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Review Article

Comparing laparoscopic pectopexy with traditional surgical approaches for apical prolapse: Systemic review

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Abstract

Laparoscopic pectopexy is a relatively new technique for treating apical prolapse performed using laparoscopic instruments, allowing for smaller incisions, reduced post-operative pain, and faster recovery times compared to traditional surgical techniques. This systematic review aims to compare laparoscopic pectopexy with other surgical methods used to manage apical prolapse.

A comprehensive search was conducted in major medical databases for studies comparing laparoscopic pectopexy and other surgical techniques for apical prolapse management. Outcome measures included apical prolapse recurrence rates, intraoperative and post-operative complications, operation time, patient-reported outcomes, and quality of life assessments. A total of 11 studies were included in this systematic review, and they generally showed that both laparoscopic pectopexy is effective in treating apical prolapse, with low recurrence rates and minimal intraoperative complications. Laparoscopic pectopexy offers other benefits, such as shorter operation times, better patient-reported outcomes, and better post-operative quality of life than other methods.

Keywords: Pectopexy, Laparoscopic pectopexy, Apical prolapse, Pelvic organ prolapse, Apical prolapse management.

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1. Introduction

Apical prolapse, also known as uterine or vaginal vault prolapse, affects 6–8% of adult women, particularly postmenopausal women.[1,2] It results from weakened pelvic floor support, leading to the descent of the uterus or vaginal vault into or outside the vaginal canal.[3,4] This condition can severely impact a woman's quality of life, causing discomfort, urinary and bowel dysfunction, and sexual difficulties.[1] Several factors increase the risk, including vaginal childbirth, previous prolapse, advanced preoperative prolapse stages (3 or 4), higher parity, heavier birthweight, older age, elevated BMI, and pelvic floor muscle defects.[5]

Surgical intervention is often necessary for significant cases of apical prolapse. Pectopexy is one such procedure, aiming to restore the normal position of the uterus or vaginal vault by attaching it to pelvic ligaments or the abdominal wall using mesh for reinforcement.[6-8] Laparoscopic pectopexy, a minimally invasive approach, uses small incisions and specialized instruments to perform the procedure with real-time visualization.[9] Compared to traditional open surgery, this method offers benefits such as reduced postoperative pain, shorter hospital stays, quicker recovery, and improved cosmetic results. It also allows for more precise mesh placement, potentially reducing the risk of recurrence and blood loss, and may be safer for patients with comorbidities that complicate open surgery.[10-12] In contrast, open surgical techniques involve larger incisions for direct access to pelvic structures and are generally associated with longer recovery times. However, they may be more appropriate for patients with severe prolapse, complex or recurrent cases, or prior abdominal surgeries. Some surgeons also prefer open methods due to the tactile feedback during the operation.[13]

Comparative studies on laparoscopic pectopexy and other surgical methods like sacrocolpopexy have shown mixed results. While both are effective in managing prolapse,

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laparoscopic pectopexy has demonstrated advantages in reducing urinary incontinence, postoperative pain, and hospitalization duration in some studies. Nevertheless, all surgical options carry risks such as infection, bleeding, mesh-related complications, and injury to surrounding organs.[10,11,14]

Given the variety of surgical approaches and their associated outcomes, the choice of procedure should be guided by individual patient characteristics, surgeon expertise, and patient preferences. To support evidence-based decision-making, we conducted a systematic review to compare the effectiveness and outcomes of laparoscopic pectopexy with other surgical interventions for apical prolapse. This review's findings would inform surgical practice and enhance the quality of patient care.

2. Materials and Methods

This was a systematic review conducted in accordance with the Preferred reporting items for systematic reviews and meta-analyses (PRISMA).[15]

2.1. Search strategy

A systematic and comprehensive search of electronic databases (PubMed, Embase, Medline, Google Scholar, Web of Science, and Scopus). They used medical subject headings (MeSH terms) and keywords and medical subject headings (MeSH) terms related to "laparoscopic pectopexy," "colpopexy," "sacrocolpopexy," "apical prolapse," and related synonyms in the search. Additionally, the reference lists of identified articles were manually screened for potential additional articles.

