Article Review

OSCS (One Step Conservative Surgery) vs MOSCUS (Modified One Step Conservative Uterine Surgery) for Placenta Accreta Spectrum (PAS) Surgery, Which One Is More Preferred? A Literature Review

Cantika Anakita,[1] Arya Marganda Simanjuntak,[2] Donel S,[3] Noviardi,[3] Renardy Reza[3]
[1]Resident, Department of Obstetric-Gynecology, Faculty of Medicine, Universitas Riau, Arifin Achmad General Hospital, Pekanbaru, Riau
[2]Clinical Clerkship, Department of Obstetric-Gynecology, Faculty of Medicine, Universitas Riau, Arifin Achmad General Hospital, Pekanbaru, Riau
[3]Clinical Consultant, Department of Obstetric-Gynecology, Faculty of Medicine, Universitas Riau, Arifin Achmad General Hospital, Pekanbaru, Riau
Corresponding: Cantika Anakita, Email: cantikanakita@gmail.com
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Abstract
Introduction: Placenta Accreta Spectrum (PAS) is a severe obstetric complication causing hemorrhage, maternal morbidity, and mortality. Two widely adopted approaches to treatment are OSCS and MOSCUS. This literature review compares OSCS and MOSCUS to provide evidence-based insights for optimizing PAS treatment.
Objective: This study aims to compare the preferred conservative uterine surgical approaches in the management of Placenta Accreta Spectrum (PAS).
Methods: A literature review was undertaken following the scale assessment of narrative review articles (SANRA). We utilized various databases to evaluate current evidence for OSCS and MOSCUS in treating PAS. Relevant articles were reviewed to perform a comparative analysis between OSCS and MOSCUS in order to address the objective.
Result: The key difference between OSCS and MOSCUS lies in bleeding control by optimal uterine reconstruction with transverse b-lynch suture and selective vascular ligation. While OSCS is ideal for simpler cases due to its efficiency and practicality, MOSCUS is better suited for complex PAS cases, offering reduced complications and improved outcomes.
Conclusion: MOSCUS may be preferable to OSCS in terms of technique with optimal uterine reconstruction by adding several techniques to potentially preserve the uterus. More comparative research between the two required to evaluate the results prospectively.

Keywords: MOSCUS; OSCS; Placenta Accreta Spectrum (PAS) Surgery, Uterine Conservative Surgery

OSCS (One Step Conservative Surgery) vs MOSCUS (Modified One Step Conservative Uterine Surgery) pada Teknik Operasi Placenta Accreta Spectrum (PAS): Manakah yang Lebih Direkomendasikan? Tinjauan Literatur

Abstrak
Pendahuluan: Placenta Accreta Spectrum (PAS) merupakan komplikasi obstetri berat yang menyebabkan perdarahan, morbiditas dan mortalitas ibu. Dua pendekatan yang banyak diadopsi adalah OSCS dan MOSCUS. Tinjauan literatur ini membandingkan OSCS dan MOSCUS untuk memberikan wawasan berbasis bukti untuk mengoptimalkan tatalaksana PAS
Tujuan: Penelitian ini bertujuan untuk membandingkan pilihan tindakan bedah uterus konservatif yang lebih disukai dalam penatalaksanaan Placenta Accreta Spectrum (PAS).
Metode: Metode yang digunakan dalam penelitian ini adalah tinjauan literatur yang mengikuti penilaian kualitas SANRA. Kami menggunakan berbagai basis data untuk mengevaluasi bukti terkini OSCS dan MOSCUS dalam tatalaksana PAS. Artikel didiskusikan untuk membuat tinjauan yang komprehensif dan membuat analisis komparatif antara OSCS dan MOSCUS untuk menjawab tujuan penelitian.
Hasil: Perbedaan antara OSCS dan MOSCUS bergantung pada kontrol perdarahan dengan rekonstruksi uterus yang optimal dengan jahitan b-lynch melintang dan ligasi pembuluh darah selektif. OSCS ideal untuk kasus-kasus yang
Kesimpulan: MOSCUS dapat menjadi pilihan dibandingkan dengan OSCS dalam hal teknik dengan rekonstruksi rahim yang optimal dengan menambahkan beberapa teknik yang berpotensi mempertahankan rahim. Penelitian komparatif lebih lanjut antara keduanya diperlukan untuk mengevaluasi hasilnya secara prospektif.

