Original article

Bilateral Sacrospinous Colposuspension (BSC) for the treatment of vaginal vault prolapse – description of a novel method

DIRK G. KIEBACK

Interdisciplinary Pelvic Floor Center, Department of Obstetrics and Gynecology
Diakonissenkrankenhaus Flensburg, Flensburg, Germany

Abstract: Vaginal vault prolapse is observed with increasing frequency in the era of large aging populations. Various surgical techniques have been established, varying in performance, difficulty and outcome, specifically complications. A bilateral sacrospinous colposuspension technique (BSC) with a corresponding mesh prosthesis was developed using a direct I-Stitch fixation of the 38 microgram mesh from the vaginal apex or uterine cervix to the sacrospinous ligament or the parasacral tendinous region for the treatment of an anatomical central pelvic floor defect. As a minimally invasive approach with the potential for conservation of the uterus, this technique should be applicable to all age groups including the increasingly frequent elderly patient with significant co-morbidities.

Keywords: Bilateral sacrospinous colposuspension; Operative therapy; Single incision; Vaginal mesh placement; Vaginal vault prolapse; Macroporous; Lightweight

INTRODUCTION

Vaginal vault prolapse is a known clinical entity observed increasingly frequently in the era of large aging populations[1]. Historically, treatment options included abdominal surgical interventions such as sacrocolpopexy or fascial slings[2,3], and operations via the vaginal approach such as the unilateral Amreich-Richter operation with the vaginal apex sutured to the sacral bone after hysterectomy[4]. More recently, extensive reconstructions using prosthetic mesh for the induction of neo-ligaments and neo-fasciae have been advocated[5], sometimes also in the context of primary surgical interventions in the untreated patient[6].

Intravaginal slings (IVS) placed transischiorectally have been proposed by Petros and Farnsworth and shown to be promising in a small series of cases[7,8]. However, rectal injury and erosions were identified as major problems of this technique which led to the abandonment of IVS[9].A multi-center series in Austria yielded better results but still described severe complications[10].

It appears that total lack of a formalized anatomically based procedure was a major contributing factor to these unfavorable outcomes, as well as a deficit of education in potential surgeons, potentially even amplified by encouragements and assurances of "simplicity" by the manufacturers. Several parts of the technical description itself already harbored the potential for major complications, for example the para-anal entry point at the six o'clock position where the rectal arteries is found.

In the development of our refined transperineal bilateral sacrospinous colpofixation (TPBCF) technique, we have successfully optimized the surgical procedure of transperineal vaginal sling placement regarding the anatomical and clinical outcome and the potential for complications. Details were published recently[11,12].

With the advent of the i-Stitch instrument, finger-guided placement of sutures in the pelvis without extensive dissection became a reality. Equally, lightweight polypropylene mesh as described for the InGynious Mesh[11] became available.

These two factors lead to the development of the BSC-Mesh abolishing the transperineal phase of the TPBCF in favor of a direct i-Stitch-sutured fixation to the sacrospinous ligament or to the more cranially located parasacral tendinous insertion of the pelvic floor muscles. The weight of the material was significantly reduced in comparison to the transperineal tape, as no pull-through forces need to be applied in the direct approach. Anatomical studies lead to the determination of the width of the apical part of the BSC Mesh as well as the angle of the "arms" leading to the points of fixation in the pelvis. These arms were given extra length for adaptability of the positioning of the vaginal apex to the individual pelvic anatomy.

SURGICAL TECHNIQUE

Step1: Pre-operative treatment

Each patient is treated with vaginal or systemic estriol application for four weeks before surgery. Single dose antibiotic prophylaxis with a combination of a cephalosporin and metronidazole is administered i.v. half an hour before starting the procedure. The vagina is thoroughly disinfected with copious amounts of antiseptic solution during the initial phase of the operation. The anus is thereafter covered with an adhesive sterile impermeable membrane and thereby sealed off from the operative field.

Step 2: Incision in the posterior vaginal wall

A longitudinal incision is made in the midline of the posterior vaginal wall 3 cm distal to (not at) the vaginal apex. The injection of vasoconstringent medication under the vagina before incision may be considered, is, however, by no means necessary as significant bleeding is the exception when choosing this approach.

Step 3: Access to the sacrospinous ligament

A canal designated to admit the index finger of the surgeon is formed by advancing Metzenbaum scissors immediately under the vaginal wall horizontally in the direction of the pelvic side wall. By inserting the finger, a direct access to the sacrospinous ligament can thereafter be developed by blunt dissection. No extensive mobilization of tissue planes or retractor placement, nor visualization of the target structure is required at this point.