2.2. Study selection

We evaluated the identified studies based on their titles and abstracts. The eligibility criteria encompassed randomized controlled trials (RCTs), observational studies, intervention studies, systematic reviews, and meta-analyses published in English that investigated or compared laparoscopic pectopexy and other surgical methods for apical prolapse in adult female patients were included. The full texts of potentially eligible articles were then retrieved and assessed for inclusion. Since medical technologies evolve and advance faster and laparoscopic pectopexy is still emerging, we only included studies published within the last 8 years to account for the latest and updated evidence. We excluded case reports and studies with insufficient data, theses, editorials, letters to the editor, commentary, opinion articles, narrative and scoping reviews, and non-peer-reviewed journal articles. The selection process of the included studies is presented in **Figure 1**.

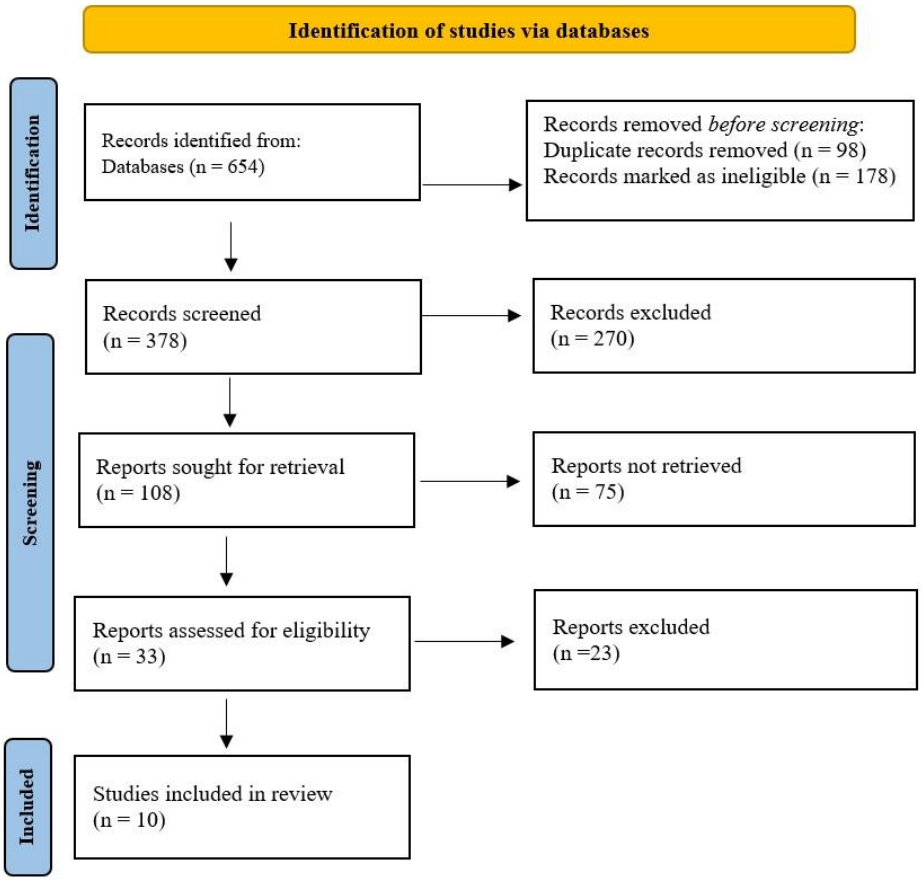

Figure 1: Flow diagram for the selection of studies included in our systematic review

2.3. Data extraction

We extracted data using a standardized form, and the following information was extracted from each included study: authors, publication year, study design, and summary of findings.

2.4. Quality assessment

The quality of included studies was assessed using appropriate tools based on the study design. For cohort studies, we used the Newcastle-Ottawa Scale (NOS),[16] while the Cochrane Collaboration's Risk of Bias tool (CCRB) was used for the quality assessment of randomized studies.[17] The NOS, with a scale of 0 to 9, is used to assess the quality of cohort and cross-sectional studies, evaluating participant selection, comparison of study groups, and assessment of outcome or exposure. Except for comparability, which allowed for two points, each NOS item could only receive one point, with a minimum score of zero.[16] The CCB contains seven components: random sequence generation, allocation concealment, blinding of participants and people, blinding of result evaluation, completeness of outcome data, report selection, and additional biases.[17] The risk of bias in the studies was evaluated and graded each study as low, high, or uncertain risk of bias.

