Review Article

Feasibility of pelvic organ prolapse surgery using polytetrafluoroethylene mesh ORIHIME®—a narrative review of the recent articles

Masami Takeyama, Kazunobu Yagi, Yukiko Doi, Tomoko Kuwata, Hiromi Kashihara, Chikako Kato

Urogynecology Center, First Towakai Hospital, Takatsuki, Osaka, Japan

Contributions: (I) Conception and design: M Takeyama; (II) Administrative support: M Takeyama; (III) Provision of study materials or patients: K Yagi; (IV) Collection and assembly of data: M Takeyama; (V) Data analysis and interpretation: K Yagi; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

Correspondence to: Masami Takeyama, MD, PhD. Head of the Urogynecology Center, First Towakai Hospital, 2-17 Miyanocho, Takatsuki-city, Osaka 569-0081, Japan. Email: gh.sammy@gmail.com.

Background and Objective: Although transvaginal mesh surgery (TVM) using polypropylene (PP) mesh is no longer performed worldwide due to a severe warning by the U.S. Food and Drug Administration (FDA) in 2011, TVM surgery has been widely performed in Japan to date because of the availability of polytetrafluoroethylene (PTFE) mesh ORIHIME®. PTFE is a safe material that has been used as a medical material, but its weak adhesion to the surrounding tissue may cause problems in maintaining the position of the mesh in the TVM. The effectiveness and safety of the ORIHIME®, which has been used in Japan since 2019 and has been in use for more than 5 years, need to be verified. Therefore, we aimed to review articles published after 2019 on the outcomes of pelvic organ prolapse (POP) surgery using ORIHIME®.

Methods: PubMed and Google Scholar were used for the search, English as the language, with PTFE mesh ORIHIME® and POP as the keywords. The search for papers from January 2019 to July 2025 resulted in a list of 10 papers. One of these papers was on the properties of ORIHIME®, eight were on TVM using ORIHIME®, and one was on laparoscopic sacrocolpopexy (LSC) using ORIHIME®.

Key Content and Findings: Regarding the characteristics of ORIHIME®, histopathologically, images of the tissue around the mesh in recurrent cases showed that inflammation around the PTFE mesh was weaker *in vivo* than in the PP mesh. Although most of the papers on TVM with ORIHIME® have had short-term data up to 1 year, a consensus is emerging that TVM with ORIHIME® is more prone to recurrence than TVM with PP. On the other hand, there seems to be no problem with using ORIHIME® for LSC.

Conclusions: TVM with ORIHIME® has a high risk of recurrence when procedure is performed in the same way as TVM with PP due to mesh arm slippage. LSC with ORIHIME® appears to be comparable in performance to LSC with PP mesh. Long-term follow-up data are awaited in both procedures.

Keywords: Pelvic organ prolapse surgery (POP surgery); polytetrafluoroethylene mesh ORIHIME® (PTFE mesh ORIHIME®); transvaginal mesh surgery (TVM); laparoscopic sacrocolpopexy (LSC)

Received: 20 March 2025; Accepted: 17 September 2025; Published online: 26 September 2025.

doi: 10.21037/gpm-25-12

View this article at: https://dx.doi.org/10.21037/gpm-25-12

Introduction

Background

Pelvic organ prolapse (POP) is a disease that occurs when the tissue supporting the pelvic floor becomes loose and damaged due to factors such as aging, parity, and obesity, and affects many middle-aged and elderly women and impairs their quality of life (QOL) (1). Many surgical techniques have been devised, but the high recurrence rate has been a major problem (2,3). To solve this problem, transvaginal mesh surgery (TVM) techniques using PP mesh were devised. The low recurrence rate led to TVM being performed around the world (4,5), but due to the high number of mesh-related complications (6), its use in the U.S. and Europe has declined drastically (7), leading to its ban by the U.S. FDA in 2019.

Rationale and knowledge gap

In Japan, a unique version of TVM procedure, utilizing a self-cut mesh based on the Prolift™ technique has been developed. However, the use of PP mesh was banned also in Japan in April 2019 due to the U.S. FDA's decision and currently only polytetrafluoroethylene (PTFE) mesh ORIHIME® can be used for TVM surgery because the Ministry of Health, Labour and Welfare had permitted the mesh for use in the POP surgery. ORIHIME® has been available in Japan starting in 2019. Lower coefficient of friction of PTFE and insufficient adhesion of the mesh to the surrounding tissue (8) may increase the risk of recurrence of POP when used for TVM. Until now, no review article has provided an overview of the feasibility of using PTFE mesh ORIHIME for POP surgery. This article, therefore, examines this issue.

