent patient with coexisting cystocele.

extensively on the urethra, the anal canal or the surrounding structures. Only the neutral position allows the most reliable evaluation of the morphology and anatomical relations and offers the possibility to detect potential disturbances.

In the diagnosis of urinary incontinence it is very important to assess precisely the location of the urethra and its morphology, to distinguish the layers of the urethral wall, to depict the striated sphincter and to assess the bladder neck at rest and during dynamic tests. The location of the urethra was until now described by the values of different angles observed on the sagittal plane during TPUS.[8] However, the measurements obtained only in one plane could not give the whole information about the diagnosed disturbances and should not be considered as prognostic factors. Thus, 3D-EVUS, giving an opportunity of the assessment of the urethral angulations on three different planes, seems to be a very promising alternative method to TPUS. Moreover 3D-EVUS provides very precise assessment of anatomy and morphology of female pelvic floor structures and can improve our knowledge on etiology of their disorders.

This study shows that in females suffering from SUI and coexisting pelvic organ prolapse the endovaginal examination is not reliable in the assessment of the urethral mobility due to alterations of anatomical relations resulted from introduction of the transducer into the vagina. Additionally, in all patients the transducer inserted into vagina makes squeeze test impossible to perform appropriately. However, in the measurements of the length of urethral complex and BSD at rest and during Valsalva manoeuvre in incontinent patients with no coexisting anatomical disturbances both TPUS and EVUS methods have the same accuracy.

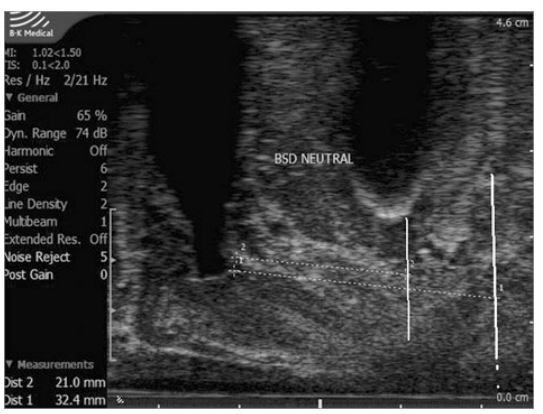

Fig. 5. – EVUS. Measurements of BSD (21 mm) and urethral length (32.4 mm) at rest in 61 Y incontinent patient.

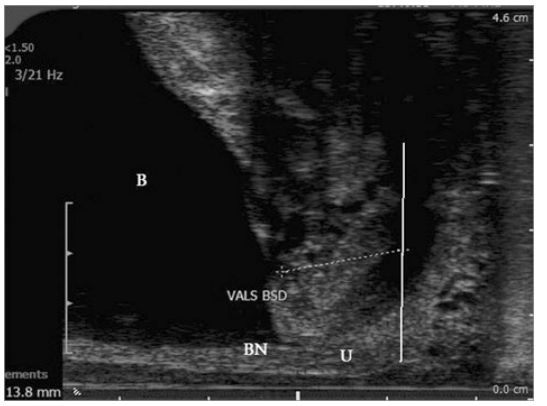

Fig. 6. – EVUS. Measurements of BSD (13 mm) during Valsalva manoeuvre in 61 Y incontinent patient. B - bladder, BN - bladder neck, U - urethra.

CONCLUSION

In incontinent women with no coexisting anatomical disturbances both ultrasound methods (TPUS and EVUS) have the same accuracy in the measurements of urethra complex and BSD at rest and during Valsalva manoeuvre. Measurements taken by EVUS during squeezing and measurements in incontinent women additionally suffering from pelvic organ prolapse appears to be inaccurate due to the introduction of the transducer into the vagina, which alters the anatomical relationships of the pelvic structures.

REFERENCES

1. De Lancey JO. The hidden epidemic of pelvic floor dysfunction: achievable goals for improved prevention and treatment. Am J Obstet Gynecol 2005; 192: 1488-95.
2. Peng Q, Jones R, Shishido K, Constantinou CE. Ultrasound evaluation of dynamic responses of female pelvic floor muscles. Ultrasound Med Biol 2007; 33: 342-52.
3. Thompson JA, O'Sullivan CPB, Briffa K, Neumann P. Comparison of transperineal and transabdominal ultrasound in the assessment of voluntary pelvic floor muscle contractions and functional manoeuvres in continent and incontinent women. Int Urogynecol J 2007; 18: 779-786.
4. Dietz HP, Haylen BT, Broome J. Ultrasound in the quantification of female pelvic organ prolapse. Ultrasound Obstet Gynecol 2001; 18: 511-4.
5. Barry C, Dietz HP. The use of ultrasound in the evaluation of pelvic organ prolapse. Reviews in Gynaecological Practice 2005; 5: 182-195.
6. Thompson JA, O'Sullivan CPB, Briffa K, Neumann P, Court S. Assessment of pelvic floor movement using transabdominal and transperineal ultrasound. Int Urogynecol J 2005; 16: 285-292.
7. Howard D, Miller JM, Delancey JO, Ashton-Miller JA. Differential effects of cough, valsalva, and continence status on vesical neck movement. Obstet Gynecol 2000; 95: 535-540.
8. Pregazzi R, Sartore A, Bortoli P, Grimaldi E, Troiano L, Guaschino S. Perineal ultrasound evaluation of urethral angle and bladder neck mobility in women with stress urinary incontinence. BJOG 2002; 109: 821-7.
9. Dal Corso HM, D'Elia A, De Nardi P, Cavallari F, Favetta U, Pulvirenti D'Urso A, Ratto C, Santoro GA, Tricomi N, Piloni V. Anal endosonography: a survey of equipment, technique and diagnostic criteria adopted in nine Italian centers. Tech Coloproctol 2007; 11: 26-33.
10. Starck M, Bohe M, Fortling B, Valentin L. Endosonography of the anal sphincter in women of different ages and parity. Ultrasound Obstet Gynecol 2005; 25: 169-76.

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Commentary

Invited comment: A new theory of anorectal function

(P. Petros, M. Swash et al. - issue 3, 2008)

General Comments

Thanks for asking us to comment on this manuscript by Petros and Swash, on various studies and case reports focusing on the central hypothesis that augmenting ligamentous support improves muscular loading which leads to improved muscular contractility. The studies on the continence mechanism also hypothesize that directional forces of muscular and ligamentous opposition are important.

Many studies have an running theme of a mid urethral sling procedure for urinary incontinence producing "cure" of concomitant "idiopathic" faecal incontinence. While we don't dispute the observational findings, these studies provide little objective evidence to support the hypotheses of the aetiological role of ligament and muscle loading abnormalities. There are several methodological limitations which we have commented on separately in turn.

Padmore in 1918 initially suggested the ship in a dry dock theory for uterine support, and later Delancey described the 3 layers of fascial support in the pelvic floor based on objective histological evidence. It would seem a plausible hypothesis that reinforcing fascial support should augment pelvic floor dynamics and function, however some of the claims of reconstituting anatomy are poorly founded with little evidence to support claims given in the discussions.

The term "idiopathic" faecal incontinence is used throughout without fully explaining how this group of patients is defined and on what specific clinical and investigational criteria. The aetiopathogenesis of urinary and faecal incontinence is rarely a singular process. Insults to the pelvic floor are usually multiple (including chronic straining, increased intra abdominal pressure effects, parturition and the menopause). Thus, it is difficult to make generalizations from case reports, retrospective analyses and uncontrolled studies, reflecting some of the evidence base presented here.

There is no doubt that different collagen types (such as those in patients with EDS III or benign joint hypermobility syndrome) are more prone to pelvic organ prolapse and ligamentous laxity [Alwari et al, Grahame R et al]. However surgery on this type of collagen has a higher risk of recurrence and it is unclear from this work how this type of surgery will benefit those with congenital collagen weakness.

Pelvic floor weakness is age and parity dependent. Collagen types change with age, from a more supple type I collagen to a more brittle type III collagen which is more prone to breakage. Addressing ligamentous laxity is an important one, however one should keep in mind that those with long term symptoms are likely to have multiple weakness throughout the pelvic floor or even global ligamentous laxity. With more type III collagen in an ageing pelvic floor, once ligamentous tensions exceed their modulus of elasticity for that tissue for stretch and recoil, it is likely that laxity begets further laxity.

Experimental Study No 1:
Directional muscle forces activate anorectal continence and defecation in the female

Previous attempts at correction of the puborectal angle do not result in improved continence and this is no longer attempted.[1, 2] It is unclear if indeed the outer longitudinal muscle of the rectum merges with the uterosacral ligaments proximally, as the authors contend; rather, it seems to enter the posterior rectovaginal facsia, and continues to the anal skin as the corrugator cutis ani.[3, 4]

The 25 patients with urinary and faecal incontinence are not described in a standardised or systematic fashion. Additionally, with only 4 control patients it is not possible to make meaningful comparisons (ideally they would be parity and age matched). The methodology is opaque – it is not clear how these muscular forces of opposition / contraction were measured or quantified. It is also unclear how "X" and "Y" were accurately and reproducibly placed without unwitting bias - what anatomical landmarks were used? What measurements were taken at rest, squeeze and strain to support the hypothesis? "T" pinching of the anterior rectal wall, is too high anatomically for the transverse perineii as shown. The authors quote all these dynamic movements, "consistent with anchoring of various muscle groups" with no objective measurement. They acknowledge that there are no differences in imaging between continent and incontinent groups after a procedure meant to alter anatomy, but then go on to advocate ligamentous reinforcement for faecal incontinence.