Kata kunci: MOSCUS; Operasi Akreta; Operasi konservatif Uterus; OSCS

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Introduction

Placenta accreta spectrum (PAS) disorder affects approximately 1 in every 533 pregnancies worldwide.[1] Over the past few decades, its prevalence has increased substantially, largely due to the rising rates of cesarean deliveries.[2,3] The likelihood of developing PAS increases significantly, from 3% following a single cesarean section to 67% after five or more cesarean procedures.[3,4] Furthermore, advanced maternal age and higher parity are strongly linked to PAS incidence, with prevalence rates of 56.4% and 66.7%, respectively.[4] Maternal mortality associated with PAS ranges from 7% to 10%, with hemorrhage being the primary cause of death.[2,3]

Maternal mortality linked to placenta accreta spectrum (PAS) is estimated to range between 7% and 10%, with hemorrhage being the predominant cause.[2,3] The American College of Obstetricians and Gynecologists (ACOG) reports that average blood loss in these cases is approximately 3,000 to 5,000 mL. Nearly 90% of patients require blood transfusions, and up to 40% necessitate extensive transfusions involving more than 10 units of packed red blood cells.[3,4] To address this, a technique called One-Step Conservative Surgery (OSCS) has been introduced to preserve uterine function. One conservative method involves leaving the placenta in situ[5]; however, its application is hindered by complications such as retained placental tissue, secondary hemorrhage, infection, and systemic as well as procedural limitations that affect its overall effectiveness.[6]

OSCS and MOSCUS are both uterus-sparing approaches for women with PAS, yet they differ in their indications, operative principles, and clinical performance. OSCS was initially introduced as a single-stage conservative technique to limit bleeding through a retrovesical bypass, targeted vascular ligation, and repair of the myometrial defect, and it is generally best suited to moderate PAS when fibrosis is limited and tissue planes remain identifiable.[7,8]

Evidence suggests that, in appropriately selected patients, OSCS can preserve the uterus in roughly 78–90% of cases; however, performance declines markedly when lower uterine segment (LUS) fibrosis or cervico-trigonal hypervascularity is underappreciated, leading to greater transfusion requirements and hysterectomy conversion rates that may reach 10–22%.[7,9,10]

By comparison, MOSCUS was introduced for severe and/or highly vascular PAS and expands the original concept by combining bilateral uterine artery ligation, placement of a paracervical tourniquet, partial myometrial resection, and a transverse B-Lynch compression suture to achieve more complete hemostatic control.[10,11]

Reports from Taiwan and Vietnam indicate that MOSCUS is associated with lower estimated blood loss (900–1,600 mL), reduced transfusion demand, fewer bladder injuries, and uterine preservation rates of 90–97% even in complex PAS with extensive fibrosis.[11-13]

OSCS remains a useful uterus-sparing option for carefully selected cases with moderate invasion and preserved tissue planes, whereas MOSCUS appears to provide more dependable hemostasis and operative consistency in severe PAS, translating into lower morbidity and improved surgical outcomes.[10-15] Furthermore, placenta accreta spectrum involving the cervical-trigonal area with dense fibrosis (PAS type 4) is associated with increased operative complexity, higher intraoperative bleeding, and greater risk of organ injury, as the intense vesicouterine fibrotic adhesions make surgical dissection extremely challenging and limit the effectiveness of conservative approaches.[13]

Methods

This literature review was prepared in accordance with the scale for the assessment of narrative review articles (SANRA) to strengthen methodological transparency, logical structure, and clinical relevance. To capture the broadest possible evidence base on uterus-preserving surgery for placenta accreta spectrum (PAS), with specific attention to One Step Conservative Surgery (OSCS) and Modified OSCUS (MOSCUS), we conducted a comprehensive search across multiple major biomedical databases and publisher platforms. The electronic search covered PubMed, Scopus, Web of Science, ClinicalKey, SpringerLink, Wiley Online Library, Taylor & Francis Online, MDPI, and other relevant publisher sites. In addition, Google Scholar was used to identify pertinent book chapters and non-indexed sources that might not appear in traditional databases. From this overall search process, 20 references were ultimately retained for analysis.

