Technical note

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Perineal body repair in patients with third degree rectocele: a critical analysis of the tissue fixation system

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Abstract

Aim We describe the technique of tissue fixation system (TFS) perineal body repair in patients presenting with symptomatic third degree rectocele.

Method The single sling TFS perineal body repair is performed in three surgical steps: (i) dissection of the rectum off the vagina and laterally displaced perineal body; (ii) identification of the deep transverse perineii muscles beyond their insertion point behind the descending pubic ramus; (iii) elevation and approximation of the separated and laterally displaced perineal bodies by insertion, without tension, of non-stretch 7 mm polypropylene tape into the bodies of the deep transverse perineii muscles.

Results From January 2007 to December 2009 we performed the TFS operation for 30 women, median age 61 (range 47–87) years, mean parity 2.6 (range 1–5), with third degree symptomatic low rectocele (median obstructive defaecation syndrome score 19; range 11–24). Median hospital stay was 24 (range 12–96) h. The median visual analogue scale for postoperative pain was 1 (range 1–7). Complications occurred in three cases (10%) and included a surfaced tape that was partly resected (repair maintained), a recurrence of the rectocele due to incorrect placement (failed repair) and a foreign body abscess requiring tape removal. At 12-month follow-up, 27 patients (90%) reported normal defaecation and the median obstructive defaecation syndrome score was significantly reduced to 4 (range 1–6; $P < 0.001$).

Conclusion The TFS perineal body repair is an effective, safe, minimally invasive treatment in women with symptomatic low rectocele.

Keywords Obstructed defaecation, perineal body, rectocele, tissue fixation system

Introduction

The aetiology of rectocele is still debated. It has been defined, essentially, as a herniation of a central weakness in the posterior vaginal wall tissue [1]. Nichols *et al.* [2] described a low rectocele, caused by dislocation of the rectovaginal fascia (RVF) from the perineal body (PB), a mid rectocele caused by overstretching of the connective tissues between vagina and rectum and a high rectocele caused by damage to the anterolateral attachments of the vagina and cardinal ligaments.

A multitude of surgical approaches have been proposed for the treatment of rectocele (transvaginal, perineal, endorectal, abdominal) [3–14] with results often controversial. However, site-specific repairs are required to restore the anatomy and therefore function [15]. In 2005, one of the authors (PP) first described the technique of tissue fixation system (TFS) using a tensioned sling to link laterally displaced RVF and PBs to repair low rectocele [16]. Surgical methodology (tapes, anchors, applicators) has evolved significantly during the last 8 years, resulting in increased safety and improved outcomes. The aim of this study is to describe in detail the novel TFS operation and to assess the long-term results, in terms of both anatomical restoration and resolution of obstructed defaecation symptoms.

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Surgical technique

The single sling TFS PB repair operation (TFS Surgical, Adelaide, Australia) is performed in three surgical steps: (i) dissection of the rectum off the vagina and laterally displaced PB; (ii) identification of the deep transverse

perineii (DTP) muscles beyond their insertion point behind the descending pubic ramus; (iii) elevation and approximation of the separated and laterally displaced PBs by insertion, without tension, of non-stretch 7 mm polypropylene tape into the bodies of DTP muscles.

With the patient in a lithotomy position, a transverse incision is made 1 cm proximal to the hymenal ring. The vagina and wall of the rectum are stretched in opposite directions by assistants while the dissection is performed to facilitate access to the natural tissue planes. Once revealed, the PBs, which have been displaced behind the ischial tuberosities, are medialized with a No. 1 Vicryl suture. Using dissecting scissors, a longitudinal channel approximately 4 cm long is created at an angle of 30° into the substance of each PB along the length of the DTP muscle to just behind the posterior border of the inferior pubic ramus. The TFS applicator (Fig. 1) is placed into the channel and pushed forward until resistance is met. Guarding the shaft with the tip of the index finger, the applicator is pushed 1 cm into the membranous tissues at the posterior margin of the DTP muscle and the anchor is released (Fig. 2). Following insertion of the anchors, the laterally displaced PBs are gently approximated by tightening the TFS tape until a resistance is felt against the tightening (Fig. 3). At this stage, a 'bridge' of tape 1.5–2 cm long is seen between the PBs, having elevated them to a more horizontal plane. The musculo-fascial layer of the rectum adherent to the posterior vaginal wall is also reinforced in the midline with three 2/0 Vicryl sutures.