2.5. Data synthesis and analysis

A meta-analysis was not feasible due to the potential heterogeneity among the included studies. Instead, a narrative synthesis of the findings was presented in **Table 1** and **Table 2**, summarizing the key outcomes reported in each study.

2.6. Ethics

This was a systematic review of previously published studies without directly involving participants. Therefore, ethical approval was not required.

3. Results

The initial search yielded 654 results, of which 378 titles and abstracts were screened after removing duplicates. Of eligible titles and abstracts, the full-text versions of 108 studies were screened. The titles, abstracts, and full texts of 33 articles were found eligible and subjected to a thorough review, and 10 articles were included (**Table 1**). Most of the included studies were prospective observational studies, of which 4 were prospective, and 2 were retrospective. Among two cohorts, one was retrospective, while another one was prospective. One was a systematic review, and another was a prospective randomized trial.

Table 1: Characteristics of the included studies

Authors	Year*	Title	Study design	Summary of findings
Yu et al.[6]	2023	Laparoscopic pectopexy with native tissue repair for pelvic organ prolapse	Prospective, observational study	Laparoscopic pectopexy combined with additional vaginal tissue repair for treating severe pelvic organ prolapse can lead to favorable outcomes and enhance patient satisfaction.
Yang et al.[7]	2023	Effectiveness of Laparoscopic Pectopexy for Pelvic Organ Prolapse Compared with Laparoscopic Sacrocolpopexy	Prospective cohort	The pectopexy group had a lower proportion of robotic-assisted surgeries compared to the sacrocolpopexy group (15.7% vs. 41.6%, $p < 0.001$). The average duration of pectopexy was shorter than sacrocolpopexy (174.2 vs. 187.7 minutes), with a mean difference of 13.5 minutes (95% confidence interval, 3.9−23.0; $p = 0.006$). However, the two groups had no significant differences in intraoperative blood loss, length of hospital stay, and post-operative 7-day complications. Both groups achieved anatomical success. At the 1-year follow-up, the pectopexy group had a higher rate of urinary symptoms recurrence (13.7%) compared to the sacrocolpopexy group (5.0%) (OR=3.1; 95%CI: 1.1−8.8, $p = 0.032$). Pectopexy group showed better improvement at post-operative months 3, 6, and 12 than sacrocolpopexy group.

Table 1 Continued…				
Szymczak et al.[9]	2019	Comparison of laparoscopic techniques for apical organ prolapse repair – a systematic review of the literature	Systematic review	Most studies examined anatomical and subjective results, with follow-up periods ranging from 1 month to over 7 years. The success rates for laparoscopic and abdominal repairs of apical defects were comparable, but laparoscopy demonstrated advantages in terms of perioperative blood loss, hospital stay duration, and recovery process. The anatomical success rate ranged from 77% to 100% in reported cases. Patient satisfaction rates were 96.4% to 97.6% for pectopexy, 71.0% to 100% for laparoscopic sacropexy, 66.7% to 87.8% for lateral ligament suspension, and 95% to 95.5% for laparoscopic uterosacral ligament suspension. Prolapse recurrences were reported in 13.2% of patients after laparoscopic uterosacral ligament suspension and 10.4% after laparoscopic sacropexy, with a reoperation rate for laparoscopic sacropexy ranging from 2.2% to 12.8%.
Szymczak et al.[10]	2022	Perioperative and Long-Term Anatomical and Subjective Outcomes of Laparoscopic Pectopexy and Sacrospinous Ligament Suspension for POP-Q Stages II-IV Apical Prolapse	Prospective, observational study	Both sacrospinous ligament colpo/hysteropexy and laparoscopic sacropexy have yielded positive results in terms of anatomical and subjective outcomes for apical prolapse. Additionally, laparoscopic sacropexy has shown a protective effect on the anterior compartment, meaning it helps prevent prolapse
Noé et al.[8]	2015	Laparoscopic Pectopexy: A Prospective, Randomized, Comparative Clinical Trial of Standard Laparoscopic Sacral Colpocervicopexy with the New Laparoscopic Pectopexy—Post-operative results and intermediate-term follow-up in a pilot study	Prospective, randomized trial	The long-term follow-up, with an average duration of 21.8 months for pectopexy and 19.5 months for sacropexy, demonstrated notable differences in terms of new-onset defecation disorders. The occurrence of de novo defecation disorders was 0% in the pectopexy group compared to 19.5% in the sacropexy group. The incidence of new-onset stress urinary incontinence was similar between the two groups, with 4.8% in the pectopexy group and 4.9% in the sacropexy group. Regarding rectoceles, the occurrence was comparable in both groups, with rates of 9.5% in the pectopexy group and 9.8% in the sacropexy group. However, after pectopexy, no new lateral defect cystoceles were found, whereas 12.5% were detected after sacropexy. The rates of apical descensus relapse were 2.3% for pectopexy and 9.8% for sacropexy, but the difference was not statistically significant. There were no significant differences in the occurrence of new-onset anterior defect cystoceles and rectoceles between the two groups.

