Transvaginal mesh procedures for prolapse, analyzing its outcome rates and complications-literature review

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Abstract

Objective of the study: To know the efficacy of transvaginal mesh repair augmented by synthetic polypropylene mesh for pelvic organ prolapse with objective and subjective result of the procedure.

Material and methods: Evidence was gathered mostly about transvaginal synthetic polypropylene mesh using the search terms Transvaginal mesh, urinary incontinence, Mesh-complication, anterior prolapse, posterior prolapse, pelvic organ prolapse, vault prolapse, and mesh erosion-From April 2008 to March 2013. Online search range: Pub Med, Medline, RCT, Embase, database, Retrospective study and prospective study.

Result: In vaginal Prolapse surgery, graft or mesh is used more frequently than traditional repairs, which has high failure rates. Vaginal approach of mesh placement and suspension of the upper part of the vagina is seen to be more appropriate and successful, showing effects similar to that of the invasive abdominal approach. Because of its lower failure rates it is recently supported by Cochrane review as well. To make such kinds of surgeries easier, more standard and least invasive vaginal kits are being upgraded. It is said that every surgeon can perform the procedure with mesh kits easily, but it is not so. It needs advance pelvic surgery skills, a lot to understand and the limitations of the technique as well. This current paper focuses the needs for the development of the kit, how to use it, results and complications till date and the techniques how to overcome the complications. Before recommending the technique for general use in all Prolapse patients, a lot of things like investigation on proper patient selection, continue research on graft composition, techniques that minimize complications of needle passes or mesh placement should be understood thoroughly. Apart from these we still should have more surgical skills to perform the procedures, to reduce complications and increase better results.

Conclusion: Transvaginal repair using a synthetic polypropylene transvaginal mesh is a feasible and efficient procedure for the treatment of pelvic organ prolapse with less significant complications. Monofilament macro porous synthetic polypropylene mesh is effective, due to its low risk of infection and foreign body reaction. Proper patient selection is the best way to avoid unnecessary complications.

Keywords: Pelvic organ prolapse, transvaginal mesh, synthetic polypropylene mesh, mesh complication

Introduction

Pelvic organ Prolapse (POP) is a most common disease among women which refers as the protrusion of the pelvic organ down into its actual position throughout the vagina. There are many factors associated with Prolapse; several genes have been suggested to be yoked to the defect of vaginal wall itself or its supporting structures such as ligaments, fasciae or muscle injury. When intra abdominal pressure increases resulting in genital support defective this is chronically subjective with pelvic organ prolapsed [1]. The prevalence of POP increases with age and is approximately 31% across all age brackets. Required surgical repair by age 80 is 11% and operation within 3 years is 29 to 40%. Past literature shows that POP affects half of women aged 50-79 years, it is thought to be increased by 45% in future over 30 years as the general population is increase simultaneously [2]. Recent published data shows that 30-50% of women at risk of developing Prolapse during their lifetime [3]. The main clinical manifestations are visible bulge, symptom of pressure, urinary symptom, bowel symptom and sexual discomfort which is more commonly seen with POP patients [4]. Pathogenesis of POP are not clearly mentioned in past literature however trauma during child birth, congenital weakness of ligament and collagen metabolism thought to be the main risk factor of POP [3]. Population studies have shown
that Prolapse is more common in whites, less common in Asians, and uncommon in blacks suggest congenital and cultural factors. Genetics may also have a role in those women who have collagen or connective tissue diseases contributing to the development of prolapsed [5,6]. Some women under stress develop pelvic floor dysfunction, including Prolapse, urinary and fecal incontinence [16]. Postoperative-poor attention at the time of hysterectomy leads to prolapsed in some cases [7]. Women with connective tissue disorders may be more likely to develop POP. In a small case series study, one third of women with Marfan syndrome and three fourths of women with Ehlers-Danlos syndrome reported a history of POP [8]. De Lancey has described the suspension of the vagina in terms of levels of support [9]. The support of the upper third of the vagina to the pelvic sidewalls (level I) is via vertical fibers of the paracolpium, which is a continuation of the cardinal ligament. The middle third of the vagina (level II) is attached to the paracolpium and laterally to the Arcus tendons and fascia of the Levator ani muscles. Level III support of the lower third of the vagina is via fusion with the perineal membrane, Levator ani muscles and perineal body. Disruption or dysfunction of any of these levels of support can lead to loss of support and subsequent Prolapse. Difficult vaginal delivery cause both direct Levator ani muscle trauma and neuropathic injury to these muscles, thus contributes significantly to the development of POP [10,11]. In addition, injury to the pelvic connective tissues has been associated with POP; disruption or stretching of these tissues can occur during vaginal delivery, hysterectomy, chronic straining or with normal aging [12]. The majority of treatment is justified through traditional practice rather than scientific evidence. Most of the women that have undergone surgical repair for genital Prolapse, found to have a high recurrence rate of Prolapse, too many technical modifications have been developed to get improve the results [13]. Various types of surgical procedure were introduced previously among them transvaginal mesh repair is the new tradition and the most common procedure across all age groups which method is famous among woman these days [14]. Many techniques were used previously for modification; recent studies are incredible showing minimum complication with the high anatomic cure rate if handled properly. Synthetic implants, a macroporous net made of a wide mesh of knitted polypropylene monofilaments is currently the method of choice for surgery in patients with Prolapse. This process provides additional stability to traditional repair, decreasing the recurrence rate areas. It compromised 75% of all Prolapse mesh surgeries [15]. However, a complication unique to mesh is also mentioned in most of the patients among them mesh erosion or extrusion which seems to be most common even develop several years after the procedure [16-18]. Future research should therefore concentrate on the surgeon's experience as a possible risk factor for failure and might give insight into learning curve aspects of vaginal mesh surgery. This review presents with a large number of transvaginal mesh procedure and determination of statistical method to investigate the effect of the procedure. The review data shows there has been controversy whether transvaginal mesh procedures are best for Prolapse because of its complications; however this method is more effective than other surgical approach.

Materials and methods
A Pub MED, Dynamed, Medline, randomized control trials, was searched for keywords Transvaginal mesh, urinary incontinence, Mesh -complication, anterior prolapse, posterior prolapse, pelvic organ prolapse, vault prolapse, mesh erosion-From April 2008 to March 2013. Searches were updated on a regular basis and also incorporated with recent guidelines. Most of the articles were considered in the process; on the basis of subject relevance. Our specific objectives were to estimate the anatomic cure rate, the risk, benefits and complications, Report adverse event rates associated the mesh/graft use in pop. For review total of 44 articles were include which was previously published between years 2008 to 2012. This paper will review outcome results of these modalities.

Inclusion and exclusion criteria
The inclusion criteria were evidence based original study, randomized control trials, retrospective study, prospective study, the control group and test group. Incidence of the complications was the primary and secondary standards. Follow-up of three months to 38 months were included. Exclusion criteria were Controlled trial or a control group other than transvaginal repair of pop.