Objective

The objective of this review is to clarify the feasibility of POP surgery with PTFE mesh ORIHIME®. Because it would be necessary to discuss the results of POP surgery using ORIHIME®, which has been in use for more than 5 years, and to discuss the feasibility of POP surgery using ORIHIME®. We present this article in accordance with the Narrative Review reporting checklist (available at https://gpm.amegroups.com/article/view/10.21037/gpm-25-12/rc).

Methods

Search strategy summary is shown in *Table 1*. About the paper search, we used PubMed and Google Scholar as search engines, English as language, and papers published between January 2019 and July 2025. The keywords used were: POP and PTFE mesh ORIHIME.

Table 2 shows the 10 papers retrieved by PubMed and Google Scholar.

Research reviewed including fundamental or key findings

In this article, papers on the results of TVM surgery using ORIHIME® are reviewed first. Next, papers on laparoscopic sacrocolpopexy (LSC) using ORIHIME® are reviewed. The current problems of TVM and LSC using ORIHIME® are identified and their solutions are discussed.

Basic information about PTFE and PTFE mesh ORIHIME®

PTFE is a chemically stable medical material with low tissue reactivity and minimal degradation, and has been used for many years in artificial blood vessels, sutures, cardiac patches, and mesh for hernia repair, and PTFE has been suggested as a safe material (19,20). *Table 3* shows the specifications of ORIHIME®. The pore size is almost the same as that of Gynemesh®PS, and the weight is about twice as much. The results of a breaking strength test showed that the minimum breaking load is greater than that of Gynemesh®PS and Polyform™.

The PTFE mesh ORIHIME® (CROWNJUN Kouno Co., Chiba, Japan) currently used in Japan is made of PTFE, a radiopaque material, and these implants can be detected on X-ray and computed tomography (CT) images. Yamaguchi *et al.* (21) described that Pelvic cavity CT was performed 3 days after POP surgery, and three dimension (3D) construction imaging of mesh was performed using SYNAPSE VINCENT® software (Fujifilm Medical Co., Tokyo, Japan). They raised the voltage setting to 140 kV, because the visualization of mesh was unclear due to noise at a normal voltage of 120 kV. They confirmed that mesh implanted during the TVM procedure could be visualized at high density by CT imaging. They examined 18 cases of TVM and 23 cases of LSC. Both the body and the arm could be detected in all TVM cases (100%), and the entire mesh implant could be visualized with 3D CT. Among the LSC cases, the arm could be detected in all cases (100%), and the body, including incomplete images, could be detected in 19 cases (82.6%). The mesh located on the

Table 1 The search strategy summary

Items	Specifications
Date of search	28/February/2025
Databases and other sources searched	PubMed and Google Scholar
Search terms used	PTFE mesh ORIHIME, pelvic organ prolapse
Timeframe	January 2019 to February 2025
Inclusion criteria	Study type: all types of study, cohort study, prospective study, retrospective study and case report
Selection process	M.T. conducted the search using PubMed and Google Scholar through internet. We conducted the search again on 1st of August, 2025 as indicated by the reviewers. All the studies retrieved by the PubMed and Google scholar were selected

PTFE, polytetrafluoroethylene.

anterior and posterior vaginal walls could be visualized in only five cases (21.7%). Visualization of mesh by imaging devices after POP surgery will contribute both to the evaluation of mesh status in complications and recurrence, as well as to the clinical knowledge regarding the physiology of the female pelvic structure. Delicate visualization of the implant would be an excellent tool to verify the workmanship of the mesh surgery.

Here, I reviewed a paper on the characteristics of ORIHIME®. Kuwata *et al.* (13) compared histopathology in the recurrent cases of TVM using ORIHIME® and Polyform™, demonstrating that ORIHIME® caused a weaker inflammatory response than Polyform™, suggesting that in ORIHIME®, the cause of mesh displacement is due to less response of the surrounding tissue to the mesh, which is thought to be one of the factors in post-operative TVM recurrence.

However, ORIHIME® causes fewer inflammatory changes to the tissue than Polyform™; therefore, ORIHIME® may be safer to use *in vivo*.

The authors showed the histological findings of three samples of ORIHIME® and 2 samples of Polyform™.