Table 1 Continued…				
Kale et al.[11]	2017	Laparoscopic pectopexy: initial experience of single center with a new technique for apical prolapse surgery	Prospective observational study	The laparoscopic pectopexy procedures were executed successfully, and there were no complications during both the intraoperative and post-operative phases. None of the patients experienced de novo apical prolapse, de novo urgency, de novo constipation, stress urinary incontinence, anterior or lateral defect cystoceles, or rectoceles throughout the 6-month follow-up period.
Chuang et al.[18]	2022	Laparoscopic pectopexy: the learning curve and comparison with laparoscopic sacrocolpopexy	Retrospective observation study	The operation time for laparoscopic pectopexy was significantly shorter than that of laparoscopic sacrocolpopexy, with durations of 182.9 ± 27.2 and 256.2 ± 45.5 minutes, respectively ($p < 0.001$). Both groups did not experience any major complications. However, post-operative low back pain and defecation symptoms were exclusively reported in the laparoscopic sacrocolpopexy group. Throughout the follow-up period (mean of 7.2 months for laparoscopic pectopexy and 16.2 months for laparoscopic sacrocolpopexy), none of the cases experienced a recurrence of apical prolapse.
Biler et al.[19]	2018	Perioperative complications and short-term outcomes of abdominal sacrocolpopexy, laparoscopic sacrocolpopexy, and laparoscopic pectopexy for apical prolapse	Retrospective cohort study	Laparoscopic pectopexy group had a significantly shorter mean operating time of 74.9 minutes compared to the other groups ($p < 0.001$). Rates of de-novo stress urinary incontinence, urgency, defecation problems, and perioperative complications did not show statistically significant differences between the groups.
Astepe et al.[20]	2019	Intermediate-term outcomes of laparoscopic pectopexy and vaginal sacrospinous fixation: a comparative study	Retrospective observational study	The recurrence rates of apical descensus were similar between the two groups. However, the incidence of de novo cystocele was higher in the sacrospinous fixation group at 25.6%, compared to 8.3% in the pectopexy group. Both groups reported high treatment satisfaction rates. The pectopexy group had a better post-operative sexual function.
Obut et al.[21]	2021	Comparison of the Quality of Life and Female Sexual Function Following Laparoscopic Pectopexy and Laparoscopic Sacrohysteropexy in Apical Prolapse Patients	Prospective randomized study	The post-operative complications observed in both procedures were comparable, except for constipation, which occurred in 3.2% of patients in the pectopexy group and 20% in the hysterosacropexy group ($P = 0.036$).

OR: Odd ratio; CI: Confidence interval; POP-Q: Pelvic organ prolapse quantification

3.1. Effectiveness and perioperative outcomes

A prospective observational study evaluating laparoscopic pectopexy with native tissue repair for pelvic organ prolapse reported that it could effectively treat severe pelvic organ prolapse with good outcomes and patient satisfaction.[6] A systematic review comparing laparoscopic techniques for apical prolapse management involving 24 studies found that most studies followed up cases for 1 month to over 7 years