Where uterosacral ligament (USL) repair is required, our standard protocol [16] is to open out the apex of the vagina with a 4 cm long transverse or vertical incision sited 2 cm below the posterior part of the cervix, or hysterectomy scar. The USLs are identified and

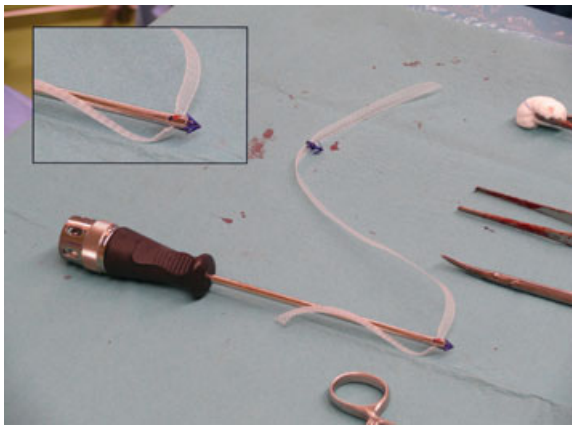

Figure 1 The tissue fixation system applicator tape (TFS Surgical, Adelaide, Australia).

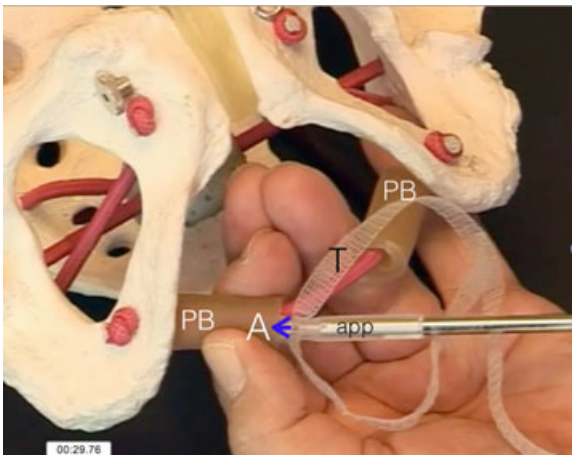

Figure 2 Model showing the insertion of the TFS anchor. The applicator (app) contains the anchor (A). The anchor is inserted through the laterally displaced perineal body (PB) just beyond its insertion into the posterior part of the descending ramus.

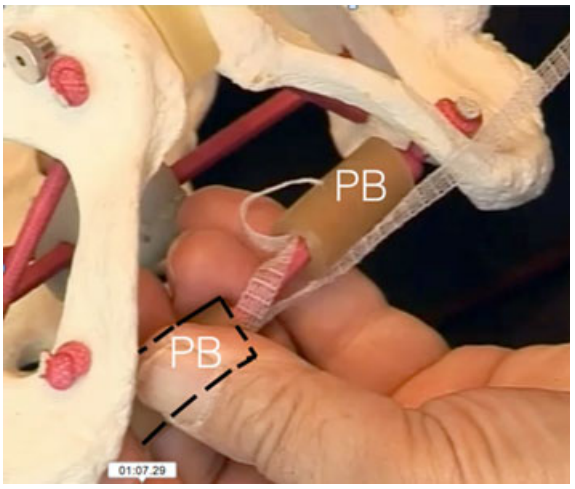

Figure 3 Model showing the elevation of the perineal bodies (PBs) and closure of the rectocele hiatus. The tape is tightened by the one-way tensioning action, elevating and approximating both PBs in a horizontal position. The tape remains bare in the middle for a distance of 1.5–2 cm between the two PBs and it fibroses with time.

checked rectally under tension. A channel is created inside the natural USL to within 2 cm of the sacral bone with a Metzenbaum scissors. The TFS applicator is inserted in the channel and the tape is tightened through the one-way trapdoor at the base of the anchor (Fig. 4).

A video demonstrating the technique is available at (Video S1).

Descriptive statistics (SPSS 14.0 PL for Windows; SPSS Inc., Chicago, IL, USA) for continuous data were performed and the results are given as median values

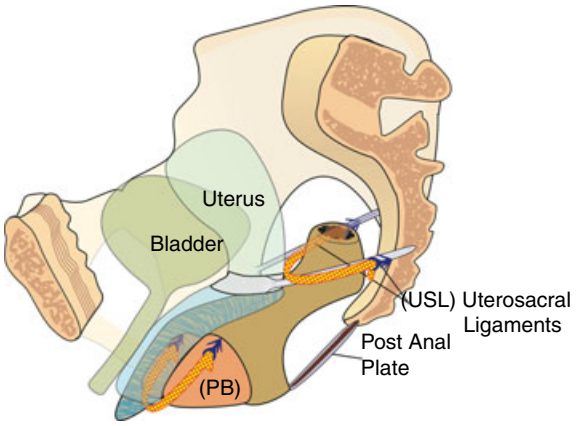

Figure 4 Schematic view of repair of perineal bodies (PB) and uterosacral ligaments (USL) using the TFS tapes.

with range. Statistical significance was assigned to $P < 0.05$.