1. Matsuoka H, Mavrantonis C, Wexner SD, Oliveira L, Gilliland R, Pikarsky A. Postanal repair for fecal incontinence – is it worthwhile? Dis Colon Rectum 2000; 43: 1561-7.
2. van TetsWF, Kuijpers JH. Pelvic floor procedures produce no consistent changes in anatomy or physiology. Dis Colon Rectum 1998; 41: 365-369.
3. Lunniss PJ, Phillips RK. Anatomy and function of the anal longitudinal muscle. Br J Surg 1992; 79: 882-4.
4. Aigner F, Zbar AP, Ludwikowski B, Kreczy A, Kovacs P, Fritsch H. The rectogenital septum: morphology, function, and clinical relevance.Dis Colon Rectum 2004; 47: 131-40.

Experimental Study No 2:
A direct test for the role of the pubourethral ligament in anorectal closure

This single case presentation produced both faecal and urinary continence from a mid urethral sling procedure. It is unclear what the mechanism of incontinence here was, with no mention of structural or functional assessment. Urethral tapes are a common procedure for urinary stress incontinence – with the common co-prevalence of urinary and faecal incontinence, it would be expected that more faecally incontinent patients would benefit. This group requires a closer look to determine the structural anorectal changes with a sling that may produce continence. Unfortunately the authors do not advance an explanation of the mechanism of action.

Study No. 3:
Reflex contraction of the levator plate increases intra-anal pressure, validating its role in continence

It is known that both vaginal and anal distention produce rises in voluntary squeezes of the external anal sphincter. Two fingers in the vagina producing an unknown force produces a higher rise in the control rather than the incontinent groups in this study. It is feasible to explain this through a sensory mechanism rather than a mechanical one - the digits would produce sensory biofeedback to enhance reflex contraction.

Experimental Study No. 4
Abdominal pressure increase during anorectal closure is secondary to striated pelvic muscle contraction

The authors report no significant differences in increases intra abdominal pressure on straining and squeezing. They used a solid state catheter, which depends on direct compression to demonstrate a pressure rise. For measurement of pressure inside a hollow viscus this is optimally measured

directly (via needle technique) or indirectly (via measurement of intravesical intraabdominal pressure and transduction of this pressure through a column of water).

Experimental Study No. 5:

A prospective endoanal ultrasound study suggests that internal anal sphincter damage is unlikely to be a major cause of fecal incontinence.

The author uses the term "idiopathic" loosely, using it in a previous study to describe faecal incontinence in study 1 as patients with intact sphincters. Most authorities would disagree with the contention that the internal sphincter does not contribute to incontinence; the internal anal sphincter contributes 80% of the resting sphincter pressure. One of the frequent causes of faecal incontinence in the elderly is internal sphincter atrophy. The internal anal sphincter thickness is also age dependent and to arbitrarily say < 2 mm is abnormal is over-simplistic.

The gold standard for endoanal imaging, is using a dedicated endoanal probe with a 360 degree field of view, at a frequency of 10 -15 MHz , the probe used in this study is a rectal probe with linear array sector scanning at 7 MHz.

We agree that not all patients with an internal sphincter injury will be incontinent, but again incontinence is multifactorial and all aspects of the continence mechanism including the internal anal sphincter structure and function should be assessed with the correct instruments.

Experimental Study No. 6:

Correction of abnormal geometry and dysfunction by suspensory ligament reconstruction gives insights into mechanisms for anorectal angle formation

This is a case study of a patient with some functional symptoms of pain, urinary stress leakage and rectal evacuation difficulties helped by perineal digitation. Imaging is suggestive of a non-relaxing puborectalis which fits her "functional" type of symptomatology. The patient applies perineal pressure, but with an attenuated perineal body and the passage of only a small amount of contrast one wonders if the patient is anally digitating.

It is unclear how this posterior sling is inserted and how it augments and supports the uterosacral ligaments. The post operative images still show a non-relaxing puborectalis as the anorectal angle increases with straining. It would be surprising if this patients evacuation actually improved in light of the images shown. Postoperative proctography would have better illustrated the anorectal angle relaxation during evacuation rather than straining films which are less physiological method of illustrating puborectalis movement.

Study No 7:

Role of puborectalis muscle in anal continence - comments on original 4D pelvic ultrasound data from Chantarasorn & Dietz

Recent publications have detailed the importance of puborectalis and the remaining pubovisceral sling in the continence mechanism. Levator trauma in obstetric trauma produces urinary stress incontinence, particularly following forceps-assisted delivery. It is true that few of these patients have faecal incontinence, however in the long term it is unclear if these injuries produce the delayed incontinence often reported 20 or more years later. Puborectalis weakness and atrophy are genuine entities that contribute to faecal incontinence.[1,2] 4D ultrasound was used in this retrospective study, however MRI is the gold standard for pelvic floor imaging of levator injuries, better yet would be the use of an MR endocoil.[3,4]

1. Bharucha AE, Fletcher JG, Harper CM, Hough D, Daube JR, Stevens C et al. Relationship between symptoms and disordered continence mechanisms in women with idiopathic faecal incontinence. Gut 2005; 54: 546-555.
2. Azpiroz F, Fernandez-Fraga X, Merletti R, Enck P. The puborectalis muscle. Neurogastroenterol Motil 2005; 17 Suppl 1: 68-72.
3. DeLancey JO, Kearney R, Chou Q, Speights S, Binno S. The appearance of levator ani muscle abnormalities in magnetic resonance images after vaginal delivery. Obstet Gynecol 2003; 101: 46-53.
4. Terra MP, Beets-Tan RG, Vervoorn I, Deutekom M, Wasser MN, Witkamp TD, Dobben AC, Baeten CG, Bossuyt PM, Stoker J. Pelvic floor muscle lesions at endoanal MR imaging in female patients with faecal incontinence. Eur Radiol 2008; 18: 1892-901. Epub 2008 Apr 4.

Study No. 8:

Stress urinary incontinence results from muscle weakness and ligamentous laxity in the pelvic floor

This study assesses the histology of pubocccygeus biopsies during a mid urethral sling procedure. Importantly no comparisons were made with control tissue which we realize will be difficult to recruit for but the stated findings are meaningless otherwise. This sling procedure corrects the anatomical abnormality caused by ligamentous laxity and or injury, but this study does not show how this procedure improves muscle contraction which is the contention of the discussion. At least some post operative histology would be needed in the long term, before the word "cure" can be used.

Study No. 9:

Double incontinence, urinary and fecal, cured by surgical reinforcement of the pubourethral ligaments

This study appears to be prospectively collected data on the mid urethral sling procedure, retrospectively analysed for patients with faecal incontinence. It is not made clear what type of faecal incontinence these patients had (passive leakage, urge incontinence or post-defaecation soiling). In the era of endoanal ultrasound to use an examining finger to assess sphincter integrity is insufficient, and makes this an even more heterogenous group to rationalize and promote the use of a midurethral tape for.

Study No. 10:

Fecal incontinence cure by surgical reinforcement of the pelvic ligaments suggests a connective tissue aetiology

It is not mentioned what criteria were used to determine positioning of this synthetic mesh, whether anteriorly in 3, posterioly in 9 or both in 18 patients. The "pictoral diagnostic" algorithm offers little to the reader in explanation of which technique is applied for this heterogenous group of patients. What was the basis of the prevalence data? What was the reference for this algorithm. What are the grounds for assuming that the prevalence (frequency) and probability (likelihood) of symptoms are equivalent? In pelvic floor parlance the terms anterior, middle and posterior often refer to the various compartments, the author has cystocele under the middle compartment and uterine and vault prolapse under the posterior compartment. Why is nocturia under the posterior and faecal incontinence under anterior, is the idea to explain pathogenesis of ligamentous laxity? How does symptom frequency relate to treatment in this algorithm. This illustration attempts to stratify pathogenesis, symptoms and therapy but it fails to show this.

Importantly the endopelvic fascia and ligaments all work in concert through all compartments in the pelvic floor, and surgery on one compartment often affects the others.

The results are presented in a rather irregular way. The timings of the follow up visits are not mentioned. It would have strengthened the argument to have undertaken testing on the patients who did not respond to surgery, as it would have been the ideal control compared to those with symptomatic improvement. It is not stated how mean anal pressure was calculated. Pudendal nerve terminal latencies are a poor choice of physiological measure – they are notoriously poorly reproducible and reflect only the fastest conducting fibers in the pudendal nerve. How was functional anal canal length measured?

It would have strengthened the data enormously to have used one of the validated scoring systems or questionnaires of quality of life. In the discussion there is no objective evidence from the data presented that ligamentous support improves muscular force and continence.

The explanation for improved continence in patients with suspected pudendal neuropathies and failure in nulliparous women is based on conjecture. The incompletely rationalised application of the laws of Laplace and Poiseuille may further confuse the reader as their link is not clearly supportive of the authors' hypothesis.

Study No 11:

Ligamentous repair using the Tissue Fixation System confirms a causal link between damaged suspensory ligaments and urinary and fecal incontinence

This pictoral algorithm is commented on above. Once again in this study it does not inform the reader of what specific criteria were used to determine which approach was used. These patients seem to form a heterogenous group with combined prolapse of varying degrees and different types of incontinence. The results presented makes no note of such things as POP-Q scores or symptom scoring perioperatively. These would be standard in any operative study ooking at outcome for surgery for prolapse and or incontinence, the stated primary aim of this study.

It is unclear why the cystocoele repairs were performed: if the objective was to show ligamentous support improves function, why were standard cyctocele repairs undertaken and then disbanded because of poor results? How did this fit in with the algorithm of treatment.