and reported comparable success rates for laparoscopic and abdominal techniques.[9] However, this systematic review found that laparoscopic techniques had less perioperative blood loss, shorter hospital stays, and a quicker recovery. Another prospective observational study comparing Laparoscopic Pectopexy and Sacrospinous Ligament Suspension found that both methods were effective but laparoscopic pectopexy had less recurrent prolapse.[10] These findings were also reported by another study that followed up patients for 18.3 months who underwent sacrocolpopexy and sacrohysteropexy and found 100% success rates and improved vaginal symptoms, sexual well-being, and overall quality of life.[22] Similarly, a prospective observational study reported successful laparoscopic pectopexy throughout a 6-month follow-up period.[11] Also, another study found that pectopexy leads to better post-operative sexual function compared to vaginal sacrospinous fixation.[20] Our systematic review further aligns with numerous previous studies reporting that laparoscopic pectopexy has a shorter operation duration, shorter hospital stay, and quick recovery for patients.[7,9,18,19] A prospective cohort evaluating comparing laparoscopic pectopexy and Sacrocolpopexy for pelvic organ prolapse found that laparoscopic pectopexy duration was significantly shorter than sacrocolpopexy (174.2 vs. 187.7 minutes) ($p = 0.006$).[7] Similarly, a retrospective observation study and cohort found laparoscopic pectopexy to be significantly shorter than laparoscopic sacrocolpopexy (both $p<0.001$).[18,19]

3.2. Complications and prolapse reoccurrence

Most studies found that patients who underwent laparoscopic pectopexy had less complication and less recurrence rate.[7,9,11,18-20] During 1-year post-operative follow-up, a prospective cohort found that the pectopexy group had a higher rate of urinary symptoms recurrence (13.7%) compared to the sacrocolpopexy group (5.0%) (OR=3.1; 95%CI: 1.1−8.8, $p = 0.032$).[7] However, it had a lower prolapse recurrence rate than sacrocolpopexy (13.2% vs.10.4%).[9] This contrasts a prospective observational study that reported no complications during both the intraoperative and post-operative phases, without de novo apical prolapse, de novo urgency, de novo constipation, stress urinary incontinence, anterior or lateral defect cystoceles, or rectoceles throughout the 6-month follow-up period.[11] Comparing laparoscopic pectopexy with laparoscopic sacrocolpopexy, a retrospective observation study found that the sacrocolpopexy group was the only one to have post-operative low back pain and defecation symptoms; however, no recurrence of apical prolapse was found in both groups during follow-up with an average duration of 7.2 months for laparoscopic pectopexy and 16.2 months for sacrocolpopexy.[18] One study also found that laparoscopic pectopexy resulted in less post-operative constipation than hysterosacropexy.[21] Another study with a long-term follow-up, with an average duration of 21.8 months for pectopexy and 19.5 months for sacropexy, found the occurrence of de novo defecation disorders and new lateral defect cystoceles were 0% in the pectopexy group compared to 19.5% and 12.5%, respectively, in the sacropexy group, with a similar incidence of new-onset stress urinary incontinence, similar occurrence rates of rectoceles.[8] This aligns with another study showing that laparoscopic pectopexy resulted in a lower incidence of de novo cystocele compared to vaginal sacrospinous fixation (8.3% vs 25.6%).[20]

Overall, studies showed that laparoscopic pectopexy was advantageous over open surgery methods,[9,18] as summarized in **Table 2**.

Table 2: Summary of the key differences between laparoscopic pectopexy and open abdominal surgery methods

Characteristic	Laparoscopic pectopexy	Open surgery
Learning curve	Shorter	Longer
Incisions	Small incisions in the abdomen	Larger incision in the lower abdomen
Duration	Shorter	Longer
Blood loss	Less	More
Recovery time	Shorter	Longer
Hospital stay	Shorter	Longer
Risk of complications	Lower	Higher
Risk of urinary incontinence	Lower	Higher
Reoperation rate	Lower	Higher
Recurrence	Lower	Higher

4. Discussion

Laparoscopic pectopexy is a relatively new technique for treating apical prolapse, using laparoscopic instruments and a polypropylene mesh to securely reattach the vaginal vault or the uterus with the help of lateral parts of the iliopectineal ligament.[11,23] Though laparoscopic pectopexy has gained popularity as a minimally invasive approach,[24,25] it is essential to consider its benefits and compare them to other surgical options to determine the most suitable treatment for each patient. This systematic review compared laparoscopic pectopexy with other surgical interventions used to treat apical prolapse.