Papers on the TVM surgery with ORIHIME®

Kawaguchi *et al.* (17) reported the results up to the first year of TVM surgery using ORIHIME®. This study was a retrospective cohort, multi-center study including 55 patients. Mesh shape is similar to that of Elevate™. Recurrence was detected in 4 patients (7.3%). They observed Clavien-Dindo grades 2 and 3 complication in 9.1% and 1.8%. Vaginal mesh exposure occurred in 1 patient. This is the first paper on the results of TVM surgery with PTFE mesh ORIHIME®. The results are presented through the first year of cases in which anterior wall POPs were repaired with TVM. Some of the cases were repaired with vaginal total hysterelectomy (VTH) plus sacral uterine ligament fixation at Delancey's level 1 (level 1). It does not represent the results of TVM alone because it is a multicenter study that included cases with level 1 repair with VTH plus sacral uterine ligament fixation. Therefore, the weakness of the ORIHIME®, which has a low coefficient of friction, making the anchored mesh arm slippery and weakly adhering to the surrounding tissue, may be hidden. However, it appears that ORIHIME® can be used without problems for use in the Delancey's level 2 repairs in addition to sacral uterine ligament fixation as a Delancey's level 1 repair.

Nakai *et al.* (10) reported the short-term outcomes of TVM with ORIHIME® for POP. This study was a retrospective, single-center, comparative study.

This paper reviewed the mid-term results of a trial of vaginal total hysterectomy, utero-sacral culdoplasty, and anterior TVM (TVM-A) for cystocele and uterine prolapse, pelvic organ prolapse quantification system (POP-Q) stages of them were stage III or IV. The mesh used for TVM was Polyform™ in 15 patients and ORIHIME® in 13 patients, and results up to 1 year postoperatively were compared. There were no significant differences in patient background, and perineoplasty was attempted simultaneously at the time of surgery in 2 patients (13.3%) in the polyform™ group and in 9 patients (69.2%) in the ORIHIME® group. Operative times were 140.1±27.3 and 132.4±18.3 min, respectively.

Table 2 List of papers on POP surgery using PTFE mesh ORIHIME

Reference No.	Title	Authors	Journals	URL	Search engine
(9)	Is transvaginal mesh surgery with polytetrafluoroethylene mesh ORIHIME® feasible for anterior pelvic organ prolapse?—Randomized comparative study between ORIHIME® and Polyform™	Masami Takeyama, Tomoko Kuwata, Hiromi Kashihara, Chikako Kato, Masaki Watanabe	Int J Urol 2024;31:1017-21	https://doi.org/10.1111/IJU.15506	PubMed and Google Scholar
(10)	Preliminary evaluation of the short-term outcomes of polytetrafluoroethylene mesh for pelvic organ prolapse	Kensaku Nakai, Akihiro Hamuro, Kohei Kitada, Mie Tahara, Takuya Misugi, Akemi Nakano, Masayasu Koyama, Daisuke Tachibana	J Obstet Gynaecol Res 2021;47:2529-36	https://doi.org/10.1111/jog.14795	PubMed and Google Scholar
(11)	Is Posterior Transvaginal Mesh Surgery Using PTFE Mesh ORIHIME Effective and Safe for Advanced Posterior Vaginal Prolapse?	Kazunobu Yagi, Masami Takeyama, Yukiko Doi, Tomiko Kuwata, Hiromi Kashihara, Chikako Kato	Int J Urol 2025;32:560-6	https://doi.org/10.1111/iju.70008	PubMed and Google Scholar
(12)	Performance of the Transvaginal Mesh Surgery TVM-UPB Compared to the Laparoscopic Sacrocolpopexy Using a Polytetrafluoroethylene Mesh ORIHIMEfor Advanced Anterior Vaginal Prolapse	Yagi K, Takeyama M, Doi Y, Kuwata T, Kashihara H, Kato C, Watanabe M	Int J Urol 2025. [Epub ahead of print]. doi: 10.1111/iju.70169	https://doi.org/10.1111/iju.70169	PubMed and Google Scholar
(13)	Histopathological considerations of transvaginally implanted polytetrafluoroethylene mesh in human biological tissues	Tomoko Kuwata, Masaki Watanabe, Hiromi Kashihara, Chikako Kato, Masami Takeyama	Continence Reports 2023;7:100033	https://doi.org/10.1016/j.contre.2023.100033	Google Scholar
(14)	Favorable Postoperative Outcomes After Transvaginal Mesh Surgery Using a Wide-Arm ORIHIME® Mesh	Kenji Kuroda, Koetsu Hamamoto, Kazuki Kawamura, Ayako Masunaga, Hiroaki Kobayashi, Akio Horiguchi, and Keiichi Ito	Cureus 2024;16:e53388	https://doi.org/10.7759/cureus.53388	Google Scholar
(15)	Mid-term performance of laparoscopic sacrocolpopexy using polytetrafluoroethylene mesh ORIHIME®	Masami Takeyama, Masaki Watanabe, Tomoko Kuwata, Hiromi Kashihara, Chikako Kato	Continence Reports 2023:5:100022	https://doi.org/10.1016/j.contre.2023.10002	Google Scholar
(16)	Transvaginal Polytetrafluoroethylene Mesh Surgery for Pelvic Organ Prolapse: One-Year Safety and Efficacy Results	Tetsuji Soda, Hiroshi Kiuchi, Yohei Koida, Takahiro Imanaka, Takeshi Oida, Yasuhiro Matsuoka, and Kenichiro Sekii	Urology 2024;186:131-8	https://doi.org/10.1016/j.urology.2024.01.017	Google Scholar
(17)	Transvaginal polytetrafluoroethylene mesh surgery for pelvic organ prolapse 1year clinical outcomes	Shohei Kawaguchi, Kazutaka Narimoto, Akihiro Hamuro, Tomomi Nakagawa, Satoko Urata, Suguru Kadomoto, Hiroaki Iwamoto, Hiroshi Yaegashi, Masashi Iijima, Takahiro Nohara, Kazuyoshi Shigehara, Kouji Izumi, Daisuke Tachibana, Yoshifumi Kadono, Atsushi Mizokami and Masayasu Koyama	Int J Urol 2021;28:268-72	https://doi.org/10.1111/iju.14444	Google Scholar
(18)	Efficacy of Transvaginal Surgery Using an ORIHIME Mesh With Wider Arms and Adjusted Length	K Kuroda, K Hamamoto, K Kawamura, H Kobayashi	Cureus 2024;16:e57106	https://doi.org/10.7759/cureus.57106	Google Scholar