Results

Since its introduction in 2005, we have performed this technique in 234 patients with third and fourth degree rectoceles and obstructed defaecation [17]. However, in this paper we analyse a smaller cohort of 30 Caucasian women, median age 61 (range 47–87) years, mean parity 2.6 (range 1–5), who were consecutively operated in three tertiary referral units in Germany, Spain and Australia between January 2007 and December 2009. Three patients were menopausal and eight patients had had a hysterectomy. All cases had everting rectocele with bulging of 2 cm or more beyond the hymenal remnant on straining at clinical examination, Pelvic Organ Prolapse Quantification (POP-Q) stage III [18], and complained of 'outlet' obstruction requiring manual assistance during defaecation. The mean obstructive defaecation syndrome (ODS) score was 19 (range 11–24) [19]. Preoperative pelvic floor ultrasonography, performed by an 'integrated' multimodalities approach (transperineal, TPUS; endovaginal, EVUS; endoanal, EAUS) [20,21], confirmed the clinical diagnosis of rectocele. At TPUS, during the Valsalva manoeuvre, the median protrusion of the anterior rectal wall was 2.4 (range 2–4.5) cm. At EVUS and EAUS, no significant prolapse of the anterior or middle compartments or anal sphincter lesions that could change the indication to TFS was found.

All patients underwent TFS PB repair. In two cases, the DTP muscle had been ruptured and was absent on the right side and the TFS anchor was successfully inserted in the fascia attached to the posterior part of the descending ramus between the upper two-thirds and lower one-third. In eight women with previous hysterectomy, TFS PB repair was also associated with TFS USL repair. Nineteen patients had, in addition, a TFS midurethral sling for urinary stress incontinence and one patient had an I-plasty operation for tethered vagina syndrome. Median hospital stay was 24 (range 12–96) h. The median visual analogue scale (VAS, range 1–20) to measure postoperative pain was 1 (range 1–7). In three patients with score 7, the postoperative pain was attributed to excessive tension from approximation of the No. 1 Vicryl sutures used to locate the laterally displaced PBs, early in the learning curve. Complications included postoperative haemorrhage which required blood transfusion in one patient and a perineal abscess which was treated by removing the tape in another case. There were two erosions. One was partly excised and the perineum remained intact. The other erosion was caused by extrusion of the anchor because of incorrect placement, causing recurrence of the prolapse. This patient declined another TFS and had a standard PB approximation.

At 12-month follow-up, 27 (90%) patients reported normal defaecation and the median ODS score was significantly reduced to 4 (range 1–6; $P < 0.001$). No evidence of prolapse was found on examination. The 'bridge' of polypropylene tape had become totally infiltrated with scar tissue and could not be felt as a tape. In those patients who were sexually active, no patient or partner complained of difficulty during intercourse. Transperineal ultrasonography confirmed the absence of protrusion of the anterior rectal wall during the Valsalva manoeuvre.

Discussion

The TFS is a novel, minimally invasive technique for PB repair in patients with symptomatic third degree low rectocele. It restores anatomy by elevating and approximating laterally displaced PBs by insertion, without tension, of a non-stretch 7 mm polypropylene tape into the bodies of the DTP muscles, immediately reducing the rectocele protrusion. Our surgical methodology is an extension of the surgical principle behind the tension-free vaginal tape operation, using a small segment of tape to reinforce damaged structures by creation of an artificial collagenous neoligament [22,23].

The preference for the TFS PB repair over alternative methods (standard colporrhaphy, laparoscopic ventral rectopexy, stapled transrectal resection, internal transanal Delorme's operation, transperineal or transvaginal fascial repair or mesh implant) [2–14] was

guided by the surgical principles inherent in the 'integral system theory' [24]: (i) tissue conservation; (ii) use of small tapes to reinforce damaged ligaments; (iii) avoidance of excessive tissue tension. Regarding the first principle (tissue conservation), the vagina is a cylindrical organ and any excision of significant tissue risks shortening or narrowing it. Our experience in operating on patients who have had wedge excision of skin and underlying perineal tissue is that it not only can be destructive to that central part of the PB but can cause severe, even painful scarring. Regarding the second principle (use of tape to reinforce damaged ligaments), we applied exactly the same methodology as for the tension-free vaginal tape operation for stress urinary incontinence [22], using small strips of tape to create a strong collagenous neoligament [23] that can more easily resist the muscle and intra-abdominal forces imposed upon it. Our rationale for using tapes is as follows. Connective tissue damaged by childbirth or weakened congenitally [25] may be a major cause of prolapse; there is no known method to date for preoperative assessment of quality of tissues for native tissue surgery; if the tissues are displaced but undamaged, native tissue operations are more likely to succeed. Otherwise, approximating two sites of damaged tissue can only result in more damaged tissue and surgical failure. This may explain the high failure rates reported in many native tissue studies. The strong repair and restitution of anatomy achieved in this study by repairing DTP muscle appear to confirm the hypothesis of Stein and DeLancey [26], a hypothesis we share, that a structure analogous to what we identify as the 'DTP' muscle may be a major supporting structure for the PB and damage to this structure a major cause of low rectocele. Regarding the third principle (avoidance of excessive tissue tension), the organs and tissues in that area are innervated by visceral nerves which are very sensitive to stretching. The TFS avoids the forcible approximation of standard PB operations.