The results presented in tables I and II are an amorphous mixture of prolapse scores, and a list of procedures without knowing their indications. It is not clear what structural abnormalities these 33 faecally incontinent patients had. There are no descriptive statistics to support why the authors believe TFS outcome in faecal incontinence is equivalent to the tension free system. The table of results show the TFS for the anterior, transverse, posterior and sling procedure ;if the suggestion is that changing tension in the ligaments and muscles in the pelvic floor improves faecal incontinence, it is not represented here which tension systems work. There are no sub group analyses for this faecally incontinent group. There is also no mention of the incidence of constipation symptoms which is always relevant in treating continence.

The conclusions drawn from this study are overstated, and cannot be made on the results shown. There are no comparative or randomized data to show that both approaches were equivalent. How was "cure" of urinary and faecal incontinence defined over this mean of 12 month follow up?

Study No 12:

Role of the uterosacral ligaments in the causation of rectal intussusception, abnormal bowel emptying, and fecal incontinence-a prospective study

This study is presented in a more cohesive way in comparison to the previous ones but with major methodological flaws. There are numerous procedures previously described to reduce and prevent this intussusception some used for rectal prolapse as in rectopexy procedures and EXPRESS (external rectal pelvic suspension) procedure. Rectal intsussusception on proctography is a common finding in asymptomatic patients and care must be taken before deciding on surgery, symptomatic patients tend to have more full thickness rather than mucosal prolapse.[1,2] The degree of intussusception is not quantified, whether mucosal only, anterior only, circumferential, intra anal etc. Other important proctographic features of evacuation are not mentioned, such as rectocoele size, emptying, pelvic floor descent, and the degree or absence of "anismus" – a poor prognostic factor for surgical outcome.

A large proportion of patients presenting with solely an evacuation disorder have underlying psychological contributors to their symptoms, these patients also have higher surgical failures and many studies have shown that these patients do well with a conservative therapy, biofeedback. [3,4]

The stated aim of the study was to address the effect of uterosacral ligament reinforcement on the various anatomical abnormalities and incontinence. However the approach involves, in addition to the tension free IVS as the new treatment, a posterior repair as well as a perineal body repair. A posterior repair is one of the conventional approaches to treating a symptomatic rectocoele and a perineal body repair is sometimes used for faecal incontinence where the sphincter is sometimes involved in this procedure. This makes it difficult to say which procedure has worked for which symptom. Twelve patients also underwent hysterectomy. If this was performed at the same time this would surely complicate interpretation of the findings.

Was the "focused questionnaire" a validated tool? Was it generic, disease specific or quality of life related? How was "compete normalization" of defaecation defined, there is no mention of symptoms such as bowel frequency, straining, laxative use, manual manoevures etc, critical for defining symptomatic improvement. Which "numeric rating scale" for faecal incontinence was used, and why was not one of the numerous validated questionnaires available used.

Complications of rectal perforation and erosion in "expert" hands occurred in this study with relatively small numbers, which raises concerns as to who should be undertaking this procedure. This procedure does not seem minimally invasive as is the suggestion, and these are serious complications that shouldn't be down played. Unfortunately, in the absence of objective assessment, we do not share the same enthusiasm as the authors for promoting the novel idea of tension free augmentation of the uterosacral ligaments.

1. Pomerri F, Zuliani M, Mazza C, Villarejo F, Scopece A. Defecographic measurements of rectal intussusception and prolapse in patients and in asymptomatic subjects.AJR Am J Roentgenol. 2001 Mar;176(3):641-5.
2. Dvorkin LS, Gladman MA, Epstein J, Scott SM, Williams NS, Lunniss PJ.Rectal intussusception in symptomatic patients is different from that in asymptomatic volunteers. Br J Surg. 2005 Jul;92(7):866-72.
3. Nehra V, Bruce BK, Rath-Harvey DM, Pemberton JH, Camilleri M. Psychological disorders in patients with evacuation disorders and constipation in a tertiary practice. Am J Gastroenterol. 2000 Jul;95(7):1755-8.
4. Rao SS. The technical aspects of biofeedback therapy for defecation disorders. Gastroenterologist. 1998 Jun;6(2):96-103.

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Original article

Transanal doppler-guided hemorrhoidal artery ligation / recto anal repair (HAL-RAR®) for treatment of Grade 3-4 hemorrhoids: a new mini-invasive technology

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Abstract: Postoperative pain is the main adverse effect of formal hemorrhoidectomy. RAR (Recto Anal Repair) - a new technique based on HAL - Doppler-guided Hemorrhoidal Artery Ligation of the terminal branches of the su-perior hemorrhoidal artery combined with TRM (Transanal Rectal Mucopexy) - is presented as an alternative to hemorrhoidectomy. *Methods:* This non-controlled, prospective study includes 85 patients (male: 57, female: 28, mean age: 44 years) treated for Grade III-IV hemorrhoids. By means of a special new modified proctoscope, the arteries leading to the hemorrhoidal cushions were located in the pain-free area of the rectum above the dentate line and ligated under Doppler guidance. A transanal rectal mucopexy was then performed to lift and secure the hemorrhoidal prolapse back in place. *Results:* Time of operation ranged from 24 to 45 minutes (32±5.21). Postoperative discomfort was measured with a visual analog scale (1-10) and resulted in a mean score of 33.2 ± 0.52 mm (range: 2.1-4.8 mm) on the first day, and a mean score of 16.5 ± 0.10 mm (range: 0-4.0 mm) over five days. Patients were examined at intervals of 6, 8 and 12 months thereafter. The mean follow-up was 10 months (range: 6-12). Bleeding re-solved in 82 patients (96.5 percent), prolapse in 78 patients (91.8 percent). The complication rate was low. *Conclusion:* RAR (Recto Anal Repair) - a combination of Doppler-guided ligation of the hemorrhoidal ar-teries (HAL) with transanal rectal mucopexy (TRM) - is a safe and effective alternative to hemorrhoidectomy, and associated with minimal discomfort and a low risk of complications.

Key words: Hemorrhoids; Doppler-guided hemorrhoidal artery ligation; Transanal rectal mucopexy; Prolapse; Rectal bleeding.

INTRODUCTION

There are several well-established procedures such as Milligan-Morgan,[1] Parks,[2] and Ferguson,[3] which are considered the gold standard in treating Grade III-IV hemorrhoidal disease. Surgical hemorrhoidectomy is a notoriously painful procedure, and much research over the last two decades has concentrated on reducing posthemorrhoidectomy pain resulting from these surgical incisions. This effort has resulted in outpatient treatments such as sclero-therapy,[4] rubber band ligation,[5] Ultroid and Bipolar diathermy coagulation,[6, 7] and infrared photocoagulation.[8] This process accelerated the need for "minimally invasive" treatment methods also for the higher Grade III-IV patients. Since November 2003, we have included HAL [9] Hemorrhoid Artery Ligation into our treatment concept because of its minimally invasive approach. The essentials of the operation are the precise and selective ligation of the arteries supplying blood to the hemorrhoids. This technique allows for the restoration of the normal anatomy using minimally invasive surgery with substantially reduced pain and discomfort. In observational studies this treatment has been shown to be efficient in treating Grade II-IV hemorrhoidal diseases.[9-12] In a prospective study, the results of HAL corresponded to those achieved with conventional surgery (Milligan-Morgan).[13] Residual prolapse however, has been reported at 8% for Grade III and 50-60% for Grade IV hemorrhoids.[11] To address this shortcoming, we propose the use of a new technique which is a combination of HAL with transanal rectal mucopexy (TRM) already described by Farag,[27] carried out with a new, modified proctoscope and a special device for lifting and fixing the protruding hemorrhoids.

PATIENTS AND METHODS

This non-randomized, prospective study includes 85 patients with symptomatic hemorrhoids Grade III-IV treated by RAR (Recto Anal Repair), which is the combination of HAL (Hemorrhoidal Artery Ligation) and TRM (Transanal Rectal Mucopexy), at the Coloproctology Center in Moscow, Russia, over a period of 12 months from January 2007 to January 2008.

Patient selection

The study includes adult patients only. All patients were subjected to a detailed clinical examination prior to the procedure using rigid sigmoidoscopy and anoscopy for the diagnosis and staging of the disease. Any prolapse which could be reduced was classified as Grade III hemorrhoidal disease. Prolapsing hemorrhoids which could not be reduced were classified as Grade IV. Other underlying pathologies were excluded by barium enema or colonoscopy where necessary. Prior to surgery a photograph of the anal aspect of the patient was taken. Patients with the following conditions were excluded: (1) acute thrombosed hemorrhoids; (2) external hemorrhoids or other concomitant anal diseases (fissure, fistula, or abscess, etc.); (3) inflammatory bowel disease or hematological disorders; (4) anticoagulants; and (5) patients with a previous history of anorectal surgery, including previous hemorrhoidectomy or fistula surgery. The patients belonged to Category I-II of the ASA score (American Society of Anesthesiologists).

Patient preparation

All patients received a written explanation of the HAL-RAR treatment technique and an informed consent form was obtained. The procedure was approved by the local Ethics Committee and was performed according to the Declaration of Helsinki. Patients were prepared by having an oral intake of fluids from midday before the procedure, and being given two "Microlax" enemas (Kabi Pharmacia AB) two hours before the procedure. One hour before the procedure, Emla ointment (Astra Zeneca, Sweden) was applied to the perineal region and intramuscular butorphanol tartrat (Stadol, Bristol-Myers Squibb) was entered. Prophylactic antibiotics were not routinely prescribed.