POP, pelvic organ prolapse.

Table 3 Characteristics of the PTFE mesh ORIHIME® and PP mesh

Characteristics	ORIHIME®	Polyform™	Gynemesh®PS
Material	Polytetrafluoroethylene	Polypropylene	Polypropylene
Mesh size of each product available (mm)	150×200, 300×300	100×150, 150×200	100×150, 250×250
Pore size (μm)	Macroporous: 2,490	Macroporous: 1,480	Macroporous: 2,600
Weight (g/m^2)	95	40	50
Thickness (μm)	280	180	415

PP, polypropylene; PTFE, polytetrafluoroethylene.

Bleeding >100 mL was observed in 10 (66.7%) and 5 (38.4%) patients, respectively. At 1 year postoperatively, there was only 1 recurrence in the polyform™ group (6.7%). The combination of utero-sacral culdoplasty and TVM-A showed no difference between the two groups, suggesting that TVM-A combined with VTH and utero-sacral culdoplasty using ORIHIME® is not problematic. However, this paper did not estimate the results for TVM-A with ORIHIME® mesh alone.

Kuroda *et al.* (14) demonstrated the data on the TVM using wide-arm-ORIHIME®. This study was a retrospective, comparative study among ORIHIME®, wider arm ORIHIME®, Polyform™ and Gynemesh®PS. The number of patients was 116, including 14 Prolift™ with Gynemesh®PS, 43 Elevate™ with Polyform™, 24 Uphold™ with non-wide-arm ORIHIME® and 35 Uphold™ with wide-arm ORIHIME®. In all groups, residual urine volume, 60-minute pad test, IPSS, OABSS and ICIQ-SF scores were significantly improved one year after surgery compared to preoperatively. The data are not very powerful because of the small population size in this trial, and it is not very meaningful because of the different surgical procedures performed with each mesh. The only meaningful comparison may be between ORIHIME® and ORIHIME® with wide arm, which use the same mesh material and similar surgical technique. In the former, there were 6 (25%) recurrences and 0 (0%) mesh exposures up to 1 year, whereas in the latter there were 1 (2.9%) recurrence and 3 (8.6%) mesh exposures. In this study, recurrence was defined as POP-Q stage II or higher. It was found that broader mesh arms resulted in significantly fewer recurrences. The reason for more mesh exposure was unknown. In the following paper, Kuroda *et al.* (18) reported on a technique for adjusting the size of the mesh. The study was also a retrospective comparative study. The number of patients was 84, including 29 with normal arms, 27 with wide arm LA (–) and wide arm LA (+). There is little difference between wide arm LA (–) and wide arm LA (+). There was a significantly higher rate of improvement at 1 year postoperatively on the scores of IPSS, OABSS and ICIQ-SF.