Studies were eligible if they focused on pregnant patients diagnosed with PAS and provided clinically meaningful content related to OSCS and/or MOSCUS, including operative descriptions, outcome reporting, or comparative analysis of uterus-conserving techniques. We included a range of evidence types, case series, retrospective cohort studies, operative technique papers, and expert reviews, to reflect both real-world outcomes and detailed surgical rationale. Key outcomes of interest included estimated blood loss, transfusion requirements, hysterectomy conversion, operative time, intraoperative complications (including bladder injury), and postoperative recovery. We restricted inclusion to full-text, English-language publications from the last two decades to maintain contemporary clinical relevance. Exclusion criteria comprised studies that did not directly address PAS, lacked sufficient surgical detail regarding OSCS or MOSCUS, evaluated only alternative strategies (e.g., cesarean hysterectomy or embolization) without relevant comparison, or did not provide interpretable clinical outcome data. Editorials, basic science reports, and duplicate/overlapping patient cohorts were also excluded. Through this structured approach, the included literature was synthesized into a cohesive narrative intended to clarify the evolving role of OSCS and MOSCUS in PAS management, particularly where operative decisions carry major implications for maternal safety and future fertility.

Overview of OSCS

One-Step Conservative Surgery (OSCS), also termed as the resective-reconstructive technique, is a promising method for managing placenta accreta spectrum (PAS) cases while preserving the uterus and reducing morbidity. The rationale for OSCS is supported by several critical considerations. Foremost, OSCS prioritizes uterine preservation, allowing patients to retain reproductive potential while avoiding the irreversible loss of fertility associated with hysterectomy. Additionally, this technique minimizes surgical morbidity by reducing intraoperative risks, such as excessive blood loss and injury to surrounding pelvic structures. The targeted approach to hemostasis, achieved through selective ligation of blood vessels supplying the invasive placental tissue, enhances bleeding control and improves surgical outcomes. Furthermore, OSCS holds promise for improved postoperative recovery, as its conservative nature typically results in shorter recovery times and fewer complications compared to more radical procedures like hysterectomy. These benefits underscore the value of OSCS as a strategic option in managing PAS.[7,9,16]

This surgical procedure aims to effectively control hemorrhage while preserving the uterus whenever feasible.

The retrovesical bypass technique is utilized to ensure precise dissection and avoid critical structures, while targeted ligatures are strategically placed to minimize blood loss. Hemostasis is achieved using Cho's suture, a method known for its safety and efficacy in reducing bleeding and minimizing ureteral injury. In cases where tissue damage is extensive and repair is not possible, hysterectomy becomes the definitive option. After achieving hemostasis, fibrinogen levels are assessed to confirm they exceed 200 mg%, ensuring adequate coagulation before proceeding. The repair is conducted in two stages: first, U-stitches made with polyglactin suture are placed 1 cm from the myometrial border to align the tissue edges and reduce tension on the repair. Next, a continuous suture with polyglactin is used to securely close the borders and enhance hemostasis. Previously, a reabsorbable net was employed for tension distribution with favorable outcomes, but its occasional unavailability led to the use of Vicryl™ mesh, which has yielded similar results. Any minor muscular defects identified during the procedure are addressed to ensure optimal outcomes. This comprehensive approach underscores the importance of meticulous planning, precise surgical techniques, and robust hemostatic measures in managing invasive placental disorders, emphasizing the role of multidisciplinary coordination and anticipation of complications.[8]

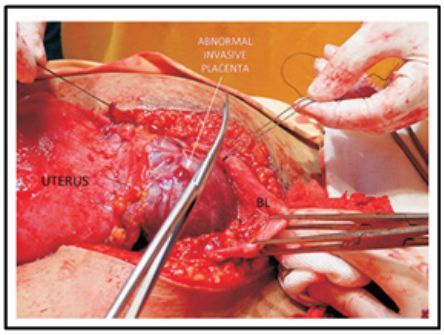


Figure 1. Intraoperative superior view demonstrating anterior placental invasion. The placenta reaches the uterine serosal surface, but a lax, separable layer is still identifiable between the bladder's posterior wall and the placenta. This indicates that despite abnormal placental adherence, part of the vesicouterine space remains intact.[8]