Operative technique

All patients were treated with the same HAL Doppler equipment (HAL-Doppler, A.M.I. Agency for Medical Innovations Ltd, Feldkirch, Austria). The RAR procedure was performed in the lithotomy position under general anesthesia as a day-case or short-stay procedure. General anesthesia was induced with intravenous propofol and the airflow maintained using a laryngeal mask. Intravenous ketorolac

(50 mg) was given at induction. After cleaning the perineal skin region and covering the patient with sterile draping around the perineal area, an anococcygeal ligament block of 5 ml bupivacaine 0.5 percent (Astra Zeneca, Sweden) was performed. After relaxation of muscles and lubrication of the anal canal with electro-conductive gel, the probe (RAR-2011) was inserted to start the search for the hemorrhoidal arteries by means of Doppler technology. The probe was gently rotated to lo-calize hemorrhoidal arteries. Most often 6 arteries were localized in the 1, 3, 5, 7, 9 and 11 o'clock positions (as viewed in the anatomical lithotomy position). The surgery was performed according to the Meintjes modification. At first the arteries at 11 and 1 o'clock were ligated separately. The ligations were performed with a vicryl stitch especially made for this procedure (A.M.I. HAL Suture, 2/0 Vicryl, tapered needle, 5/8 circumference, reinforced needle-thread connection). A double figure-of-eight stitch was placed through the ligation window of the probe and ligated with a knot pusher. Obliteration of the vessels was confirmed by the absence of any Doppler sounds distal to the sutures. The transanal mucopexy was carried out using the RAR probe (RAR-2011) in combination with the special RAR metal sleeve (RAR-2013), by applying longitudinal continuous running sutures in 3-4 quadrants. (The scheme of operation) (Fig. 1).

Postoperative Management

Food was allowed in the immediate postoperative period. For pain relief, dologesic was prescribed. Intramuscular Butorphanol tartrat (Stadol, Bristol-Myers Squibb) (1 mg/kg body weight) or ketorolac trometamin (30-60 mg) injections were given on demand. For stool softening, patients received Macrogol 4000 (Forlax, Beaufour Ipsen International) 10 gram 1-2 times a day for 3 weeks. Addition-ally, we prescribed "Detralex" (microni/ed purified flavonoid fraction (Daflon) for all patients 1000 mg/day orally for a period of 3 weeks. For the first 10 days patients were advised to take anti-inflammatory suppositories. Hospital discharge was followed under strict criteria: (1) the patients were fully ambulatory; (2) "Butorphanol tartrat" injection was no longer required; and (3) the patients did not complain of bleeding or urinary retention. Patients were advised not to have physical strain for another 3 weeks.

Measured Outcomes

Operative data and postoperative complications were recorded. Postoperative hemorrhage was defined as: (1) when the bleeding required surgical intervention, or (2) when hospital readmission was required. A 100-mm visual analog scale (VAS) - from 0 (no pain) to 100 (the worst pain imaginable) - was used to evaluate the intensity of pain postoperatively. The patient was instructed to score pain according to this. The first pain score was done three hours after the end of the intravenous anesthesia effect. Thereafter, the pain score was obtained daily, from the first to the seventh postoperative day and a mean pain score was calculated. This score thus took into account the intensity and duration of pain. Because the time of maximal pain perceived by different patients might be quite different, a mean pain score is a better reflection of the pain experienced in the first postoperative week. The number of intramuscular "Butorphanol tartrat" and "ketorolac trometamin" injections given during hospitalization, and the total number of dologesic tablets (ketorolac) taken by the patient during and after hospital discharge, were recorded. Other information, including the day of first bowel movement after surgery and the time it took to return to work, was also recorded. To assess postoperative functional outcomes, patients were administered a simple, standardized questionnaire to grade incontinence in accordance with

The Scheme of the Operation

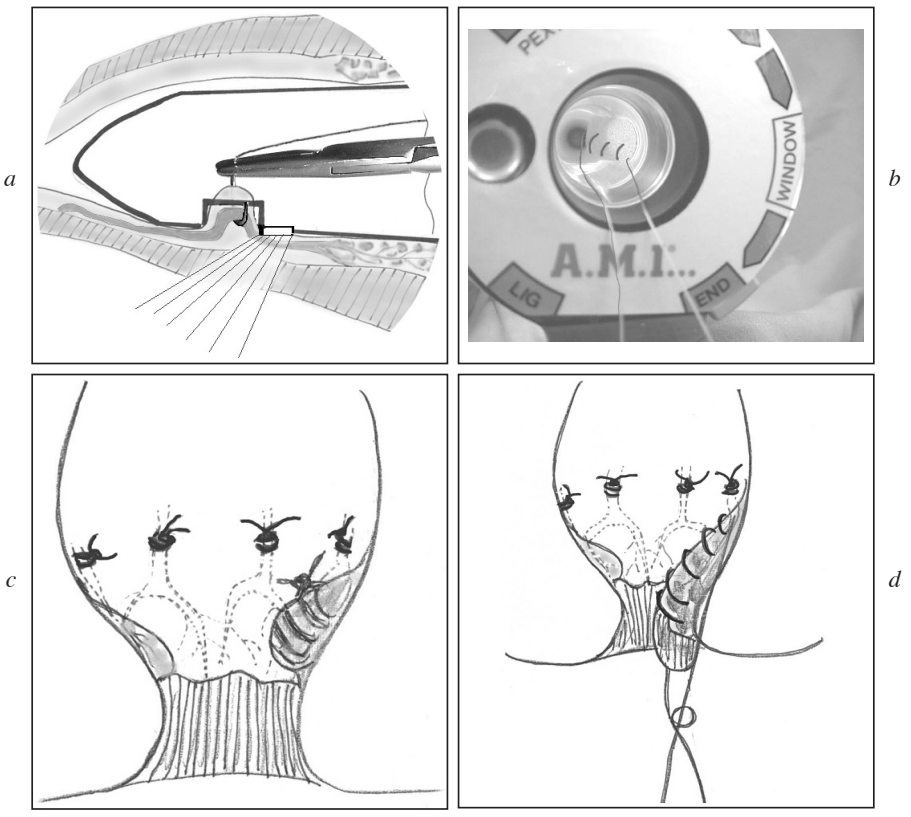

Fig. 1. – *a*) Doppler-Guided Hemorrhoidal Artery Ligation - HAL; *b*) Transanal Rectal Mucopexy - TRM - with RAR Probe and RAR Sleeve; *c*) Continuous running suture; *d*) Recto Anal Repair - RAR. Acombination of HAL and TRM.

TABLE 1. – *Characteristics of patients who underwent RAR. Values are mean (SD).*

Parameter	*Men (n. = 57)*	*Women (n. = 28)*
Age, years	45 (9.1)	44 (8.8)
Disease duration (years)	7 (4.1)	8 (3.0)
Classification of hemorrhoids n. (%)		
Grade III	45 (74)	16 (26)
Grade IV	12 (50)	12 (50)

TABLE 2. – *Preoperative symptoms of hemorrhoids.*

Symptoms of hemorrhoids	*(n. = 85)*
Prolapse	
moderate	32 (37.6)*
severe	53 (62.4)
Bleeding	
light	21 (24.7)
moderate	34 (40.0)
severe	18 (21.2)
Anal pain	
light	64 (75.3)
Pruritus/anease	
light	24 (28.2)
moderate	1 (1.2)

(*) = %

Wexner et al.'s scores. Outpatient follow-up was at 2 weeks, 1, 6, 8 and 12 months after the procedure.

RESULTS

Doppler guided hemorrhoidal artery ligation (HAL) was introduced to the clinic in November, 2003 to treat patients with hemorrhoidal diseases of Grade II-IV. Since then, 627 patients were treated with this new treatment method DG-HAL. From January 2007 through to January 2008, 85 patients, mean age of 44 (range 27-68) years; male: 57, female: 28, with Grade III-IV hemorrhoids were treated with the new RAR technology. Disease duration: 8 (range 8-18) years (Tab. 1).

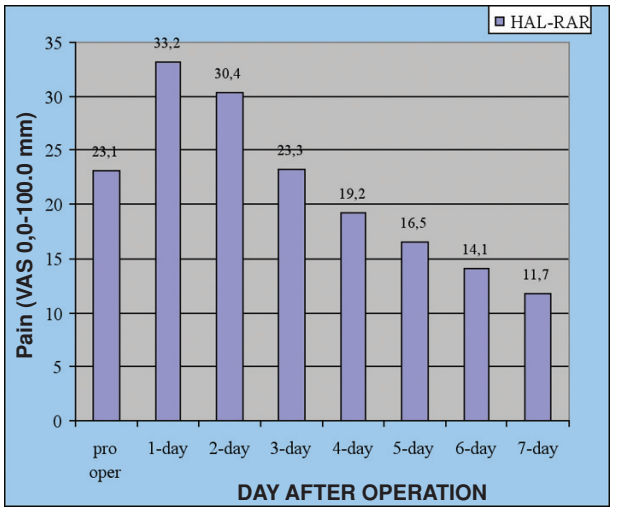

Fig. 2. – Pain scores (visual analog scores -VAS) before (pre-op) and after HAL-RAR mean(SD)

TABLE 3. – *Pain score and quantity of analgesics consumption (n. = 85).*

Days after operation	*VAS mean (SD)*	*Analgesic requirement «Ketorolac trometamin (mg.) mean (SD)*
1 day	33.2 ± 0.52 mm	31.6 ± 0.45 mg
2 day	30.4 ± 0.61 mm	28.7 ± 0.52 mg
3 day	22.3 ± 0.98 mm	17.4 ± 0.10 mg
4 day	19.2 ± 0.10 mm	14.4 ± 0.10 mg
5 day	16.5 ± 0.10 mm	13.3 ± 0.93 mg
6 day	14.2 ± 0.79 mm	–
7 day	11.7 ± 0.81 mm	–

TABLE 4. – *Postoperative complications, n. = 85.*

Type of complication	*Patients*	*n. (%)*
Thrombosis of external hemorrhoids	7	(8.2)
Fever	3	(3.5)
Postoperative bleeding	0	0
Urinary retention	0	0
Total	10	(11.7)

Main symptoms complained of during consultation and found during clinical inspection were prolapsing piles, bleeding, and anal pain (Tab. 2).