Recently, they released another paper (22), investigating the influence of mesh-related factors on POP recurrence after TVM using ORIHIME. The Pearson chi-square test, multiple logistic regression analysis, and Cox proportional hazards model were used to identify independent predictor of prolapse recurrence. Among preoperative and intraoperative factors, POP-Q stage 4 and mesh arm width <6 cm were significantly associated with prolapse recurrence. On multiple logistic regression analysis, only the mesh arm width of 6 cm was a significant predictor of recurrence.

Takeyama *et al.* (9) reported the results of a prospective comparative study between TVM with Polyform® and TVM with ORIHIME® for anterior wall TVM. This paper reports the first mid-term results of TVM-A with ORIHIME® for anterior wall POP. The study compared the results of TVM-A with 2 mesh arms (TVM-A2) in a randomized controlled trial during the short period of time that polyform™ and ORIHIME® were available in Japan in 2019. The study compared the results of 100 patients with anterior wall POP up to the fourth year after operation. Fifty patients each were assigned to the ORIHIME® group and the Polyform™ group. The preoperative POP-Q stage was stage 3 in 49 cases and stage 2 in 1 case in each group. Operative time was 28.6±4.5 and 28.3±4.4 minutes, with no perioperative complications. 10 (33.3%) patients in the ORIHIME® group and 3 (9.1%) patients in the Polyform™ group had a recurrence in the operated compartment by the 4th year. Kaplan-Meier curves showed that the non-recurrence rate was significantly higher in the Polyform™ group (P=0.03). The author concluded that TVM-A2 using

ORIHIME®, which is the same procedure as TVM-A2 using polypropylene (PP) mesh, is not feasible in repairing the POP. A strength of this paper is that it presents the first mid-term results of a procedure in which the POP was repaired exclusively by TVM using ORIHIME®. Another strength of this paper is that it was possible to carry out a prospective comparative study during the short period that the two types of mesh were available for TVM in Japan, although the number of cases was small for a limitation. This study is valuable because it shows that TVM surgery with ORIHIME® can cause recurrence after the first year after surgery, possibly due to mesh misalignment. Soda *et al.* (16) conducted an observational cohort comparative study of patients who underwent TVM using ORIHIME® or Polyform™. This study included various procedures, for example, TVM-A2, uphold TVM (TVM-U), anterior & posterior TVM (TVM-AP), combined TVM (TVM-C). Recurrence was defined as the lowest point equal to or exceeding the hymen level. Restricted mean survival time (RMST) was used to analyze POP recurrence, comparing the time to recurrence between the two groups at 1 year after TVM. The number of patients was 171, including 104 patients underwent TVM with Polyform™ and 67 patients underwent TVM with ORIHIME®. The median follow-up was 10.7 months (range, 1–12 months). Of 171 patients, POP recurrence occurred in 10 of 104 patients in the Polyform™ group and 9 of 67 patients in the ORIHIME® group. The mean times to POP recurrence were 356.3 days in the Polyform™ group and 337.5 days in the ORIHIME® group. After propensity score matching, the mean time until POP recurrence in the ORIHIME® group was significantly shorter than that in the Polyform™ group [RMST difference was –20.3 days; 95% confidence interval (CI), –40.1 to –0.5; P=0.04]. While both groups had similar scores up to 1 month postoperatively, patient satisfaction scores were significantly higher in the ORIHIME® group than Polyform™ group after 3 months post-operatively (P<0.05 at 3, 6, and 12 months). The study had variations in the techniques used, and yet the sample size for each technique was small.

The observation period was too short, 1 year. The time to recurrence was compared between the two groups. Polyform™ group had significantly higher relapse rates. ORIHIME® group has a higher value in terms of the score for patient satisfaction. Yagi *et al.* (11) studied the efficacy of ORIHIME® for posterior vaginal POP. The authors investigated the efficacy and safety of TVM surgery with ORIHIME® for posterior vaginal POP. While there is a consensus that PP mesh TVM should not be used for posterior vaginal POP, this is the first study to evaluate the efficacy and safety of posterior vaginal TVM with ORIHIME®, which does not cause severe inflammation of the surrounding tissue. The study was a retrospective cohort study about TVM-P using ORIHIME® for the patients with posterior POP, the POP-Q stage of whom were III or IV. The number of the patients was 87, and follow-up period was more than 1 year. This included the anatomical recurrence rate of the operated compartment, the anatomical recurrence rate of other compartments, the incidence of mesh-related complications and risk factors for recurrence. Recurrence was defined as POP-Q stage II or higher. Univariate analysis using a Cox proportional hazards model was used to analyze factors associated with POP-Q stage II or higher. Multivariate analysis was then performed using a stepwise method. Recurrences were observed in the operated compartment in 3 patients (4.2%). Only 1 patient had a stage 4 recurrence with additional LSC procedure. No mesh extrusion was observed. One patient complained a chronic pain. This study was the first report of TVM-P with ORIHIME®. It was shown to be a safe and effective procedure. Strengths of this paper included that it was the first analysis of data from a case series of ORIHIME® in advanced posterior vaginal POP showing efficacy and safety. Limitations were that it is a single-arm analysis, and the observation period was short (1 year) and there was no comparison with native tissue repair surgeries.