Step 4: Dissection of a horizontal space under the cranial vaginal tissue

From the upper end of the longitudinal vaginal incision, the tissues of the rectovaginal septum are dissected off the posterior aspect of the vaginal wall. This will facilitate the subsequent attachment of the prosthetic tape under the intact vagina, thereby removing it from the incision and thus from potential contamination during wound healing and physiological inflammatory reactions, which both would

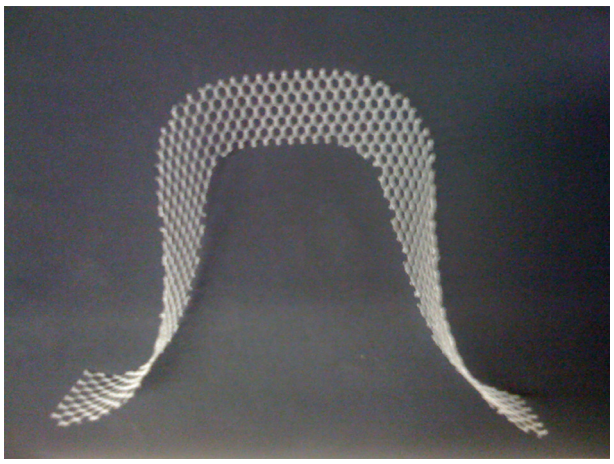


Figure 1: Original BSC-Mesh

predispose the tape to erosion. If the uterus remains in situ, the space is developed with the goal to expose the posterior surface of the cervix for later tape attachment.

Step 5: Choosing the future fixation points for the BSC Mesh
It is a matter of personal preference, on which side the i-Stitch suture is placed first . Being right-handed, we have mostly placed it first on the right side of the patient and then on the left. This means that the I-Stitch instrument is guided to the surgeon's index finger that is placed on the desired fixation point. We found it advantageous to advance it with the tip up, then turn it to the tissue immediately after anchoring. This minimized tissue resistance during placement. The internal index finger therafter pushes the tip of the I-Stitch firmly into the tissue, (not the external hand holding the i_stitch instrument), the suture is advanced into the receiving groove, the hollow guiding needle is retracted, the instrument is removed and the suture tested for stability to traction. The sutures are not knotted but guided laterally to the thighs of the patient where they are held i.e. by short Kocher clamps.

Step 7: Fixation of the tape to the underside of the vaginal apex or the posterior aspect of the cervix
It is probably a more philosophical question, whether one should use resorbable or permanent suture for fixing the tape to the underside of the vagina. In an effort to assure suture stability during fibroblast invasion of the graft, while at the same time avoiding permanent multi-knotted strings under the vaginal skin, we have adopted the use of non-resorbable polypropylene threads (USP 3-0) for this purpose.
Two sutures are placed, the first and second in the midline, the second and third 2-3 cm lateral on either side of the midline ("turning point sutures"). The suture technique involves prepositioning of the sutures holding them i.e. with short Kocher clamps centrally and i.e. Overholt forceps laterally for distinction of the sutures during later threading.
As a results six sutures will have been placed for the fixation of the BSC-Mesh: Two I-Stitches (one on each side) , two median ones, and two lateral "turning point" ones (one on each side). An identical approach is used when fixing the mesh to the posterior cervix.

Step 8: Threading the sutures through the mesh
The prepositioned sutures are threaded through the mesh from posterior to anterior: The two median sutures first with one thread of each suture on one side of the central marking on the tape, the other on the other side. Again, after threading the sutures are held with the respective clamps and not yet tied. This is followed by guiding the two lateral files through the mesh in the same posterior to anterior direction at the turning point of the U-shaped BSC Mesh from the nearly horizontal part to the straight part of the "arms". Finally, the I-Stitch sutures are threaded through the mesh at an individually chosen distance from the turning point sutures adapting the later tension of the suspension to the individual anatomical circumstances.

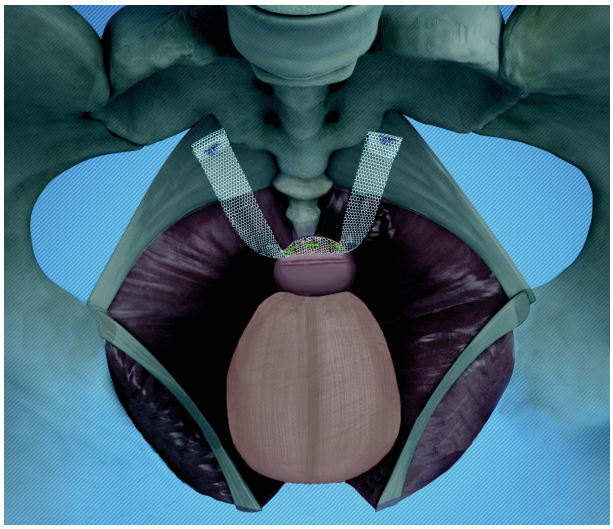
Step 9: Tyning of the sutures
The median sutures are tied and cut short first, bringing the mesh in contact with the patient`s tissue for the first time. We have found it practical to tie the most cranial of the two median sutures first followed by the second. Thereafter the two turning point sutures are knotted and cut short. The two "arms" of the mesh can now be guided into the designated spaces towards the fixation points. Before tying the I-Stitch-es we place and tie a braided resorbable suture USP 2-0 across the cranial angle of the colpotomy facilitating later closure after the prolapse is resolved.
In a final step, the two I-Stitch sutures are tied in the process re-elevating the vaginal apex (Figure 2) or the cervix (Figure 3) to their original physiological position.
The vaginal incision is closed with the pre-positioned running suture.