The mean time of operation was 32±5.2 (range 24-45) minutes. A postoperative period intramuscular injection "Butorphanol tartrat" was required only in 9 patients (10.5 percent). The pain score on the first and second day was 33.2±0.6 (range 2-5) mm and 30.4±1.9 (range 1-4) mm respectively on a VAS scale. The next days there was a small discomfort which was perceived by patients on a scale VAS from 22.3 ± 0.98mm up to 11.7 ± 0.8 mm on the 7th day. The average need for oral analgesic requirement from day 1 to 3 was 31.6±0.45 mg and 17.4±0.1 mg ketorolac. Hospital stay: 19.3± 2.17 (range 16-23) hours (Figs. 2, 3; Tab. 3).

First defecation: 1.6±0.4 (range 1-2) days after surgery. All patients complained of insignificant post-defecation pain which lasted for an average of 5-10 minutes after the first bowel movement.

None of the patients had any complaint of fecal incontinence. Time of return to work: 2.79 ± 0.81 (range 2-4) days.

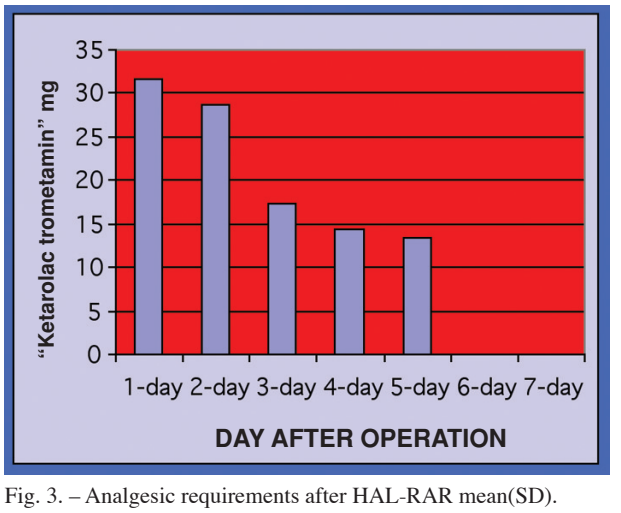

Fig. 3. – Analgesic requirements after HAL-RAR mean(SD).

TABLE 5. – *Clinical results ten months after operation (Questionnaire).*

Symptom	*Before operation*	*After operation*
Prolapse		
not present		78 (91.8)*
light		
moderate	32 (37.6)	1 (1.2)
serious	53 (62.4)	6 (7.1)
Bleeding		
not present	12 (14.1)	82 (96.5)
light	21 (24.7)	3 (3.5)
moderate	34 (40.0)	–
serious	18 (21.2)	–
Defecation pain		
not present	21 (24.7)	85 (100)
light	64 (75.3)	–
Thrombosis external hemorrhoid		
present	7 (8.3)	–
not present	78 (91.7)	85 (100)
Perianal soiling		
not present	63 (74.1)	81 (95.3)
light	21 (24.7)	4 (4.7)
moderate	1 (1.2)	–
Pruritus/anease		
not present	60 (70.6)	–
light	24 (28.2)	–
moderate	1 (1.2)	–

(*) = %

Postoperative complications were recorded in 10 patients (11.7 percent), swelling and external hemorrhoidal thrombosis in 7 pa-tients (8.2 percent). This complication was stopped conservatively by local therapy. Three pa-tients (3.5 percent) suffered hyperthermia which passed independently. The hyperthermia was probably connected to an operational trauma as it passed independently and did not demand antibiotics. Complications such as secondary hemorrhage, urinary reten-tion, incontinence, and anal stenosis were not re-corded. Patients were examined at 2 weeks, and then at 1, 6, 8 and 12 months thereafter. The mean follow-up was 10 (range, 6-12) months. Up to January 2008 all patients had a clinical anoscopic inspection within 6 to 12 month after treatment. In addition, a standardized questionnaire was used [16] (Tab. 4).

A survey on 85 patients, 10 month after the RAR treatment achieved the clinical results shown in Table 5. Bleeding re-solved in 82 patients (96.5%), some bleeding was recorded in three patients (3.5%). Prolapse was eliminated in 78 patients (91.8 percent), remaining prolapse was seen in seven patients (7.1%). It was treated by 2 sclerotherapy sessions. 6 patients (7.1%) were complaining about hemorrhoidal prolapse but were diagnosed as having skin tags. The skin tags were removed under local anesthesia. Four patients reported perianal soiling due to functional insufficiency of the anal sphincter attributed to constant prolapsed hemorrhoids.

DISCUSSION

Surgical hemorrhoidectomy Milligan-Morgan,1 Parks [2] and Ferguson [3] are considered to be the gold standards in treating hemorrhoidal disease Grade III-IV. Much research over the last two decades has concentrated on reducing post-hemorrhoidectomy pain resulting from this surgical procedure. Research has been concentrated in two areas: modification of the technique of surgical hemorrhoidectomy; and the use of a variety of surgical instruments in the hopes of decreasing postoperative pain.[17] Modifications of the surgical technique have included open, semi-open,[6] and closed incisions,[18] routine performance of lateral internal sphincterotomy,[19] and the use of stapling devices [20] (both linear and circular). No technique has been conclusively demonstrated to be superior.[21-23] Laser hemorrhoidectomy gained widespread publicity, but has never been conclusively demonstrated to be superior to conventional hemorrhoidectomy.[24-25] The new representation about pathogenetic hemorrhoidal diseases is based on a role of pathologic arterial flow through arteriovenous anastomoses, and the dystrophic phenomena in the muscular fibroplastic supportive tissue of the infe-rior hemorrhoidal plexus (Parks ligament) which degenerates with a patient's age. As a result, the mobility of the plexus increases in relation to the intrarectal pressure. The en-larged plexus hemorrhoidalis and the increased mobility caused by insufficient supportive structures are the reason for prolapsing piles. This results in an imbalance between arterial inflow and venous return. The HAL technique [9] aims specifically at interrupting the arterial flow to the hemorrhoids, thought to be a main factor in the etiology. By reducing the inflow, the plexus diminishes and the hemorrhoids shrink. This seems especially effective in Grade II and III hemorrhoids. The Doppler probe allows an accurate localization of all the arteries, which are individually ligated with figure-of-eight sutures. This serves to bunch up the mucosa, which results in a pulling-up of the prolapse while interrupting the blood supply. The HAL technique results in minimal postoperative discomfort but no pain in comparison with hemorrhoidectomy. After five years of HAL hemorhoidal artery ligation experience on Grade III-IV patients, it became clear to us that reduction of blood supply into the hemorrhoidal plexus reduces the size of the prolapse but the prolapse does not always fully disappear. RAR - a combination of HAL and additional plication sutures (TRM) described by Farag [27] to reposition and fix hemorrhoidal prolapse - demonstrates successful results also for the higher grade hemorrhoid patients. The new modified HAL-RAR proctoscope allows this combination of HAL and TRM (ligation-anopexy)[14] for treatment of protruding hemorrhoids, and also allows the pathogenetic resolution of the basic symptoms of the disease. The use of RAR will lower or eliminate invasive operations, it is a painless and minimally invasive technique that offers an excellent alternative to hemorrhoidectomy. The short hospital stay, low complication rate, and minimal postoperative pain make the RAR procedure ideal for 1-day surgery. Futhermore, it is in accordance with the requirements of minimally invasive surgery.

REFERENCES

1. Milligan ETC, Morgan CN Joones LE, et. al. Surgical anatomy of the anal canal, and the operative treatment of haemorrhoids. Lancet 1937; 2: 1119-24.
2. Parks AG. Surgical treat-ment of haemorrhoids. Br J Surg 1956; 43: 337-351.
3. Ferguson JA, Mazier WP, Ganchrow MI, Friend WG. The closed technique of hemorrhoidectomy. Surgery 1971; 70: 480-484.
4. Graham-Stewart CW. Injection treatment of haemorrhoids. BMJ 1962; 1: 213–226.
5. Barron J. Office ligation treatment of hemorrhoids. Dis Colon Rectum 1963; 6: 109-113.