Here, we reviewed a paper recently published that presented a unique approach to preventing recurrence in the anterior TVM using ORIHIME® (12). This approach involves creating a barb on the mesh arms and mechanically fixing it to the sacrospinous ligament. This paper presents an approach to preventing TVM recurrence using ORIHIME®. This approach involves creating a barb on the mesh arms and mechanically fixing it to the sacrospinous ligament.

This was a retrospective cohort study of patients who underwent uphold TVM with barb formation (TVM-UPB) or LSC for POP stage III or higher, primarily anterior prolapse, at their hospital between January 2022 and August 2023, and who underwent follow-up for at least 1 year after surgery. Note that all LSC procedures involved subtotal resection of uterus and were performed as total repair LSC. The primary outcome measure was the rate of postoperative recurrence, while secondary outcome measures included the rate of mesh-related complications and the evaluation of risk factors for recurrence. Recurrence was defined as POP

stage II or higher. There were 95 cases in the TVM-UPB group and 104 cases in the LSC group. The recurrence rate was significantly lower in the TVM-UPB group compared to the LSC group (3.2% *vs.* 14.4%; P=0.006). Mesh exposure was observed in 1.0% of the TVM-UPB group, while no mesh exposure was observed in the LSC group. Additionally, risk factors for postoperative recurrence were identified as age under 70 years (adjusted odds ratio: 6.32, 95% CI: 2.00–19.9) and a preoperative POP-Q score Ba of +2.5 or higher (adjusted odds ratio: 4.49, 95% CI: 1.10–18.3).

Strengths of this paper included that it was the first analysis of data from a case series of ORIHIME® in advanced anterior vaginal POP, showing efficacy and safety of a new device for making barbs in the mesh arms. Limitations were that it is a complicated analysis with LSC cases as control, and the observation period was not long (at least 1 year).

Paper on LSC using ORIHIME®

Takeyama *et al.* (15) reported the results of LSC using ORIHIME®. This study was a retrospective cohort study. This is the first study of the efficacy and safety of LSC with ORIHIME®. The mid-term results up to 4 years showed no problems with efficacy and safety compared to LSC with PP mesh. In LSC, all anchoring of the mesh is done by non-absorbable threads sewn into the tissue, suggesting that the mesh can be used without problems, even with poor adhesion and a low chance of displacement. The results of this study suggested that ORIHIME® can be used without problems.

Limitations and quality of research reviewed

A search on Google Scholar and PubMed under PTFE mesh ORIHIME®, POP surgery, retrieved 10 papers. These included one paper on the nature of ORIHIME®, eight papers on the TVM using ORIHIME®, and one paper on LSC using ORIHIME®, all of which were reviewed.

Most of the articles are small, retrospective studies with short-term results, each using a different technique, and it is premature to evaluate the use of this mesh technique based on these results.

Regarding the properties of ORIHIME®, a comparative study of pathology in recurrent cases of TVM using ORIHIME® and Polyform™ suggested that in ORIHIME® the cause of mesh displacement be attributable to less response of the surrounding tissue to the mesh, which is thought to be one of the factors in post-operative recurrence. This paper is very important because it suggests the cause of TVM recurrence using ORIHIME. There were eight papers on the results of anterior wall TVM using ORIHIME®. Kawaguchi *et al.* presented data from a multi-center operation, including cases where TVM was combined with sacral uterine ligament fixation, rather than TVM alone. Nakai *et al.* presented data from VTH + sacral uterine ligament fixation + TVM, rather than TVM alone; and TVM with ORIHIME® only for the level 2 repair, rather than TVM alone. These data indicated that there may be an option to use TVM using ORIHIME® only for the level 2 repair. The studies by Kuroda *et al.* and Soda *et al.* reporting the results of TVM with ORIHIME® for anterior wall POP were retrospective cohort studies with short-term results up to the first year of follow-up. These studies showed that the recurrence was more common with TVM with ORIHIME® and Kuroda's data showed that the recurrence was more common with TVM using ORIHIME® compared to TVM with PP mesh, with wider mesh arms reducing recurrence. However, there are no mid- or long-term data where recurrence would be more common, so this paper doesn't have high credibility. Adjusting the shape of the mesh had little effect on recurrence. Soda *et al.* compared the recurrence rates of TVM with PP mesh and TVM with ORIHIME® using the RMST method and found that TVM with ORIHIME® had a significantly shorter time to recurrence. The TVM technique with PP mesh in the study is a mixture of different techniques. In addition, the observation period was short and the number of cases was small. Despite these incomplete data, it was suggested that TVM with ORIHIME® was more prone to recurrence. On the other hand, QOL-related comparisons showed higher patient satisfaction with TVM with ORIHIME®. This paper doesn't have high credibility.