Data analysis
(Table 1) Altman and Falconer _et al._, evaluated safety in a study that involved 248 patients they reported complications as bladder perforation 5, rectal perforation 5 and bleeding more than 1000cc in one patient. In another study by the same author reported outcome of 3 month follow up of anterior, posterior and both compartments repaired with success rate of 87% and 91%respectively. Van Raalte _et al._, conducted 46 pt. With 10 months of follow-up there were no extrusion was reported however 15% prolapse was occurring in untreated compartment. Migliarie _et al._, showed that 12 women having POP have undergone transvaginal mesh repair during 20.5 weeks follow-up, it was observed that there was 100% success rate rather than mesh related complication. In the same way, some other studies like De Tayrac _et al._, And Nieminen _et al._, Reported that 84 POP repair with 24 weeks of follow-up and 105 POP repair cases with 36 weeks follow-up observation showed 91.6% anatomical cure rate with 8.3% mesh erosion and 87% anatomical cure rate with 1.7% stress urinary incontinence respectively. Scott serela _et al._, uses solyx (Boston scientific) reported in 63 patients (30-87year older) with 6.5 months of follow up 95% of patients were dry on the basis of subjective and objective assessment. 2 patients were seen with urinary
The incidence of early complication such as hematoma, bladder injury, late complication infection, pain and tape retention and resolved spontaneously, urge incontinence in 18 (29%); no complication of the procedure was reported. Smith ARB et al., in 36 patients with stress urinary incontinence with 9 months of follow up reported 83.4% of cure rate, the same group reported long term outcome at 3 years of 80% in 31. In 1958 the first polypropylene mesh was introduced as Marlex by Julian with a 100 % cure rate [19]. In recent years the role of synthetic polypropylene mesh implants has rapidly increased and popular in surgery for pelvic organ prolapse. The incidence of early complication such as hematoma, bladder injury, late complication infection, pain and tape erosion was seen very few. However secondary included urinary tract infection, voiding difficulty, retention and post operative anatomic cure rate objective and subjective. (Table 2) shows that complication regarding transvaginal mesh surgery was mesh erosion and extrusion even with minimum and maximum follow-up months. However anatomical cure rate was satisfactory with most of the studies. It also suggested that incidence of secondary outcome was similar with most of the studies. Cosson et al., Surgeons in France who worked on developing the Prolift System, and initially reported on a group of 684 women who underwent transvaginal mesh placement, Cure rate at 1 year was noted to be 82% (18% failure rate). The vaginal mesh extrusion rate was 6.7%, with risk of

Table 1. Transvaginal mesh procedure for pelvic organ prolapse surgery with synthetic polypropylene mesh.

| Author/Study                  | Mesh Type         | Follow up a month | Anatomic cure rate |
|-------------------------------|-------------------|-------------------|--------------------|
| Julian case control study [19]| Marlex            | 24                | 100%               |
| Fatton et al., [20]           | Polypropylene     | 6                 | 96.7               |
| Altman et al., [21]           | Polypropylene, prolift | 3              | 87%anterior, 91%posterior |
| Sola et al., [22]             | Gynecare prolift  | 7                 | 91%                |
| Van raalte et al., [23]       | Gynecare prolift  | 19                | 86.6%, 96.5% apical |
| Hinoul et al., [24]           | Gynecare prolift  | 6                 | 95.8%              |
| Iglesia et al., (RCT) [25]    | Gynecare          | 9.7               | 40.6%              |
| Cosson et al., [26]           | Autologous vaginal patch | 3            | 94%                |
| Kdous et al., [27]            | Gynecare          | 24                | 93%                |
| Luisa A et al., [28]          | Gynecare          | 12                | 87 anterior, 91 posterior, 88 both |
| Laurent de Landshree et al., [29]| Gynecare prolift | 38              | 88%                |
| The Nordic TVM group [30]     | Gynecare          | 2                 | 87%                |
| m.abdel Fattah et al., [31]   | Polypropylene     | 4 to 22 months    | 89%                |
| De tatrac et al [32]          | Polypropylene     | 37                | 89.1%              |
| Milani et al., [33]           | Polypropylene     | 17                | 94%                |
| Hiltunen (RCT) [34]           | Polypropylene     | 12                | 93%                |
| Maher et al., (RCT) 2011 [35]| Gynemesh          | 24 months         | 94%                |
| Withagen et al., (RCT) 2011[36]| Gynemesh          | 12 months         | 87%                |
| Niemenen et al., (RCT) [37]   | Gynemesh          | 36                | 87%                |
| EVA m. de. Cuyper [38]        | Gynemesh          | 6 and 12 months   | 85.7% and 88.9%    |
| Handel et al., [39]           | Polypropylene     | 13.5              | 86%                |
| Vincent letouze et al 2010 France [40]| Polypropylene | 37.79            | 94%                |
| Yan et al., [41]              | Polypropylene     | 6.7               | 90%                |
| Von Theobald & lube. (Retrospective study, France) [42]| Polypropylene | 6            | 98%                |
| Young Suk Lee [43]            | Gynemesh          | 12                | 79.4%              |
| Migliari et al., [44]         | Polypropylene     | 20.5              | 100%               |
| Dwyer and o'reilly [45]       | Polypropylene Atrium | 24            | 100%               |
| Bai et al., (prospective cohort) [46]| Gynemesh | 12                | 100%               |
| Fikret faith onol et al., [47]| Gynemesh          | 33.4-41.2 month   | 86.4% and 81.1%    |
| Salvatore et al., 2002 [48]   | Prolene           | -                 | 87%                |
| Mercer jones et al.,[49]      | Polypropylene     | 12                | 75%                |
| Palma et al., 2008 [50]       | Polypropylene     | 12                | 88%                |
| Watson et al., [51]           | Polypropylene     | 29                | 89%                |
| Montironi et al., Italy[52]   | Polypropylene     | 4.6               | -                  |
| Scott sersels et [53]         | Boston solyx      | 9.5               | 95%                |
| Smith ARB et al., [54]        | Boston solyx      | 9                 | 83.4%              |
| Petros pe et al., [55]        | Boston solyx      | 36                | 80%                |
| Moore RD et al., [56]         | Boston solyx (TVT) | 12              | 91.4%              |
| Alinsod R et al., [57]        | Boston solyx (TVT) | 21 weeks        | 97%                |
| Meschia M et al.,[58]         | Prolene AC        | 6-12              | 78-81%             |
| Beer and Kuhn [59]            | Pinnacle          | NA                | -                  |
| Karen I et al.,[60]           | Lynx(boston scientific) | 12          | 90%                |
| A. Ranganathan et al., [61]   | Advantage         | 6                 | 92%                |
mesh extrusion increased. De Novo dyspareunia was noted to be 4.9%. Fatton et al., Published one of the first retrospective, multicenter series that reported on initial operative and short-term follow-up data on 106 patients who underwent the procedure. All patients had a Stage III or Stage IV. Total mesh was used in 59 patients (53.6%), an isolated anterior