There are major differences with conventional operations. (i) Traditional vaginal repairs approximate the laterally displaced fascia by sutures only. Damaged tissue is approximated to damaged tissue. The RVF is subjected to powerful stretching forces. The high recurrence rate of this type of surgery can ultimately be attributed to not repairing the key structural supports of the posterior vaginal wall, the USL and the PB. The USLs are a vital anchoring point for the muscle forces which angulate the posterior vaginal wall. The PB acts as an anchoring point for the perineal muscles, and also for the external anal sphincter. (ii) Laparoscopic ventral rectopexy uses mesh to cover the whole posterior vaginal wall. Erosion rates of the polypropylene mesh from 3% to 28% have been reported. A greater problem than erosion is the elimination of the RVF and adhesion of the vagina to the rectum. This would prevent the backward stretching of the vagina which occurs during straining and micturition; it may cause pelvic pain and dyspareunia, shrinkage and sometimes fistulation. Biological mesh mostly avoids such complications, but it remodels and so has a higher failure rate than synthetic mesh. (iii) Transvaginal or transperineal mesh repairs (Prolift, Apogee etc.) have the same reservations as all mesh sheet implants (shrinkage, erosion, fistula). Anchoring the mesh or sling through the sacrospinous ligament (SSL) is not without hazard, as there is a significant danger of damaging sacral nerves issuing directly above the SSL and the plexus of vessels often found below. Bleeding from such vessels is extremely difficult to control. (iv) The transanal approach removes the internal rectal prolapse but does not restore the anatomical DeLancey levels of support (USL, RVF, PB).

The single incision TFS sling is a site-specific repair of USL, RVF and PB. The advantages of this technique are (i) that the one-way tensioning mechanism brings laterally displaced tissues towards their normal central position to close the herniation and support the organ and leaves a 1.5–2 cm central segment to fibrose as a 'neo central tendon'. (ii) Very small segments of tape are used. This minimizes the possibility of erosion. (iii) The tapes are placed transversely. This permits the normal antero-posterior movements of the vagina essential for normal organ function. (iv) Very little dissection is required; this vastly decreases bleeding and other morbidities. (v) The posterior (uterosacral) sling also acts as a rectopexy operation, curing anterior rectal wall intussusception. (vi) The TFS PB repair is very accurate anatomically, as it penetrates the DTP muscles to elevate both PBs from their lateral-inferior displaced positions to a more central midline position. (vii) The one-way tensioning system has a built-in limitation to overtensioning, explaining the minimal pain reported by patients for this procedure. Conventional PB repairs forcibly approximate the laterally displaced PB, causing often severe postoperative pain and predisposing to surgical failure. The quite severe pain referred by three patients of our cohort was observed early in the study, leading to the recommendation that the tape should be left very loose or not approximated at all ('tension-free' approach).

Since its introduction in 2005, the TFS technique has evolved significantly resulting in increased safety and improved outcomes. In the few early cases (three women) of this cohort we used the old versions of the

anchor, applicator and tape which, although adequate, did not work as efficiently as the current device. We used a multifilament tape, the only non-stretch tape available at that time. It is a densely knitted tape more likely to cause tissue rejection and, occasionally, sterile abscess [27]. The tape has evolved to a monofilament polypropylene tape.

In conclusion, the TFS PB repair is an effective, safe, minimally invasive treatment in women with symptomatic low rectocele, not only restoring the anatomy by elevating and approximating laterally displaced PBs by insertion of tension-free tape but also curing the symptoms of obstructed defaecation.

Author contributions

Each author has participated sufficiently in the work to take responsibility for it and approved the final submitted version. W.F.M.E. and P.P. were responsible for the project conception and design; W.F.M.E., D.A.E. and P.P. performed all surgical operations according to the protocol; W.F.M.E. and GAS were responsible for the acquisition, analysis and interpretation of data and for writing the manuscript.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Video S1. Video demonstrating the TFS repair operation technique.