The study by Takeyama *et al.* is a prospective comparative study between TVM with Polyform™ and TVM with ORIHIME® with a medium-term outcome of 4 years. Compared to TVM with Polyform™, TVM with ORIHIME® showed some cases of recurrence even after more than 1 year after surgery, suggesting that TVM with ORIHIME® is not suitable for repair of anterior wall TVM using the same technique as TVM with Polyform®. This paper is important because the feasibility of TVM using ORIHIME has been clearly denied. Here, each article has a different definition of recurrence, with one defining recurrence as POP-Q stage 2 or higher and the other

defining recurrence as the lowest point above the hymen level, and I strongly favour the former definition. There seems to be a consensus that TVM with ORIHIME® is more prone to recurrence than TVM with PP mesh for POP with anterior wall POP. The reason for this has been suggested to be that PTFE does not cause an inflammatory reaction with the surrounding tissues, resulting in weak adhesion, which may lead to recurrence in the medium to long term. A study using ORIHIME® in advanced posterior wall TVM showed that mesh-related complications were rare because ORIHIME® does not react with the surrounding tissue, with zero cases of mesh exposure and one case of chronic pain that may or may not be related to the mesh. In terms of efficacy, there were only 3 cases (4.2%) out of 87 cases of recurrence up to 1 year, and the data up to the first year suggest that this is an effective and safe method, but more data with medium to long-term follow-up is needed in the future. In the case of LSC using ORIHIME®, since all adhesion between the mesh and surrounding tissue is achieved by a sufficient number of sutures with non-absorbable thread, it is unlikely that the mesh position will shift, and since inflammation of the surrounding tissue is minimal, symptoms such as pain and mesh contracture are unlikely to occur for long periods of time. Inflammation of the surrounding tissues is also considered to be minimal. Based on the above, LSC with ORIHIME® is considered feasible. This paper was reliable because the follow-up period was mid-term of 4 years.

Strength and limitations of this review

This review is significant because it is the first to examine POP surgery using PTFE mesh, providing an overview of the current situation. This review has two limitations. First, the number of papers searched was very small. Second, many papers had diverse case numbers and surgical techniques, which made it impossible to analyze the results.

Need for future research

Recurrences and mesh-related complications following mesh surgery often occur several years after surgery, and therefore, accumulating reports of long-term outcomes are needed.

Conclusions

Repair with TVM using ORIHIME® for anterior POP has a high recurrence rate, so some surgical modification is required. TVM-UPB seems to be an effective technique in preventing POP recurrence. Short-term results regarding TVM using ORIHIME® for posterior POP are good, but long-term results remain to be seen.

LSC with ORIHIME is deemed feasible. Long-term results for both techniques are still waiting to be collected.

Acknowledgments

None.

Footnote

Reporting Checklist: The authors have completed the Narrative Review reporting checklist. Available at https://gpm.amegroups.com/article/view/10.21037/gpm-25-12/rc

Peer Review File: Available at https://gpm.amegroups.com/article/view/10.21037/gpm-25-12/prf

Funding: None.

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://gpm.amegroups.com/article/view/10.21037/gpm-25-12/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

1. Hendrix SL, Clark A, Nygaard I, et al. Pelvic organ prolapse in the Women's Health Initiative: gravity and gravidity. Am J Obstet Gynecol 2002;186:1160-6.