| Author/Study | Number of patients | Complications | Comments |
|--------------|--------------------|---------------|----------|
| Julian case control study [19] | 24 | 25% mesh erosion and infection | Safe and effective |
| Fatton et al., [20] | 110 | 4.7% mesh erosion, 2.8% granuloma | Procedure effective and safe |
| Altman et al., [21] | 123 | 10% bladder perforation, 5% rectal perforation, 1% bleed >1000cc | Secondary outcome reported inconsistently |
| Sola et al., [22] | 41 | 3.2% injury, 3 bladder injury and 1 rectal injury | Secondary outcome reported inconsistently |
| Van raalte et al., [23] | 46 | anterior, 80 posterior, 23 both | 1% mesh extrusion, 1% perirectal hematoma | Less complication |
| Hinoi et al., [24] | 48 | anterior | 10.5% extrusion, 15% prolapse in untreated compartment | No mesh erosion |
| Iglesia et al., (RCT) [25] | 24 | | 10.5% extrusion, 15% dyspareunia | Mesh extrusion reported earlier |
| Conson et al., [26] | 687 | | 15.6% mesh erosion, 12.5% reoperation | Number needed to treat |
| Kdous et al., [27] | 45 | | - |
| Luisa A et al., [28] | 68 | | 2 dyspareunia, 1 mesh exposure, 4 vaginal discharge, 3 granuloma, 6 tenderness over graft |
| Laurent de Landshree et al., [29] | 48 | anterior, 103 posterior, 37 both compartment | 3 bladder perforation, 1 rectal injury, 3 urinary incontinence, 19 mesh erosion, 14 mesh exposure, 48 anterior, 103 posterior, 37 both compartment |
| The Nordic TVM group [30] | 123 | | 2 mesh exposure, 3 bladder injury, 1 rectal injury | Overall minimal complication |
| m.abdel Fattah et al., [31] | 70 | anterior, 70 posterior, 70 both compartment | 14 urinary stress incontinence, 23 prolapsed in another compartment, 3 bladder injury, 2 rectal injury, 6 blood loss >400mL, 30 vaginal erosion, 3 vaginal adhesion, Secondary outcome report inconsistent |
| De tayarac et al., [32] | 32 | | 9.1% mesh erosion, 5.5% mesh related pain | Number needed to treat 4 |
| Milani et al., [33] | 32 | | 13% mesh erosion | - |
| Hiltunen (RCT) [34] | 19 | | - | effective |
| Maher et al., (RCT) 2011 [35] | 55 | | 9% | - |
| Withagen et al., (RCT) 2011 [36] | 93 | | 16.9% | Elderly pt. rise risk of UTI and urgency |
| Niemenen et al., (RCT) [37] | 105 | | Stress urinary incontinence, 1.7%, dyspareunia, 19% mesh erosion | - |
| Eva m. de. Cuyper [38] | 64 | | 4 dyspareunia, 3 mesh erosion, 4 urgency. | Less complication seen |
| Handel et al., [39] | 25 | | - | 100% success |
| Vincent letouzey et al 2010 France (40) | 63 | | 2 dyspareunia, 8 stress urinary incontinence, 10 urgency, 9 mesh erosion, 1 fecal incontinence | Primary outcome measure inconsistent |
| Yan et al., [41] | 30 | | 1 post operative urinary retention, 5 dyspareunia, 2 incontinence, 1 mesh erosion | Less postoperative complication |
| Von Theobald & lube. (Retrospective study, France) [42] | 92 | | 1 hematoma, 3 vaginal erosion | effective |
| Young Suk Lee [43] | 49 | | 1 vaginal erosion, 2 posterior vaginal prolapsed | effective |
| Migliari et al., [44] | 12 | | No mesh related complication | 100% success |
| Dwyer and o’reilly [45] | 50 | | 12% mesh erosion, 1 recto vaginal fistula | High rate of mesh erosion |
| Bai et al., (prospective cohort) [46] | 28 | | Undefined | - |
| Fikret fatih onel et al., [47] | 118 | | 8 stress urinary incontinence, 10 dyspareunia, 10 mesh erosion, 11 vaginal erosion | Megh erosion and extrusion average |
| Salvatoe et al., 2002 [48] | 31 | | 6 dyspareunia, 3 infections, | effective |
| Mercer jones et al., [49] | 22 | | 2 rectal perforation, 13% mesh erosion | Inadequate method |
| Palma et al., [50] | 18 | | UTI | Safe and effective |
| Watson et al., [51] | 9 | | No mesh related complication | 100% success, but less data |
| Montironi et al., Italy [52] | 35 | | 1 vaginal erosion | Safe and effective |
| Scott serels et al., [53] | 63 | | 18 urge incontinence | Infection moreover |
| Smith ARB et al., [54] | 36 | | 2 mesh erosion | success |
| Petros pe et al., [55] | 36 | | - | - |
| Moore RD et al., [56] | 61 | | 7% urinary retention | Postoperative care inadequate |
| Alimood R et al., [57] | 76 | | 4 Voiding difficulty | Most effective |
| Meschia M et al., [58] | 91 | | Recurrent UTI, dyspareunia | Infection other than mesh related |
| Beer and Kuhn [59] | 55 | | 2.3% hematoma, 2.9% urological problem, 0.8% damage to pelvic wall, 1.8% damage to nerve | Operative skill |
| Karen l et al., [60] | 102 | | 4 bladder perforation, 5 mesh erosion, 2 recurrent incontinence, 6 de Novo urge loss, 10 failure | Less complication |
| A. Ranganathan et al., [61] | 81 | | 4 persistent urinary incontinence, 2 de Novo overactive bladder | Less complication |
mesh in 22 patients (20%), and an isolated posterior mesh in 29 patients (26.4%). One bladder injury was reported that was sutured at surgery and two hematomas reportedly required secondary surgical management. In 3 months, all 106 patients were available for follow-up. Mesh exposure occurred in five patients (4.7%), two of them requiring surgical management. Granuloma without exposure occurred in three patients (2.8%). Failure rate (recurrent prolapse, even asymptomatic or low-grade symptomatic prolapse) was 4.7%. No sexual function data were reported due to the short follow-up. The Nordic TVM group published the first prospective study to date on the short-term outcomes of transvaginal repair of prolapse using Polypropylene. They are conducting a 3-year prospective multicenter trial in 28 centers and have published on the initial safety and early efficacy of the procedure with 3 month follow-up of 123 cases. There were injuries reported in 3.2% of the cases (three bladder injuries and one rectal injury) and only two mesh exposures reported at 3-month follow up. Postoperative cure (POP-Q Stage 0 or I) was 87% after anterior Prolift, 91% after posterior Prolift, and 88% after total Prolift. They also did a macroscopic assessment of the vaginal epithelium and noted an increase of mild moderate granuloma formation in the operated areas, but no cases of serious adverse tissue reactions related to the mesh. All quality of life scores improved at the 3-month visit. There were no serious adverse events attributed to the polypropylene mesh.

Van Raalte et al., recently reported on 97 patients who underwent the prolif procedure with a median follow-up of 19 months [68]. Prolift procedures included 46 anterior, 26 posterior, and 23 total (both anterior and posterior). Intraoperative complications included four cystotomies (8.6%) and one urethral obstruction. Overall cure rate at 1 year or greater was 86.6% for all compartments. Failure in the same site that mesh had been placed was lower at 10%; however, they did find that prolapse occurred in 15.5% in an untreated compartment. Apical cure was 96.5% and reoperation rate for prolapse was low at 4.3%, which they stated is comparable to abdominal sacralcopexy at 4.4%. They reported no long-term complications and no mesh extrusions. Dyspareunia rates were not reported. They concluded that the potential for improved surgical outcomes will be achieved only through modifications of techniques, longer-term follow-up, and proper patient selection.