Step 10: Preparation for postoperative car
At the end of the procedure, a vaginal gauze pack liberally coated with estriol ointment is inserted into the vagina over night together with a Foley catheter for bladder drainage. If outpatient treatment is desired, which is definitely an option due to the excellent tolerability of the intervention, this step can probably be safely omitted. In any case, weekly vaginal estriol applications are prescribed, as known from other clinical management guidelines after vaginal mesh placement.

DISCUSSION

Fascia lata slings and suspension procedures using the round ligaments have been abandoned as have resorbable meshes due to the fact, that the body does not maintain neo-ligaments without continuing stimulation of fibroblasts on site. Sacrocolpopexy with or without prosthetic mesh interposition should be combined with a Burch procedure for optimal results as shown by the studies of the NIH Pelvic Floor Disease Network[13–15]. In sum, this amounts to a significant surgical intervention with laparoscopic techniques adding

Figure 2: BSC of the vaginal apex after hysterectomy



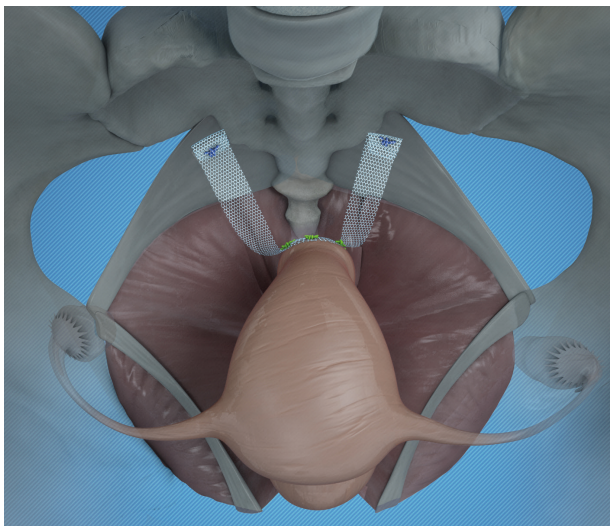


Figure 3: BSC conserving the uterus

their own spectrum of possible complications due to their transabdominal nature.

Amreich-Richter results are known for their surgery-induced dyspareunia, deep pelvic pain and secondary urinary continence problems[16] making them unattractive especially for, but not limited to, the younger patient. While having been in clinical use for a long time, systematic studies of this entity are few. Modifications using unilateral or bilateral non-resorbable sutures that serve as fixing strings suspending the vaginal apex at a distance from the sacrum have never been formally evaluated and remain experimental with anecdotal results.

Large prosthetic implants as a primary treatment approach for female genital prolapse are meeting with increased scepticism due to their potential for complications. The FDA has recently issued a statement to the effect, that large meshes are contraindicated as primary treatment in such situations[17].

The TPBCF approach outlined before offered the potential for the generation of an anatomy-analogous support of the vaginal vault or the uterus mimicking the sacrospinous ligaments or creating sacro-vaginal ligaments in it's place. It´s role is limited by the transperineal phase with it`s own potential side effects and the requirement of a more densely woven material in order to withstand the traction forces during placement. By contrast the total weight of the foreign material employed in the BSC Mesh is 38 micrograms making it weigh the equivalent of a 0-0 suture used during the Amreich Richter procedure and less than the average postal stamp.

Using suturing instead of an anchor system for fixation inside the pelvis allows for repositioning of the suture if the surgeon is not satisfied with the position of the anchor point after the first placement or the stability to traction is deemed unsatisfactory. Palpatory selection of the anchor point and direct digital control of the suturing results in optimal safety.

The indication for BSC is vaginal vault or uterine prolapse, it is not designed to correct anterior, posterior or lateral pelvic floor defects. As a minimally invasive approach with the potential for conservation of the uterus BSC would potentially be applicable to all age groups and from the increasingly frequent elderly patient with significant co-morbidities to the younger woman desiring restoration of a physiological anatomy with minimal use of foreign material.