2. Lowder JL, Ghetti C, Nikolajski C, et al. Body image perceptions in women with pelvic organ prolapse: a qualitative study. Am J Obstet Gynecol 2011;204:441.e1-5.
3. DeLancey JO. Anatomic aspects of vaginal eversion after hysterectomy. Am J Obstet Gynecol 1992;166:1717-24; discussion 1724-8.
4. Altman D, Väyrynen T, Engh ME, et al. Short-term outcome after transvaginal mesh repair of pelvic organ prolapse. Int Urogynecol J Pelvic Floor Dysfunct 2008;19:787-93.
5. Jia X, Glazener C, Mowatt G, et al. Efficacy and safety of using mesh or grafts in surgery for anterior and/or posterior vaginal wall prolapse: systematic review and meta-analysis. BJOG 2008;115:1350-61.
6. Us Food and Drug Administration. (n.d.) Urogynecologic Surgical Mesh: Update on the Safety and Effectiveness of Transvaginal Placement for Pelvic Organ Prolapse. July 2011, Retrieved March 30, 2020. Available online: https://www.fda.gov/media/81123/download
7. Maher C, Feiner B, Baessler K, et al. Transvaginal mesh or grafts compared with native tissue repair for vaginal prolapse. Cochrane Database Syst Rev 2016;2:CD012079. Update in: Cochrane Database Syst Rev 2024;3:CD012079.
8. Nakata M., Ueshima C., Different local responses of rat connective tissue to PTFE and PP surgical meshes implanted in the body.JFPFM 2022; 18 ; 72-79, doi: 10.32310/jfpfm.18.1_72
9. Takeyama M, Kuwata T, Kashihara H, et al. Is transvaginal mesh surgery with polytetrafluoroethylene mesh ORIHIME® feasible for anterior pelvic organ prolapse?-Randomized comparative study between ORIHIME® and Polyform™. Int J Urol 2024;31:1017-21.
10. Nakai K, Hamuro A, Kitada K, et al. Preliminary evaluation of the short-term outcomes of polytetrafluoroethylene mesh for pelvic organ prolapse. J Obstet Gynaecol Res 2021;47:2529-36.
11. Yagi K, Takeyama M, Doi Y, et al. Is Posterior Transvaginal Mesh Surgery Using PTFE Mesh ORIHIME Effective and Safe for Advanced Posterior Vaginal Prolapse? Int J Urol 2025;32:560-6.
12. Yagi K, Takeyama M, Doi Y, et al. Performance of the Transvaginal Mesh Surgery TVM-UPB Compared to the Laparoscopic Sacrocolpopexy Using a Polytetrafluoroethylene Mesh ORIHIME for Advanced Anterior Vaginal Prolapse. Int J Urol 2025. [Epub ahead of print]. doi: 10.1111/iju.70169.
13. Kuwata T, Watanabe M, Kashihara H, et al. Histopathological considerations of transvaginally implanted. Continence Reports 2023;7:100033.
14. Kuroda K, Hamamoto K, Kawamura K, et al. Favorable Postoperative Outcomes After Transvaginal Mesh Surgery Using a Wide-Arm ORIHIME® Mesh. Cureus 2024;16:e53388.
15. Takeyama M, Watanabe M, Kuwata T, et al. Mid-term performance of laparoscopic sacrocolpopexy using polytetrafluoroethylene mesh ORIHIME®. Continence Reports 2023:5:100022.
16. Soda T, Kiuchi H, Koida Y, et al. Transvaginal Polytetrafluoroethylene Mesh Surgery. Urology 2024;186:131-8.
17. Kawaguchi S, Narimoto K, Hamuro A, et al. Transvaginal polytetrafluoroethylene mesh surgery for pelvic organ prolapse: 1-year clinical outcomes. Int J Urol 2021;28:268-72.
18. Kuroda K, Hamamoto K, Kawamura K, et al. Efficacy of Transvaginal Surgery Using an ORIHIME Mesh With Wider Arms and Adjusted Length. Cureus 2024;16:e57106.
19. Klinkert P, Post PN, Breslau PJ, et al. Saphenous vein versus PTFE for above-knee femoropopliteal bypass. A review of the literature. Eur J Vasc Endovasc Surg 2004;27:357-62.
20. DeMaria EJ, Moss JM, Sugerman HJ. Laparoscopic intraperitoneal polytetrafluoroethylene (PTFE) prosthetic patch repair of ventral hernia. Prospective comparison to open prefascial polypropylene mesh repair. Surg Endosc 2000;14:326-9.
21. Yamaguchi A, Miwa K, Nakahira K, et al. Visualization of mesh on computed tomographic images after pelvic organ prolapse surgery. Int J Urol 2022;29:360-1.
22. Kuroda K, Hamamoto K, Kawamura K, et al. Narrower Mesh Arm Width Is an Independent Predictor of Prolapse Recurrence After Transvaginal Mesh Surgery Using ORIHIME Mesh. Cureus 2025;17:e81882.

doi: 10.21037/gpm-25-12

Cite this article as: Takeyama M, Yagi K, Doi Y, Kuwata T, Kashihara H, Kato C. Feasibility of pelvic organ prolapse surgery using polytetrafluoroethylene mesh ORIHIME®—a narrative review of the recent articles. Gynecol Pelvic Med 2025;8:23.