Sola et al., and Hinoul et al., have the only other published series in the literature regarding the Prolift procedure. Sola et al., retrospectively reported on 41 patients who underwent the Prolift procedure, with an average of 7 months follow-up (range: 2–12 months). One perirectal hematoma occurred postoperatively. Four failures were observed with a cure rate of 91.3%. Only one mesh extrusion occurred (2.4%). Hinoul et al., most recently prospectively reported on 48 patients who underwent anterior Prolift. They reported a 95.8% cure rate with a 10.4% rate of mesh extrusion. In nine of 29 (31%) sexually active patients, dyspareunia due to prolapse was present prior to surgery and disappeared in all. De Novo dyspareunia, however, did occur in 15% of patients.

Altman recently evaluated perioperative morbidity from placement of Prolift transvaginal mesh in 248 patients. Visceral injury occurred in 4.0%, bleeding greater than 1000 cc. At 0.4%, urinary tract infections in 6.5%, urinary retention in 1.6%, postoperative fever in 1.6%, and groin pain in 0.8% of patients. Unfortunately, there are even fewer data on long-term complications, such as mesh erosions, chronic pain, and defecatory dysfunction.

Discussion

Recent studies on monofilament synthetic polypropylene mesh implants have shown that the anatomical recurrence rate is very low after the use of mesh material as compared to classical prolapse repair without mesh [62]. Mono filament macro porous (pore size > 75 µm) polypropylene mesh is preferred for transvaginal surgery for POP or stress incontinence because of the low risk of infection and foreign body reactions [64]. The short-and medium-term follow-up effects of vaginal repairs for prolapsed using synthetic polypropylene mesh are promising. However, since this technique was introduced, there have been concerns about vaginal erosion. According to several surveys, the rate of vaginal erosion after vaginal wall repair ranges from 3.8% to 20% [65,66], although the definition of erosion in these studies has been usually absent or confusing. One year was considered a minimum adequate period of time to assess the efficacy of prolapsed repair. However, even one year outcomes are too early to judge whether prolapsed surgery is successful in the long term. The mean time to first re-operation is reported in the literature as 12-years [66] and therefore, failure at one year should not be regarded as an adequate representation of efficacy. Prospective studies would require extended follow-up to assess meaningful mesh/graft failure.

Interestingly though, there have been several recent reports that have shown that the overall risk of dyspareunia, when carefully studied and when the procedure is done by experts, is actually lower than traditional surgery for prolapse. Lowman et al., showed the overall risk of Dyspareunia for the Prolift procedure to be 16.7% [26]. Although, at first glance, this rate does seem high, they compared it to historical control studies and found that even with traditional vaginal or abdominal repair for prolapse, dyspareunia rates are in the range of 14.5–36.1%. Thus, they reasoned that the Prolift procedure has comparable rates of dyspareunia.

Overall all studies suggest that the anatomical cure rate is >90% with the utilization of these meshes and beneficial for the patients and surgeons because of less operative time, blood loss and gentle technique. However the risk of complication is still there during and after the procedure, but it shows in low percentage, hence we can say that this technique is more beneficial than other procedures for patients. Still need to improve the technique in the future to minimize
the complication rate. Most of the patient with prolapsed complains of urinary incontinence, fecal incontinence, pelvic pain, back pain, sexual dysfunction. So it is very important to evaluate the patient’s symptoms in relation to the existing prolapsed. The mesh procedures themselves are done quickly and easily through the same incision. One of the advantages of using mesh kits in repairing POP is the less invasive character of the process, which results in decreased operative time and blood loss [68]. The disadvantages to using these mesh devices from the erosion and extrusion rates of material. This type of complication is reported in the literature and occurs in 2.8% to 17.3% of cases [69]. Several factors are believed to contribute to mesh erosions. These include a poor healing environment, which is influenced by blood flow, infections, foreign body reactions, and mesh characteristics [70]. Deffieux et al., [66] compared the erosion rate between different types of mesh and concluded that there were no any differences.

The overall percentage rate of complications cannot be truly calculated and is difficult to ascertain from these types of reports secondary to the fact that the total number of procedures completed is unknown. It is clear, however, that many surgeons who are completing these processes may not be experienced enough or have the skills to take care of the complications; therefore, the patients are then shipped to specialists who seem to be pretty successful in managing the complications.

First mesh kits for POP repair were received by the FDA in 2001 and was reported equal to the surgical mesh repaired for the hernia. However there were no clinical data evaluated. Now a day, out of 100 synthetic mesh kits used for the POP repair, only about 20% are available in the market. Surgical mesh has been used greatly for the transvaginal repair of POP since 2004. Moreover complication free result and effectiveness of the mesh used through the vagina is still a controversial lack of evidence [71]. According to one review 30 studies on 2653 patients performed with success rate 87-95%, on several follow-up from 26weeks to 78 weeks [72]. According to another review, the operation rate to reduce complications and total operation rate overall was highest for transvaginal mesh repair than native tissue vaginal and abdominal repair [73]. In 2010 Cochrane review conducted 9733 patients in 40 studies of several surgical methods for POP repairs and mesh graft was found to be more appropriate for anterior anatomy than native tissue vaginal repair. However transabdominal repair showed better results [74] there was a high complication rate of vaginal mesh repair of POP than that of vaginal native tissue, with 10% mesh erosion complication [3].

The SOGC (Society of gynecology Canada) analyzed 18 studies with POP mesh repair, out of which 9 were 3-12 months follow up, and one was randomized trial 128 anatomical cure rate was less than stage 2 of the POP measuring system (that is leading edge of POP system and of hymeneal ring) and was reported as 75-100% [75]. The SOGC recommends transvaginal mesh repair as new techniques, has high anatomic cure rate in uncontrolled short term case series, but needs specific training for surgeons to every device prior to vaginal mesh repair; through counseling about the benefit and the rise of the procedure is required for every individual patient. In a recent RCT of 389 patients anterior mesh repair and are colporrhaphy, anatomic stage 0 and stage 2 Prolapse showed higher cure rates with interior mesh (60.87%) compared to colporrhaphy (34.5%) in a year. Bladder injury and bleeding were higher in mesh groups. Surgical re-intervention and mesh repair was 3.2%.

Regarding RCTs and Meta-Analyses the initial lack of high-quality data could not guide physicians in the appropriate use of synthetic mesh-based procedures because there was scant Level 1 evidence published in the years after the FDA's approval. Over the past few years, however, multiple RCTs and meta-analyses have helped provide higher quality outcomes data regarding the use of synthetic mesh. The RCTs most reviewed are very well-designed, and all but one met statistical power requirements [76]. However, individual results must be interpreted with caution because most conclusions are weakened by their non blinded outcomes assessment. Generalization of these events is also significantly limited because surgical methodologies between trials are known to change. Regarding to efficacy, though, mesh-based procedures provide equal or greater short-term anatomic cure rates compared with traditional repair, particularly for anterior vaginal wall Prolapse. Most RCTs only reports short-term outcomes, however, and therefore cannot be extrapolated to long-term results. Likewise, there are no exact data to suggest mesh use for apical or posterior compartment Prolapse repair at this time [77]. No investigation has documented significantly improved patient reported outcomes when comparing the different repair methods. For these reasons, widespread use of mesh for POP cannot be recommended over traditional repair without a caution. Perhaps more important are the potential complications and safety implications associated with mesh-based repair, which should be discussed with the patient when considering its use [78].