6. Dennison AR, Whiston RJ, Rooney S, et al. The management of hemorrhoids. Am J Gastroenterol 1989; 84: 475.
7. Hinton CP, Morris DL. A randomized trial comparing direct current therapy and bipolar diathermy in the outpatient treatment of third-degree hemorrhoids. Dis Colon Rectum 1990; 33: 931.
8. Neiger A. Infrared-photo-coagulation for hemorrhoids treatment. Int. Surg 1989: 74: 142-143.
9. Morinaga K, Hasuda K, Ikeda T. A novel therapy for internal hemorrhoids: ligation of the hemorrhoidal artery with a newly devised instrument (Moricorn) in conjunction with a Doppler flowmeter. Am J Gastroenterol. 1995; 90: 610-613.
10. Sohn N, Aronoff JS, Cohen FS, Weinstein MA. Transanal hemorrhoidal dearterialization is an alternative to operative hemorrhoidectomy. Am J Surg 2001; 182: 515-519.
11. Arnold S, Antonietti E, Rollinger G and Scheyer M. Doppler ultrasound assisted hemorrhoid artery ligation. A new therapy in symptomatic hemorrhoids. Chirurg 2002; 73: 269-73.
12. Narro JL. Hemorrhoid Therapy with Doppler Guided Hemorrhoidal Artery Ligation via Proctoscope KM-25. A New Alternative to Hemorrhoidectomy and Rubber Band Ligation? Zentralbl Chir 2004; 129: 208-10.
13. Bursics A, Morvay K, Kupcsulik P and Flautner L. Comparison of early and 1-year follow-up results of conventional hemorrhoidectomy and hemorrhoid artery ligation: a randomized study. Int J Colorectal Dis 2004; 19: 176-80.
14. Hussein AM. Ligation-anopexy for treatment of advanced hemmoroidal disease. Dis Colon Rectum 2001; 44: 1887-1890.
15. Jorge JMN, Wexner SD. Etiology and management of fecal incontinence. Dis Colon Rectum 1993; 36: 77.
16. Guenin M-O, Rosenthal R, Beatrice Kern B, Peterli R, et al. Ferguson Hemorrhoidectomy: Long-Term Results and Patient Satisfaction After Ferguson's Hemorrhoidectomy. Dis Colon Rectum 2005; 48: 1523-1527.
17. Lacerda-Filho A, Cunha-Melo JR. Outpatient haemorrhoidectomy under local anaesthesia. Eur J Surg 1997; 163: 935-40.
18. Ho YH, Seow-Choen F, Tan M, Leong AF. Randomized controlled trial of open and closed haemorrhoidectomy. Br J Surg 1997; 84: 1729-30.
19. Mathai V, Ong BC, Ho YH. Randomized controlled trial of lateral internal sphincterotomy with haemorrhoidectomy. Br J Surg 1996; 83: 380-2.
20. O'Bichere A, Laniado M, Sellu D. Stapled haemorrhoidectomy: a feasible day-case procedure. Br J Surg 1998; 85: 377-8.
21. Hosch SB, Knoefel WT, Pichlmeier U, et al. Surgical treatment of piles: prospective, randomized study of Parks vs. Milligan-Morgan hemorrhoidectomy. Dis Colon Rectum 1998; 41: 159-64.
22. Patel N, O'Connor T. Suture haemorrhoidectomy: a day-only alternative. Aust N Z J Surg 1996; 66: 830-1.
23. Seow-Choen F, Low HC. Prospective randomized study of radical versus four piles haemorrhoidectomy for symptomatic large circumferential prolapsed piles. Br. J. Surg 1995; 82: 188-9.
24. Ui Y. Anoderm-preserving, completely closed hemorrhoidectomy with no mucosal incision. Dis Colon Rectum 1997; 40 (Suppl): S99-S101.
25. Left EI. Hemorrhoidectomy-laser vs. nonlaser: outpatient surgical experience. Dis CoIon Rectum 1992; 35: 743-6.
26. Smith LE. Hemorrhoidectomy with lasers and other contemporary modalities. Surg Clin North Am 1992; 72: 665-79.
27. Farag AE. Pile suture: a new technique for the treatment of hemorrhoids. Br J Surg 1978; 65: 293-295.

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Transanal repair of rectourethral and rectovaginal fistulas. *Razi A, Yahyazadeh SR, Gilani MA, Kazemeyni SM. Urol J. 2008 Spring;5:111.* Rectourethral, rectovaginal and vesicovaginal fistulas (5 females and 3 male patients) following prostatectomy, urethral stricture repair, colonic resection and radiotherapy due to rectosigmoid cancer, were treated by Latzko technique. The fistula orifice was exposed and a fusiform incision was made with the orifice in its center. The mucosa lying between the incision and the orifice was excised in the direction of the incision to the orifice, leaving the fistula edges to meet. Then, the edges were closed, followed by closure of the muscular layers above it. Finally, the edges of the rectal mucosa were closed. Median follow-up was 44 months.

Cutting seton for complex anal fistulas. *Chuang-Wei C, Chang-Chieh W, Cheng-Wen H et al. Surgeon. 2008;6:185.* Using the elastic band from a surgical glove as a seton with repeated tightening at weekly intervals (mean number of seton ties 3-3 times) is claimed to be safe and effective in the treatment of trans-sphincteric, suprasphincteric fistulas and extrasphincteric fistulas (112 patients, 98 male and 14 female, median follow-up 38.6 months). The mean time of the wound healing was 9.3 weeks. Recurrence was observed in 1 patient, while 24% of the patients resulted with continence disorders (gas in 18% and liquid stool in 5%).

9 – BEHAVIOUR, PSYCHOLOGY, SEXOLOGY

Relationship of specific vaginal bacteria and bacterial vaginosis treatment failure in women who have sex with women. *Marrazzo JM, Thomas KK, Fiedler TL et al. Ann Intern Med. 2008;149:20.* Bacterial vaginosis frequently persists after treatment. To define risks for bacterial vaginosis persistence, including pretreatment detection of specific vaginal bacteria, among 335 women (16 to 29 years) reporting sex with women, an observational cohort study was done. Bacterial vaginosis was treated with intravaginal metronidazole gel (0.75%), 37.5 mg nightly for 5 nights. Among the 24% of the women who also reported sex with men within 3 months before enrollment, 39% had bacterial vaginosis. In the 120 (92%) women who returned for follow-up, the incidence of persistent bacterial vaginosis was 26% being associated with several bacteria in the Clostridiales order, Megasphaera phylotype 2, and P. lacrimalis, suggesting that vaginal microbiology at diagnosis may determine risk for antibiotic failure.

10 – MISCELLANEOUS

Natural orifice hysterectomy. *Moen MD, Noone MB, Elser DM. Int Urogynecol J Pelvic Floor Dysfunct. 2008 Jun 11; epub.* Vaginal hysterectomy exists since over a century as a minimally invasive surgery (MIS). Natural orifice surgery is perceived as a relatively recent development partly because many MIS techniques utilize new technology and devices. Despite the evidence and availability of several MIS options for hysterectomy, the majority of hysterectomies continue to be performed via laparotomy.

perineology

LATEST NEWS FROM THE **GROUPEMENT EUROPEEN DE PERINEOLOGIE**

Basic anatomic features in perineology

THOMAS MOUCHEL - FRANÇOIS MOUCHEL

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Perineology is based on the diagnosis and treatment of "specific defects" so it is important to define these "defects"[1-3] and for this purpose a good knowledge of anatomy is necessary.[4-5] Although the anatomy of this area may seem well described in textbooks, some key features are usually underestimated or even forgotten.

In order to improve the understanding of this complicated anatomy, we present a simplified three-dimensional model that describes the most important features of the functional anatomy together with some demonstrative figures.

THE PERINEAL BODY (Fig. 1)

The Perineal Body is a medial fibro-muscular structure made by the bulbocavernosus, the transverse perineal muscles and the external anal sphincter.[4-5] Apart from the transverse muscles it is the only superficial pelvic structure that is not lying in a sagittal or oblique axis.

The Perineal Body makes a kind of structural beam positioned in the medial part of the perineum and able to support the sagittal overlying structures. As a result it can be regarded as the "center of gravity" of the perineum.

The Perineal Body is involved in creating the angle of the vagina and is the key structure that defines the first part of the vagina.[6] The angle of the vagina, divides it into two parts and facilitates perineal balance allowing the posterior movement of the viscera (bladder, second vaginal part and rectum) and their support on the levator plate.

The perineal body is one of the key elements of vaginal support and its defects (usually post delivery) are causative for most of the perineal dysfunctions (Fig. 2). Anatomical reconstitution of the perineal body is thus critical in perineal surgery.

THE LEVATOR ANI MUSCLES

Instead of the usual description in three components (pubo-coccygeus, ilio-coccygeus and coccygeus) which is open to anatomical and functional misinterpretation, we consider like Shafik there are only two anatomical and functional entities:

– The **pubo-rectalis** (Fig. 3),[7, 8] muscular sling that surround the three visceral axis and the upper part of the perineal body. It is the muscle of urinary and anal continence. It corresponds to the upper loop of the anal sphincter. It is impossible to repair a damaged pubo-rectalis by surgery. The best way to improve its function is still physiotherapy.