This systematic review found that laparoscopic pectopexy was effective with less perioperative blood loss, shorter hospital stays, a quicker recovery process, and better post-operative quality of life. These findings were also reported in previous studies confirming that.[23,24,26] These might be attributed to the laparoscopic approach resulting in smaller incisions, leading to less tissue trauma, reduced risk of infection, and quicker healing, resulting in cost savings and increased patient satisfaction. This approach also allows less post-operative pain and faster recovery compared to

traditional open surgeries.[27] Another previous study support this by showing that laparoscopic pectopexy performed on 60 women with stage II–IV apical prolapse as associated with no blood transfusion and was easy for surgeons to learn,[27] aligning with our systematic review showing that laparoscopic pectopexy has a shorter learning curve. As suggested by a study comparing laparoscopic sacrohysteropexy with laparoscopic pectopexy, the latter is less complex,[21] which explains its shorter duration and learning curve, making it the best option for apical prolapse.

This systematic review showed that laparoscopic pectopexy was shorter than other methods, such as vaginal colpopexy (sacrospinous fixation) and sacrocolpopexy. Sacrospinous fixation involves sacrospinous fixation by abdominal or vaginal approach and does not need the use of mesh, making it ideal for patients with concerns about mesh-related complications.[2,28,29] On the other hand, sacrocolpopexy is a variant of vaginal colpopexy where the vaginal vault or cervix is attached to the sacrum using mesh using either open surgery or a laparoscopically.[30,31]

As shown by this systematic review, laparoscopic pectopexy offers the benefits of being a minimally invasive procedure, resulting in smaller incisions, in addition to the aforementioned advantages. Additionally, it provides robust support to the prolapsed organ, decreasing the risk of recurrence.[5] This might be attributed to using polypropylene mesh that provides better support to the prolapsed organ.[18,32] Nonetheless, there are concerns regarding mesh-related complications, although the incidence of such issues is generally low. Few studies have reported mesh-related complications, including mesh exposure, organ perforation, dyspareunia, and urinary problems.[33] Our systematic review showed that laparoscopic pectopexy leads to fewer post-operative complications even after long-term follow-up. Complications, such as urinary incontinence, defecation problems, cystocele, and rectocele, as well as prolapse recurrence, were less common for laparoscopic pectopexy compared to other methods, such as laparoscopic uterosacral ligament suspension, sacropexy, sacrocolpopexy, sacrospinous fixation, and hysterosacropexy. Laparoscopic pectopexy does not reduce pelvic space, which does not affect pelvic organs and eventually explains less complications compared to other methods.[21] Though vaginal colpopexy is a well-established technique that does not involve the use of mesh, it may be a preferred option for patients with concerns about potential mesh-related problems, but it may lead to longer hospital stays compared to laparoscopic pectopexy. One previous case report presented a case of the evisceration of intestines through the vagina 14 months after laparoscopic pectopexy for apical prolapse with a history of previous total vaginal hysterectomy.[33] This evisceration is rare, presenting in 0.14-4.1% of patients.[34] Like laparoscopic pectopexy, sacrocolpopexy utilizes mesh to provide support, but it is preferred for severe apical prolapse. Therefore, the choice between laparoscopic pectopexy and sacrocolpopexy would depend on the severity of the prolapse, surgeon's expertise in performing each procedure, and the consideration of the fact that laparoscopic pectopexy is shorter, less complex, and associated with fewer complications.[35]

This systematic review has some limitations to recognize. A systematic review is prone to publication bias, selection bias, heterogeneity among included studies that limited meta-analysis, varying qualities of included studies, language bias as we only included articles in English, and publication status bias. Furthermore, the findings of this review might have restricted generalizability in different settings depending on the particularities of settings and patient population. Therefore, further longitudinal research is recommended to address these limitations.

5. Conclusion

Laparoscopic pectopexy is a promising surgical method for apical prolapse, offering the benefits of minimally invasive surgery, reduced post-operative pain, and faster recovery times. However, other surgical methods, such as vaginal colpopexy and sacrocolpopexy, have their own advantages and may be more suitable for certain patients or specific clinical scenarios. Ultimately, the surgical method should be chosen based on individual patient characteristics, the severity of the prolapse, and the surgeon's expertise to achieve the best possible outcome for each patient.

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7. Conflict of Interest

None.

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