Complication of transvaginal mesh
Most common post operative problems occur with pain which is related to mesh along with mesh erosion, exposure, perforation such as bladder and bowel [79]. Among them most at least common symptom is mesh erosion which occurs in 5 to 19% of all women, SOGC report suggests 2 to 11% however different ratio suggest that longer follow up is necessary to provide adjunct data. One of the author research found that mesh erosion is commonly seen in 7 to 20%[80] of all women who underwent to these procedures, simultaneously same author described that patients age is the risk factor for developing erosion [81]. In a multicentre cohort retrospective study they concluded that mesh retraction, contraction and shrinkage is associated with pain and it is approximately 11.7% [82]. The SOGC and Canadian association
report they concluded that urogenital atrophy, and smoking is also associated with mesh erosion as a risk factor, and they suggest to use of tropical estrogen can be helpful in most of the woman [83]. Half of the patient required to remove the mesh completely or partially and anatomical cure rates varies upon 18.8 to 56% and POP-Q system stage-2 strongly reported in such patient with 5 years of follow-up [84]. 18% of the women developed pelvic muscle dysfunction and pain; of these, one quarter continued to have symptoms after 6 months of therapy. Pelvic pain, groin pain, and dyspareunia can occur with pelvic reconstructive surgery regardless of the use or nonuse of mesh. However, a complication unique to mesh is erosion (also described as exposure or extrusion), which seems to be the most common complication, and may sometimes present several years after the index procedure. One of the study reported that pain after vaginal mesh placement are not understood. Most of the hernia mesh also retraction and pain were revealed gradually in patients at 5 years [85]. Mesh grafts in the vagina are placed in a clean contaminated field with a single vaginal incision, and the “arms” of some mesh configurations pass into the obturator internus and levator-ani muscles. Shrinkage or contraction of mesh around these structures or excess tension on the mesh arms can cause vaginal pain in some individuals. All vaginal surgery can potentially affect vaginal length and function; however, the addition of synthetic mesh could make the vagina, a cylindrical organ that expands and contracts, less pliable and perhaps more prone to pain or dyspareunia. One ultrasound study evaluating women at 3 months after anterior vaginal mesh placement found severe contraction or shrinkage, defined as a decrease of more than 50% of the size of the mesh, in 9.3% of patients [86]. Some of the survey revealed that mesh durability and complication is very lower based with short term follow up and of few limited data; however some of the patient who underwent vaginal procedure healed without any problem, but some group experienced life threatening symptom. So large cohort study is desperately needed to infer the number of mesh- augmented vaginal procedures, that are being performed and its future risk and benefit. The exposed mesh should be excised; the edge of the vaginal epithelium undermined freshment and should close with absorbable interrupted sutures. Proper selection of the patient is necessary to avoid complications. Till the date no randomized controlled trials were published whether to choose correct patient for mesh kit.

Polysomnogram macro porous polypropylene mesh kit for pelvic organ prolapse repair has better outcome result. Initial surveys are very encouraging and showing high cure rates with minimal complications when used properly. Proper patient selection is the best way to avoid unnecessary complications. Long term follow-up is needed to better elucidate the use of polypropylene synthetic mesh for pelvic organ prolapse repair. There is another possibility that stem cell and gene therapy are likely to play a role in future management of pelvic organ prolapsed [87]. However matter is concerned about good anatomical and surgical skills for future minimization of complication rate and better choice of mesh regarding to develop more advanced technique for POP. These techniques will likely be a part of Gynecologist’s future challenges to test materials, finalize dimensions, assemble model test and calibrate model.

Competing interests
The authors declare that they have no competing interests.

Authors’ contributions
R Thakur studied the design and carried out most of the study. All co-author collected information and provided valuable suggestions in the preparation of the manuscript.

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References
1.  Kearney R, Sawhney R and DeLancey JO: Levator ani muscle anatomy evaluated by origin-insertion pairs. Obstet Gynecol 2004, 104:168-73. | PubMed Abstract | PubMed Full Text
2.  Samuelsson EC, Victor FT, Tibblin G and Svardsudd KF: Signs of genital prolapse in a Swedish population of women 20 to 59 years of age and possible related factors. Am J Obstet Gynecol 1999, 180:299-305. | Article | PubMed
3.  Maher C and Baessler K: Surgical management of anterior vaginal wall prolapse: an evidence-based literature review. Int Urogynecol J Pelvic Floor Dysfunct 2006, 17:195-201. | Article | PubMed
4.  Fatton B, Amblard J, Debodinance P, Cosson M and Jacquetin B: Transvaginal repair of genital prolapse: preliminary results of a new tension-free vaginal mesh (Prolift technique)–a case series multicentric study. Int Urogynecol J Pelvic Floor Dysfunct 2007, 18:743-52. | Article | PubMed
5.  Kahlon K, Shott S and Brubaker L: Outcome after rectovaginal fascia reattachment for rectocele repair. Am J Obstet Gynecol 1999, 181:1360-3; discussion 1363-4. | Article | PubMed
6.  Kim S, Harvey MA and Johnston S: A review of the epidemiology and pathophysiology of pelvic floor dysfunction: do racial differences matter? J Obstet Gynaecol Can 2005, 27:251-9. | PubMed
7.  Wall LL: The muscles of the pelvic floor. Clin Obstet Gynecol 1993, 36:910-25. | Article | PubMed
8.  Carley ME and Schaffer J: Urinary incontinence and pelvic organ prolapse in women with Marfan or Ehlers Danlos syndrome. Am J Obstet Gynecol 2000, 182:1021-3. | Article | PubMed
9.  DeLancey JO: Anatomic aspects of vaginal eversion after hysterectomy. Am J Obstet Gynecol 1992, 166:1717-24. | Article | PubMed

Conclusion
Monofilament macro porous polypropylene mesh, due to its low risk of infection and foreign body reaction, highly adopted method of transvaginal surgery for pelvic organ prolapse and found to be more successful according to the short and medium term follow up results of vaginal repairs using this mesh, though vaginal mesh erosion is an issue of concern, but it is reported in studies that using synthetic polypropylene mesh kit for pelvic organ prolapse repair has better outcome result. Initial surveys are very encouraging and showing high cure rates with minimal complications when used properly. Proper patient selection is the best way to avoid unnecessary complications. Long term follow-up is needed to better elucidate the use of polypropylene synthetic mesh for pelvic organ prolapse repair. There is another possibility that stem cell and gene therapy are likely to play a role in future management of pelvic organ prolapsed [87]. However matter is concerned about good anatomical and surgical skills for future minimization of complication rate and better choice of mesh regarding to develop more advanced technique for POP. These techniques will likely be a part of Gynecologist’s future challenges to test materials, finalize dimensions, assemble model test and calibrate model.