– The **levator plate** (Fig. 4), thin muscular layer attached around the pelvic floor and interacting, in the centre, with the different visceral axis through the suspensory sling described by Shafik.[9] It probably plays an important role in the opening of the anal canal during defecation. Furthermore, this thin muscular layer is able to support the different viscera of the pelvis. Sagging of the levator plate is a key defect that can be treated in Perineology.[10]

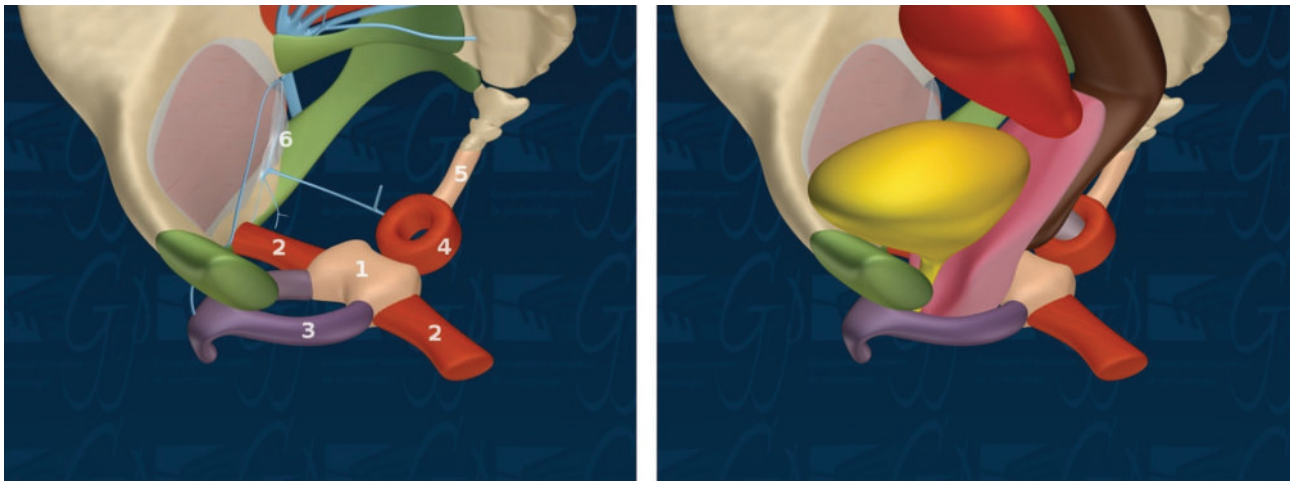
Because there is no levator ani muscle between the vagina and the rectum, levator myorrhaphy at this level would not be anatomical.[11]

THE PELVIC FASCIA (Fig. 5)

Mixed connective structure directly related with the different local connective tissues, it forms in places different ligaments described under specific names which are also open to misinterpretation.

In our point of view,[4, 5] the fascia must be seen as a thin layer stretching all over the pelvis with lateral insertions on

Fig. 1. – Superior and lateral view of superficial perineum and its innervation.



This layer plays an important role in the transversal support of the pelvic floor. 1: perineal body, 2: transverse muscle, 3: bulbocavernosus muscle, 4: sub-cutaneous external anal sphincter = base loop of Shafik, 5: ano-coccygeus ligament = intermediate loop of Shafik, 6: pudendal nerve in Alcock's canal.

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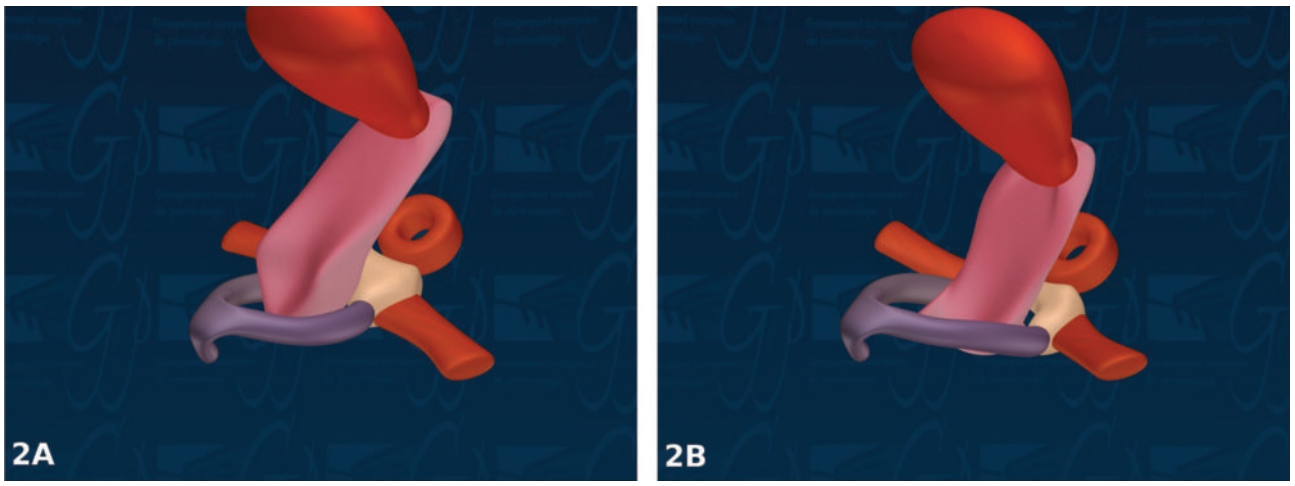
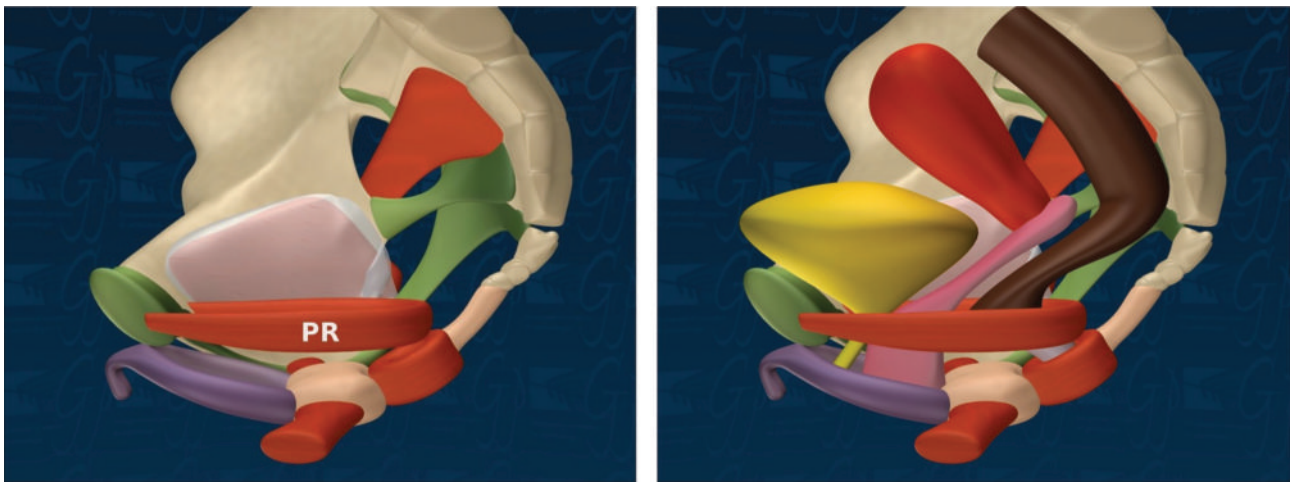
Fig. 2. – Example of long term consequences of perineal body's injury: cystocele arising because of lack of support (2A: normal anatomy, 2B: perineal body's injury and cystocele).



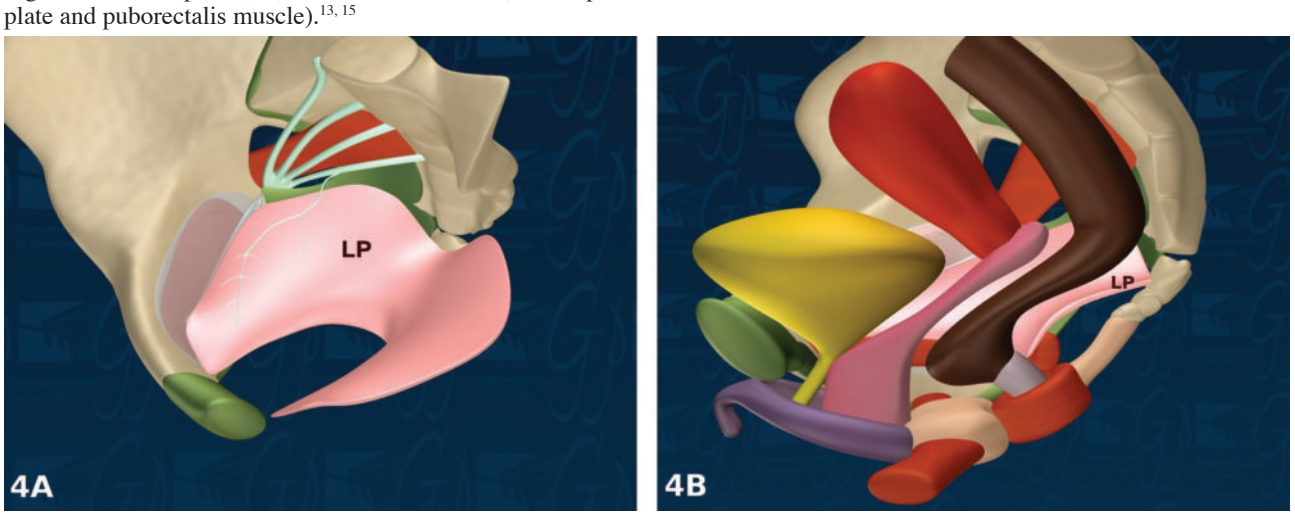
Perineal body's repair is one of the most important surgical procedures available to restore pelvic floor anatomy and to treat efficiently genital prolapses.

Fig. 3. – Pubo-rectalis muscle (PR).



Its resting tone takes part in the support of pelvic floor. Its contraction ensures continence keeping. Its relaxation is involved in micturition and defecation. These pictures show the Shafik's triple-loop system which compresses opposed alternating anal segments. The top loop is equivalent to puborectalis muscle and exerts traction to the front. The intermediate loop is equivalent to the top part of the external sphincter that merges with the ano-coccygeus ligament and pulls to the back. The base loop is equivalent to the bottom part of the external sphincter that merges with the perineal body and pulls to the front.

Fig. 4. – Levator plate (LP) and its innervation (4A : Superior and lateral view, 4B : lateral view with hemisection of levator plate and puborectalis muscle).[13, 15]



It is easier to consider this structure as unique, instead of describing several muscles. This muscular plate plays a passive role in supporting viscera. Its contraction could take part in supporting function and defecation.