BSC-Mesh placement can be combined with an anterior an/or posterior colporrhaphy. If indicated, this step should be perfomed first, as the performance of vaginal reconstruction becomes markedly more cumbersome after correction of the prolapse.

REFERENCES

1. Wilkins MF, Wu JM. Lifetime risk of surgery for stress urinary incontinence or pelvic organ prolapse. Minerva Ginecol 2017;69:171–7.
2. Takacs EB, Kreder KJ. Sacrocolpopexy, Surgical Technique, Outcomes, and Complications. Curr Urol Rep 2016;17:90.
3. Ijland MM, Fischer D-C, Kieback DG, McGrath G, Farnsworth B. Midline intravaginal slingplasty for treatment of urinary stress incontinence, Results of an independent audit up to 2 years after surgery. Int Urogynecol J Pelvic Floor Dysfunct 2005;16:447–54.
4. Lantzsch T, Goepel C, Wolters M, Koelbl H, Methfessel HD. Sacrospinous ligament fixation for vaginal vault prolapse. Arch Gynecol Obstet 2001;265:21–5.
5. de Ridder D. Should we use meshes in the management of vaginal prolapse? Curr Opin Urol 2008;18:377–82.
6. Dias FGF, Dias PHGF, Prudente A, Riccetto C. New strategies to improve results of mesh surgeries for vaginal prolapses repair--an update. Int Braz J Urol 2015;41:623–34.
7. Farnsworth BN. Posterior intravaginal slingplasty (infracoccygeal sacropexy) for severe posthysterectomy vaginal vault prolapse--a preliminary report on efficacy and safety. Int Urogynecol J Pelvic Floor Dysfunct 2002;13:4–8.
8. Petros PP. Medium-term follow-up of the intravaginal slingplasty operation indicates minimal deterioration of urinary continence with time. Aust N Z J Obstet Gynaecol 1999;39:354–6.
9. Feiner B, Jelovsek JE, Maher C. Efficacy and safety of transvaginal mesh kits in the treatment of prolapse of the vaginal apex, A systematic review. BJOG 2009;116:15–24.
10. Bjelic-Radisic V, Hartmann G, Abendstein B, Tamussino K, Riss PA. The posterior intravaginal slingplasty operation, Results of the Austrian registry. Eur J Obstet Gynecol Reprod Biol 2009;144:88–91.
11. Brandt A, Ulrich D, Kuszka A, Niesel A, Lutz H, Funfgeld C, Kieback DG. Treatment of pelvic organ prolapse using a lightweight modified HexaPro Mesh. Pelviperineology 2018; 37/2: 39-41
12. Buerkle B, Ollig S, Kieback DG. Transperineal Bilateral Sacrospinous Colpofixation (TPBCF) for the treatment of vaginal vault prolapse – description of a refined method. Pelviperineology 2018; 37/2: 49-52
13. Brubaker L, Cundiff GW, Fine P, et al. Abdominal sacrocolpopexy with Burch colposuspension to reduce urinary stress incontinence. N Engl J Med 2006;354:1557–66.
14. Barber MD, Brubaker L, Burgio KL, et al. Comparison of 2 transvaginal surgical approaches and perioperative behavioral therapy for apical vaginal prolapse, The OPTIMAL randomized trial. JAMA 2014;311:1023–34.
15. Barber MD, Brubaker L, Nygaard I, et al. Defining success after surgery for pelvic organ prolapse. Obstet Gynecol 2009;114:600–9.
14. 16. Kraus P, Krofta L, Krčmář M, et al. Řešení sestupu tří kompartmentů pomocí syntetického implantátu a sakrospinózní fixace, Kohortová prospektivní studie s délkou follow-up pěti let [The results of five years follow-up prospective study of vaginal prolapse repaired by prolift total mesh surgery or sacrospinous fixation]. Ceska Gynekol 2017;82:277–86.
15. 17 FDA. Urogynecologic Surgical Mesh: Update on the Safety and Effectiveness of Transvaginal Placement for Pelvic Organ Prolapse, 2011. (https://www.fda.gov/downloads/MedicalDevices/Safety/AlertsandNotices/UCM262760.pdf).

ACKNOWLEDGEMENTS AND DISCLOSURES

The author is member of the Speaker`s Board of A.M.I. Austria and receives inventor´s royalties from the same source.

Correspondence:
Dirk Kieback
Interdisciplinary Pelvic Floor Center
Department of Obstetrics and Gynecology
Knuthstrasse 1- D-24939 Fuensburg - Germany
E-mail: dirkkieback@hotmail.de