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References
1.  Kearney R, Sawhney R and DeLancey JO: Levator ani muscle anatomy evaluated by origin-insertion pairs. Obstet Gynecol 2004, 104:168-73. | PubMed Abstract | PubMed Full Text
2.  Samuelsson EC, Victor FT, Tibblin G and Svardsudd KF: Signs of genital prolapse in a Swedish population of women 20 to 59 years of age and possible related factors. Am J Obstet Gynecol 1999, 180:299-305. | Article | PubMed
3.  Maher C and Baessler K: Surgical management of anterior vaginal wall prolapse: an evidence-based literature review. Int Urogynecol J Pelvic Floor Dysfunct 2006, 17:195-201. | Article | PubMed
4.  Fatton B, Amblard J, Debodinance P, Cosson M and Jacquetin B: Transvaginal repair of genital prolapse: preliminary results of a new tension-free vaginal mesh (Prolift technique)–a case series multicentric study. Int Urogynecol J Pelvic Floor Dysfunct 2007, 18:743-52. | Article | PubMed
5.  Kahlon K, Shott S and Brubaker L: Outcome after rectovaginal fascia reattachment for rectocele repair. Am J Obstet Gynecol 1999, 181:1360-3; discussion 1363-4. | Article | PubMed
6.  Kim S, Harvey MA and Johnston S: A review of the epidemiology and pathophysiology of pelvic floor dysfunction: do racial differences matter? J Obstet Gynaecol Can 2005, 27:251-9. | PubMed
7.  Wall LL: The muscles of the pelvic floor. Clin Obstet Gynecol 1993, 36:910-25. | Article | PubMed
8.  Carley ME and Schaffer J: Urinary incontinence and pelvic organ prolapse in women with Marfan or Ehlers Danlos syndrome. Am J Obstet Gynecol 2000, 182:1021-3. | Article | PubMed
9.  DeLancey JO: Anatomic aspects of vaginal eversion after hysterectomy. Am J Obstet Gynecol 1992, 166:1717-24. | Article | PubMed
10. Delancey JO, Kearney R, Chou Q, Speights S and Binno S: The appearance of levator ani muscle abnormalities in magnetic resonance images after vaginal delivery. Obstet Gynecol 2003, 101:46-53. [ Article | PubMed Abstract | PubMed Full Text ]
11. Chen L, Ashton-Miller JA, Hsu Y and Delancey JO: Interaction among apical support, levator ani impairment, and anterior vaginal wall prolapse. Obstet Gynecol 2006, 108:324-32. [ Article | PubMed Abstract | PubMed Full Text ]
12. Delancey JO: The hidden epidemic of pelvic floor dysfunction: achievable goals for improved prevention and treatment. Am J Obstet Gynecol 2005, 192:1488-95. [ Article | PubMed ]
13. Olsen AL, Smith VJ, Bergstrom JO, Colling JC and Clark AL: Epidemiology of surgically managed pelvic organ prolapse and urinary incontinence. Obstet Gynecol 1997, 89:501-6. [ Article | PubMed ]
14. Feiner B, Jelovsek JE and Maher C: Efficacy and safety of transvaginal mesh kits in the treatment of prolapse of the vaginal apex: a systematic review. BJO 2009, 116:15-24. [ Article | PubMed ]
15. Altman D, Vayrynen T, Engh ME, Axelson S and Falconer C: Anterior colporrhaphy versus transvaginal mesh for pelvic-organ prolapse. N Engl J Med 2011, 364:1826-36. [ Article | PubMed ]
16. Caquant F, Collinet P, Debodinance P, Berrocal J, Garbin O, Rosenthal C, Clave H, Villet R, Jacquetin B and Cosson M: Safety of Trans Vaginal Mesh procedure: retrospective study of 684 patients. J Obstet Gynecol Res 2008, 34:449-56. [ Article | PubMed ]
17. Aungst MJ, Friedman EB, von Pechmann WS, Horbach NS and Welgoss JA: De novo stress incontinence and pelvic muscle symptoms after transvaginal mesh repair. Am J Obstet Gynecol 2009, 201:73 e1-7. [ Article | PubMed ]
18. Rardin CR and Washington BB: New considerations in the use of vaginal mesh for prolapse repair. J Minim Invasive Gynecol 2009, 16:360-4. [ Article | PubMed ]
19. Julian TM: The efficacy of Marlex mesh in the repair of severe, recurrent vaginal prolapse of the anterior midvaginal wall. Am J Obstet Gynecol 1996, 175:1472-5. [ Article | PubMed ]
20. Fatton B, Amblard J, Debodinance P, Cosson M and Jacquetin B: Transvaginal repair of genital prolapse: preliminary results of a new tension-free vaginal mesh (Prolift technique)—a case series multicentric study. Int Urogynecol J Pelvic Floor Dysfunct 2007, 18:743-52. [ Article | PubMed ]
21. Altman D and Falconer C: Perioperative morbidity using transvaginal mesh in pelvic organ prolapse repair. Obstet Gynecol 2007, 109:303-8. [ Article | PubMed ]
22. Solà Dalenz V, Pardo Schanz J, Ricci Arriola P and Guiloff Fische E: [Prolift system in the correction of female genital prolapse]. Actas Urol Esp 2007, 31:850-7. [ PubMed ]
23. van Raalte HM, Lucente VR, Molden SM, Haff R and Murphy M: One-year anatomic and quality-of-life outcomes after the Prolift procedure for treatment of posthysterectomy prolapse. Am J Obstet Gynecol 2008, 199:694 e1-6. [ Article | PubMed ]
24. Hinoi P, Ombelet WJ, Burger MP and Roovers JP: A prospective study to evaluate the anatomic and functional outcome of a transobturator mesh kit (prollift anterior) for symptomatic cystocele repair. J Minim Invasive Gynecol 2008, 15:615-20. [ Article | PubMed ]
25. Iglesias CB, Sokol AI, Sokol ER, Kudish BI, Gutman RE, Peterson JL and Shott S: Vaginal mesh for prolapse: a randomized controlled trial. Obstet Gynecol 2010, 116:293-303. [ Article | PubMed ]
26. Cosson, M., Rosenthall, C., Clave, H., Debodinance, P., Garbin, O., Berrocal, J., et al. (2006) Prospective clinical assessment of the total transvaginal mesh technique for treatment of pelvic organ prolapse – 6 and 12 month results. Int. Urogynecol. J. Suppl.2, $139$–$140$.
27. Kdous M and Zhioua F: [Transobturator subvesical mesh: Tolerance and mild-term results. A prospective study]. J Gynecol Obstet Biol Reprod (Paris) 2008, 37:758-69. [ Article | PubMed ]
28. Lucioni A, Rapp DE, Gong EM, Reynolds WS, Fedunok PA and Bales GT: The surgical technique and early postoperative complications of the Gynecare Prolift pelvic floor repair system. Can J Urol 2008, 15:4004-8. [ Article | PubMed ]
29. Milani AL, Hinou P, Gauld JM, Sikirica V, van Drie D and Cosson M: Trocar-guided mesh repair of vaginal prolapse using partially absorbable mesh: 1 year outcomes. Am J Obstet Gynecol 2011, 204:74.e1-8. [ Article | PubMed ]
30. de Landsheere L, Ismail S, Lucot JP, Deken V, Foidart JM and Cosson M: Surgical intervention after transvaginal Prolift mesh repair: retrospective single-center study including 524 patients with 3 years' median follow-up. Am J Obstet Gynecol 2012, 206:83 e1-7. [ Article | PubMed ]