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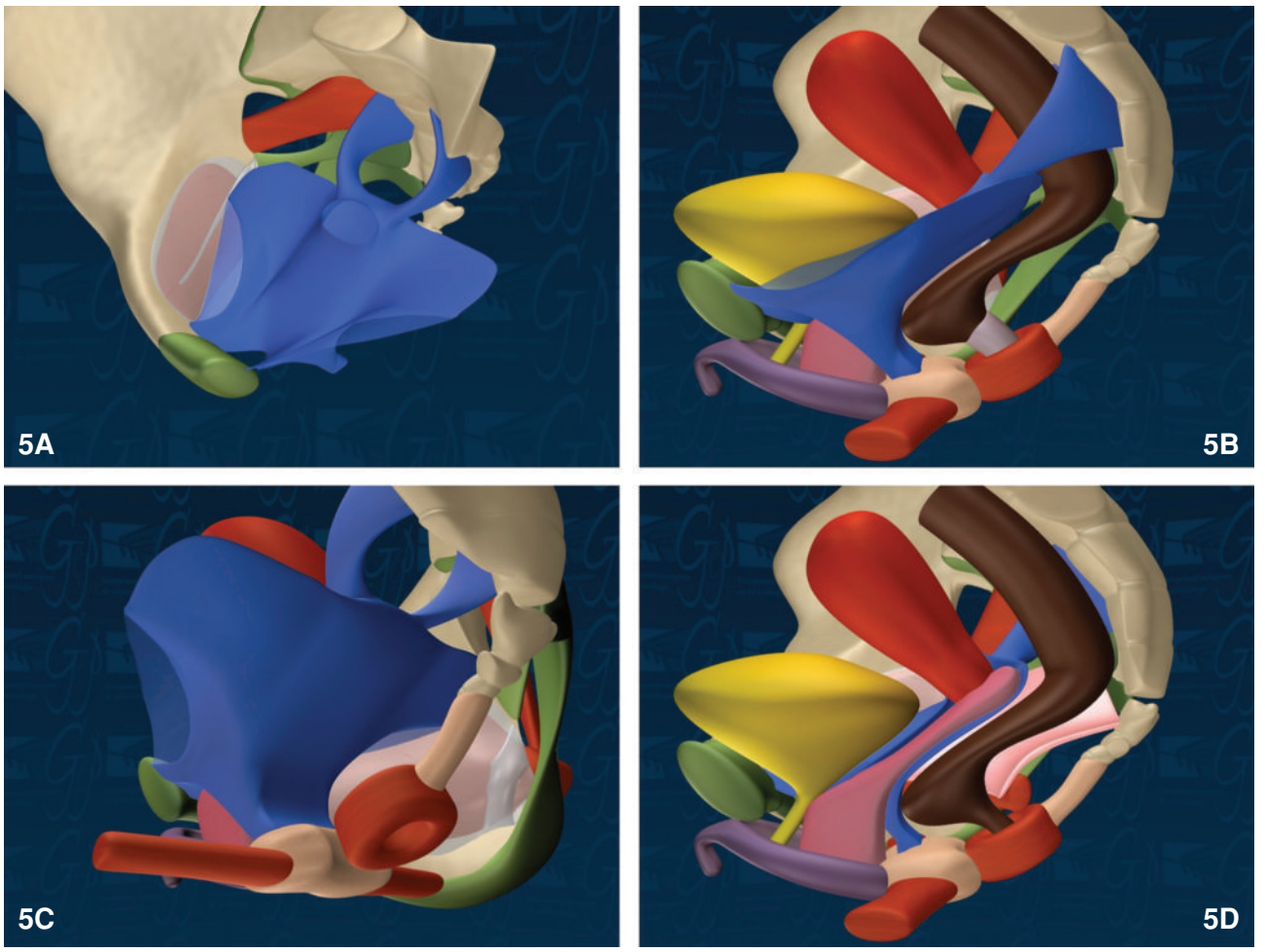
Fig. 5. – Several views of pelvic fascia (in blue color): this conjonctive structure stretches transversally and, from front to back, from its nearly circonferencial insertion.



It presents thicker and stronger areas like the utero-sacral ligaments and the pubo-urethro-vaginal ligaments. The vagina is included between the anterior and the posterior layers that merge with the perineal body. Pelvic fascia is insufficient to ensure by itself the stability of the pelvic floor. The integrity of the other perineal structures is really essential.

the white lines and, from back to front, on the sacral wall to surrounding the cervix (**utero-sacral ligament**) and after, with a division in two sheets:

– toward the pubic bone, the **pubo-cervical fascia** (**Halban's fascia**) [12] close to the second part of the anterior vaginal wall (defect of which results in a cystocoele) and then continuing to the posterior part of the pubic bone (**pubo-urethral ligaments**).

– toward the perineal body, the **recto-vaginal fascia** (**Denonvilliers fascia**) close to the second part of the posterior vaginal wall and going to attach to the perineal body. Its defect allows the development of enterocele, rectocele and uterine descent.

According to this concept, the 2nd part of the vagina is de facto included in the fascia which is involved in the angular layout of the vagina.

Therefore, the anatomy of the vagina is dependent on the quality of the connective tissue even if we think that the fascia is totally passive, its defects being usually the repercussions of the underlying perineal neuro-muscular diseases rather than direct connective tissue lesions.

THE ANAL SPHINCTER (Fig. 1, Fig. 3)

We totally agree with the concept of the three loops described by Shafik: [8]

– the **top loop** is the **pubo-rectalis** which pulls anteriorly the upper part of the anal canal;

– the **intermediate loop** corresponds to the **ano-coccygeal ligament**. This ligament is a strong fibro-muscular structure which pulls posteriorly the medial part of the anal canal;

– the **bottom loop** is the classic **sub-cutaneous sphincter**.

These antagonistic forces contribute to anal continence but also to the balance of all the perineum. To-day, this ano-coccygeal ligament remains the "unknown" of the pelvic floor. Its size and its structure are surely linked with an important function.

THE PUDENDAL AND LEVATOR NERVES (Fig. 1, Fig. 4)

Their importance deserves a later updating. [13, 14]

It is this anatomical approach that led us to the concept of Perineology. It is a global vision of all the perineal structures, but also of the different perineal diseases. This global approach is also essential in planning and performing surgery.

All the perineal diseases can be summarized in seven defects more or less associated. The job of the perineologist is to assess and diagnose these different defects and then to cure each of them.

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A later contribution in this journal will explain the different surgical procedures available to cure these defects.

The figures presented in this manuscript are samples of a DVD explaining the 3 D static and dynamic normal anatomy and perineal defects. This DVD will be available on www.perineology.com

REFERENCES

1. Beco J, Mouchel J. Understanding the concept of perineology. Int Urogynecol J Pelvic Floor Dysfunct 2002; 13: 275-277.
2. Beco J, Mouchel J. Perineology or pelviperineology: the same goal but different approaches. Pelviperineology 2007; 26: 139.
3. Beco J, Mouchel J. Perineology: a new area. Urogynaecologia International Journal 2003; 17: 79-86.
4. Mouchel F. Connaître et comprendre la nouvelle anatomie fonctionnelle. In: La Périnéologie, comprendre un équilibre et le préserver. Edited by Beco JMJ, Nélissen G. Verviers, Belgium: Odyssée 1372; 1998.
5. Mouchel J, Beco J, Bonnet P, Isambert J, Mouchel F, Wurst C. L'acte sexuel féminin: son intégration dans la conception anatomo-physiologique du plancher pelvien. In: Mise à jour en Gynécologie-Obstétrique. Paris, Vigot, 1996; 193-231.
6. Nichols DH, Randall CL. Vaginal surgery, 4 edn. Baltimore: William and Wilkins; 1996.
7. Shafik A. New concept of the anatomy of the anal sphincter mechanism and the physiology of defecation. II. Anatomy of the levator ani muscle with special reference to puborectalis. Invest Urol 1975; 13: 175-182.
8. Shafik A. A new concept of the anatomy of the anal sphincter mechanism and the physiology of defecation. The external anal sphincter: a triple-loop system. Invest Urol 1975; 12: 412-419.
9. Shafik A. A new concept of the anatomy of the anal sphincter mechanism and the physiology of defecation. VIII. Levator hiatus and tunnel: anatomy and function. Dis Colon Rectum 1979; 22: 539-549.
10. Beco JL. Interest of retro-anal levator plate myorrhaphy in selected cases of descending perineum syndrome with positive anti-sagging test. BMC Surg 2008; 8:13.
11. Mouchel T, Wurst C, Mouchel J: Faut-il encore faire des myorraphies des releveurs ? In: La Périnéologie, comprendre un équilibre et le préserver. Edited by Beco J MJ, Nélissen G. Verviers, Belgium: Odyssée 1372; 1998.
12. DeLancey JO. The anatomy of the pelvic floor. Curr Opin Obstet Gynecol 1994; 6: 313-316.
13. Barber MD, Bremer RE, Thor KB, Dolber PC, Kuehl TJ, Coates KW. Innervation of the female levator ani muscles. Am J Obstet Gynecol 2002; 187: 64-71.
14. Juenemann KP, Lue TF, Schmidt RA, Tanagho EA. Clinical significance of sacral and pudendal nerve anatomy. J Urol 1988; 139: 74-80.
15. Singh K, Jakab M, Reid WM, Berger LA, Hoyte L. Three-dimensional magnetic resonance imaging assessment of levator ani morphologic features in different grades of prolapse. Am J Obstet Gynecol 2003; 188: 910-915.

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