31. Walter JE, Lovatasis D, Easton W, Epp A, Farrell SA, Girourd L, Gupta CK, Harvey MA, Larochelle A, Robert M, Ross S, Schachter J, Schultz JA and Wilkie DH: Transvaginal mesh procedures for pelvic organ prolapse. J Obstet Gynecol Can 2011, 33:168-74. [ PubMed ]
32. Abdel-Fattah M and Ramsay J: Retrospective multicentre study of the new minimally invasive mesh repair devices for pelvic organ prolapse. BJOG 2008, 115:22-30. [ Article | PubMed ]
33. de Tayrac R, Defieux X, Gervaise A, Chauveaud-Lambling A and Fernandez H: Long-term anatomical and functional assessment of transvaginal cystocele repair using a tension-free polypropylene mesh. Int Urogynecol J Pelvic Floor Dysfunct 2006, 17:483-8. [ Article | PubMed ]
34. Milani R, Salvatore S, Soligo M, Pifarotti P, Meschia M and Cortese M: Functional and anatomical outcome of anterior and posterior vaginal prolapse repair with prolene mesh. BJO 2005, 112:107-11. [ Article | PubMed ]
35. Hiltunen R, Nieminen K, Takala T, Heiskanen E, Merikari M, Niemi K and Heinonen PK: Low-weight polypropylene mesh for anterior vaginal wall prolapse: a randomized controlled trial. Obstet Gynecol 2007, 110:455-62. [ Article | PubMed ]
36. Maher CM, Feiner B, Baessler K and Glazener CM: Surgical management of pelvic organ prolapse in women: the updated summary version Cochrane review. Int Urogynecol J 2011, 22:1445-57. [ Article | PubMed ]
37. Withagen MJ, Milani AL, den Boon J, Vervest HA and Vierhout ME: Trocar-guided mesh compared with conventional vaginal repair in recurrent prolapse: a randomized controlled trial. Obstet Gynecol 2011, 117:242-50. [ Article | PubMed ]
38. Nieminen K, Hiltunen R, Takala T, Heiskanen E, Merikari M, Niemi K and Heinonen PK: Outcomes after anterior vaginal wall repair with mesh: a randomized, controlled trial with a 3 year follow-up. Am J Obstet Gynecol 2010, 203:235 e1-8. [ Article | PubMed ]
39. De Cuyper EM, Ismail R and Maher CF: Laparoscopic Burch colposuspension after failed sub-urethral tape procedures: a retrospective audit. Int Urogynecol J Pelvic Floor Dysfunct 2008, 19:681-5. [ Article | PubMed ]
40. Handel LN, Frenkl TL and Kim YH: Results of cystocele repair: a comparison of traditional anterior colporrhaphy, polypropylene mesh and porcine dermis. J Urol 2007, 178:153-6; discussion 156. [ Article | PubMed ]
41. Yan A, Anne M, Karine A, Vanessa F, Christophe P, Anne T and Patrick M: Cystocele repair by a synthetic vaginal mesh secured anteriorly through the obturator foramen. Eur J Obstet Gynecol Reprod Biol 2004, 115:90-4. [ Article | PubMed ]
42. von Theobald P and Labbe E: [Three-way prosthetic repair of the pelvic floor]. J Gynecol Obstet Biol Reprod (Paris) 2003, 32:562-70. [ Article | PubMed ]
43. Lee YS, Han DH, Lim SH, Kim TH, Choo MS, Seo JT, Lee JZ, Chung BS, Lee JG and Lee KS: Efficacy and Safety of “Tension-free” Placement of Gynemesh PS for the Treatment of Anterior Vaginal Wall Prolapse. Int Neurourol J 2010, 14:34-42. [ Article | PubMed Abstract | PubMed Full Text ]
44. Migliari R, De Angelis M, Madeddu G and Verdaccini T: Tension-free vaginal mesh repair for anterior vaginal wall prolapse. Eur Urol 2000, 38:151-5. [ PubMed ]
45. Dwyer PL and O’Reilly BA: Transvaginal repair of anterior and posterior compartment prolapse with Atrium polypropylene mesh. BJOG 2004, 111:831-6. [ Article | PubMed ]
46. Bai SW, Kim EH, Shin JS, Kim SK, Park KH and Lee DH: A comparison of different pelvic reconstruction surgeries using mesh for pelvic organ
pouplase. Yonsei Med J 2005, 46:112-8. | Article | PubMed | PubMed Abstract | PubMed Full Text
47. Onof FJ, Tosun F, Guzel R, Boylu U, Kucuk EV and Guumus E: Minimum 1.5-year results of “surgeon-tailored” transvaginal mesh repair for female stress urinary incontinence and pelvic organ prolapse. Urology 2012, 80:273-9. | Article | PubMed
48. Salvatore S, Soligo M, Meschia M, et al. Prosthetic surgery for genital prolapse: functional outcome. International Continence Society Congress; 2002; Abstract 10. | Pdf
49. Mercer-Jones MA, Sprowson A and Varma JS: | Article | PubMed
50. Palma PC, Riccetto CI, Martins MH, Herrmann V, de Farga R, Bills A and Netto NR, Jr.: Massive prolapse of the urethral mucosa following perurethral injection of calcium hydroxyapatite for stress urinary incontinence. Int Urogynecol J Pelvic Floor Dysfunct 2006, 17:670-1. | Article | PubMed
51. Watson SJ, Loder PB, Halligan SJ, Bartram CJ, Kamm MA and Phillips RK: Transperineal repair of symptomatic rectocele with Marlex mesh: a clinical, physiological and radiologic assessment of treatment. J Am Coll Surg 1996, 183:257-61. | Article | PubMed
52. Montroni PL, Petruzelli P, Di Noto C, Gibbone C, De Sanctis C and Fedele M: [Combined vaginal and laparoscopic surgical treatment of genito-urinary prolapse]. Minerva Ginecol 2000, 52:283-8. | Article | PubMed
53. Seres S, Douso M and Short G: Preliminary findings with the Solysx single-incision sling system in female stress urinary incontinence. Int Urogynecol J 2010, 21:557-61. | Article | PubMed
54. Jackson S and Smith P: Diagnosing and managing genitourinary prolapse. BMJ 1997, 314:875-80. | Article | PubMed Abstract | PubMed Full Text
55. Petros PE: Vaginal prolapse II: Restoration of dynamic vaginal supports by infracoccygeal sacropexy, an axial-day case vaginal procedure. Int Urogynecol J Pelvic Floor Dysfunct 2001, 12:296-303. | Article | PubMed
56. Moore, R.D., Beyer, R.B., Miklos, J.R., Jacoby, K.J., Freedman, S.F., McCammon, K.M., Jacome, E.J., and Badlani, G.B.: | Article | PubMed
57. McCallum, K.M., Jacome, E.J., and Badlani, G.B.: Synthetic graft use in vaginal prolapse surgery: objective clinical, physiological and radiologic assessment of treatment. Obstet Gynecol 2008, 111:891-8. | Article | PubMed
58. Murphy M, Holzberg A, van Raalte H, Kohli N, Goldman HB and Lucente V: Time to rethink: an evidence-based response from pelvic surgeons to the FDA Safety Communication: “UPDATE on Serious Complications Associated with Transvaginal Placement of Surgical Mesh for Pelvic Organ Prolapse”. Int Urogynecol J 2012, 23:5-9. | Article | PubMed
59. Feiner B, Jelovsek JE and 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. | Article | PubMed
60. Diawaskr GB, Barber MD, Feiner B, Maher C and Jelovsek JE: Complication and reoperation rates after apical vaginal prolapse surgical repair: a systematic review. Obstet Gynecol 2009, 113:367-73. | Article | PubMed
61. Anaissi R, Safr M, Browning J: Initial outcomes of a stabilized adjustable minising for female urinary stress incontinence. Abstract 865, ICS Annual Congress, San Francisco, CA, USA 2009. | Article | PubMed
62. Meschia M, Bertozzi R, Pifarotti P, Baccichet R, Bernasconi F, Guercio E, Magatti F and Minini G: Perioperative morbidity and early results of a randomised trial comparing TVT and TVT-O. Int Urogynecol J Pelvic Floor Dysfunct 2007, 18:5086. | Article | PubMed
63. Alnissd R, Safir M, Browning J: Initial outcomes of a stabilized adjustable minising for female urinary stress incontinence. Abstract 865, ICS Annual Congress, San Francisco, CA, USA 2009. | Article | PubMed
64. Beer M and Kuhn A: Surgical techniques for vault prolapse: a review of the literature. Eur J Obstet Gynecol Reprod Biol 2005, 119:144-55. | Article | PubMed
65. De Tayrac R, Deffieux X, Gervaise A, Chauveaud-Lambling A and Fernandez H: Long-term anatomical and functional assessment of transvaginal cystocele repair using a tension-free polypropylene mesh. Int Urogynecol J Pelvic Floor Dysfunct 2006, 17:483-8. | Article | PubMed
66. Deffieux X, de Tayrac R, Huel C, Bottero J, Gervaise A, Bonnet K, Friedman R and Fernandez H: Vaginal mesh erosion after transvaginal repair of cystocele using Gynemesh or Gynemesh-Sof in 138 women: a comparative study. Int Urogynecol J Pelvic Floor Dysfunct 2007, 18:73-9. | Article | PubMed
67. Hagen S, Stark D, Maher C and Adams E: Conservative management of pelvic organ prolapse in women. Cochrane Database Syst Rev 2006, CD003882. | Article | PubMed
68. Birch C and Fynes MM: The role of synthetic and biological prostheses in reconstructive pelvic floor surgery. Curr Opin Obstet Gynecol 2002, 14:527-35. | Article | PubMed
69. LEMOS NLBM-2008, BIRCH et al 2005, HEEBNER et al 2006, GAURUDER et al 2007, HILTUMEN R et al 2007. | Article | PubMed Abstract | PubMed Full Text
70. Kohli N and Miklos JR: Dermal graft-augmented rectocele repair. Int Urogynecol J Pelvic Floor Dysfunct 2003, 14:146-9. | Article | PubMed
71. Murphy M, Holzberg A, van Raalte H, Kohli N, Goldman HB and Lucente V: Time to rethink: an evidence-based response from pelvic surgeons to the FDA Safety Communication: “UPDATE on Serious Complications Associated with Transvaginal Placement of Surgical Mesh for Pelvic Organ Prolapse”. Int Urogynecol J 2012, 23:5-9. | Article | PubMed
72. Feiner B, Jelovsek JE and 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. | Article | PubMed
73. Diawaskr GB, Barber MD, Feiner B, Maher C and Jelovsek JE: Complication and reoperation rates after apical vaginal prolapse surgical repair: a systematic review. Obstet Gynecol 2009, 113:367-73. | Article | PubMed
74. Transvaginal mesh procedures for pelvic organ prolapse. SOGC Technical Update No. 254. Society of Obstetricians and Gynaecologists of Canada. J Obstet Gynaecol Can 2011, 33:168-74. | Pdf
75. Nguyen N and Burchette RJ: Outcome after anterior vaginal prolapse repair: a randomized controlled trial. Obstet Gynecol 2008, 111:891-8. | Article | PubMed
76. Rardin CR and Washington BB: New considerations in the use of vaginal mesh for prolapse repair. J Minim Invasiv Gynecol 2009, 16:360-4. | Article | PubMed
77. Austg MJ, Friedman EB, von Pechmann WS, Horbach NS and Welgoss JA: De novo stress incontinence and pelvic muscle symptoms after transvaginal mesh repair. Am J Obstet Gynecol 2009, 201:73 e1-7. | Article | PubMed
78. Caquant F, Collinet P, Debodinance P, Berrocal J, Garbin O, Rosenthal C, Clave H, Villet R, Jacquetin B and Cosson M: Safety of Trans Vaginal Mesh procedure: retrospective study of 684 patients. J Obstet Gynaecol Res 2008, 34:449-56. | Article | PubMed
79. Altman D, Varytnen T, Engh ME, Axelsen S and Falconer C: Anterior colporrhaphy versus transvaginal mesh for pelvic-organ prolapse. N Engl J Med 2011, 364:1826-36. | Article | PubMed
80. Rardin CR and Washington BB: New considerations in the use of vaginal mesh for prolapse repair. J Minim Invasiv Gynecol 2009, 16:360-4. | Article | PubMed
81. Deffieux X, Daher N, Mansoor A, Debodinance P, Muhlstein J and Fernandez H: Transobturator TVT-O versus retropubic TVT: results of a multicenter randomized controlled trial at 24 months follow-up. Int Urogynecol J 2010, 21:1337-45. | Article | PubMed
82. Caquant F, Collinet P, Debodinance P, Berrocal J, Garbin O, Rosenthal C, Clave H, Villet R, Jacquetin B and Cosson M: Safety of Trans Vaginal Mesh procedure: retrospective study of 684 patients. J Obstet Gynaecol Res 2008, 34:449-56. | Article | PubMed
83. Cundiff GW, Varner E, Visco AG, Zyczynski HM, Nager CW, Norton PA, Schaffer J, Brown MB and Brubaker L: Risk factors for mesh/suture erosion following sacral colpopexy. Am J Obstet Gynecol 2009, 199:688 e1-5. | Article | PubMed Abstract | PubMed Full Text
84. Rardin CR and Washington BB: New considerations in the use of vaginal mesh for prolapse repair. *J Minim Invasive Gynecol* 2009, 16:360-4. [Article](http://www.ncbi.nlm.nih.gov/pubmed/19699417) | [PubMed](http://www.ncbi.nlm.nih.gov/pubmed/19699417)

85. Berndsen FH, Petersson U, Arvidsson D, Leijonmarck CE, Rudberg C, Smedberg S and Montgomery A: Discomfort five years after laparoscopic and Shouldice inguinal hernia repair: a randomised trial with 867 patients. A report from the SMIL study group. *Hernia* 2007, 11:307-13. [Article](http://www.ncbi.nlm.nih.gov/pubmed/17381442) | [PubMed](http://www.ncbi.nlm.nih.gov/pubmed/17381442)

86. Velemir L, Amblard J, Fatton B, Savary D and Jacquetin B: Transvaginal mesh repair of anterior and posterior vaginal wall prolapse: a clinical and ultrasonographic study. *Ultrasound Obstet Gynecol* 2010, 35:474-80. [Article](http://www.ncbi.nlm.nih.gov/pubmed/20317489) | [PubMed](http://www.ncbi.nlm.nih.gov/pubmed/20317489)

87. Ridgeway B, Chen CC and Paraiso MF: The use of synthetic mesh in pelvic reconstructive surgery. *Clin Obstet Gynecol* 2008, 51:136-52. [Article](http://www.ncbi.nlm.nih.gov/pubmed/18354569) | [PubMed](http://www.ncbi.nlm.nih.gov/pubmed/18354569)

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