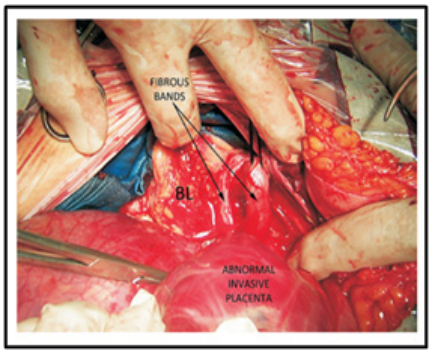


Figure 2. In this superior surgical view of anterior placental invasion, prominent fibrous bands can be seen bridging the posterior bladder wall and the placenta, suggesting a strong abnormal adhesion within the vesicouterine space.[8]

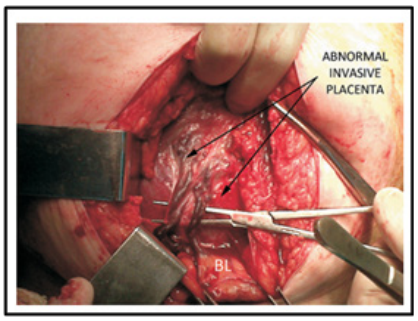


Figure 3 This superior surgical view demonstrates anterior placental invasion, with newly formed vascular networks visible between the posterior bladder wall and the invading placental tissue (black arrows), indicating ongoing neovascularization within the vesicouterine space.[8]

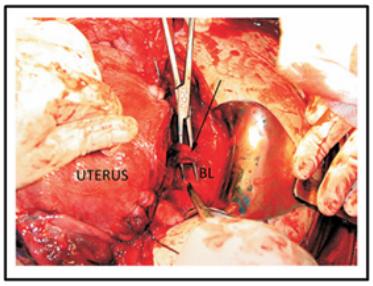


Figure 4 This superior surgical view of the lower uterus after reconstructive treatment for abnormal invasive placenta shows, as indicated by the black arrow, a direct anastomosis forming between the transmedial interuterine repair area and the bladder.[8]

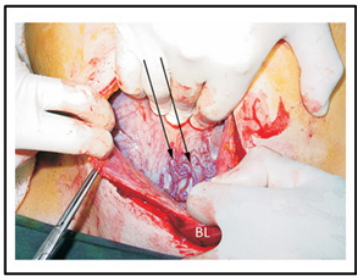


Figure 5. This superior surgical view demonstrates anterior placental invasion, with black arrows indicating a group of fine, newly developed vessels positioned between the posterior bladder wall and the placenta.[8]

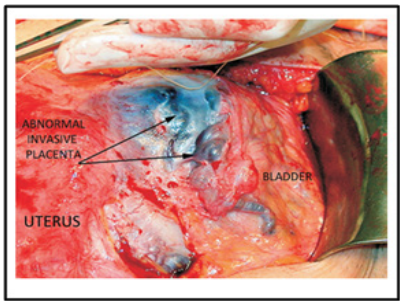


Figure 6 This superior surgical view illustrates anterior placental invasion, with the black arrows marking large, newly developed vascular channels positioned between the invasive placental tissue and the bladder.[8]

Pain management is a critical component following one-step surgeries, as these procedures result in significantly greater tissue disruption compared to standard cesarean deliveries.[8] One additional but important aspect of postoperative care is deep venous thrombosis prophylaxis. Pregnancy, pelvic surgery and bed rest should be regarded as risk factors.[17] Ideally, intermittent pneumatic compression devices are recommended.[18] Low-molecular-weight heparin may be administered when the platelet count exceeds 100,000/mm³ and should be continued until the patient achieves effective ambulation.[8]

New research shows that OSCS is effective in treating uterine disorders without resorting to more drastic measures. Studies suggest that the rate of progression to hysterectomy following OSCS is approximately 10% to 15%, depending on factors such as lesion complexity, patient condition, and surgical expertise. While specific data on maternal mortality reduction percentages for OSCS in placenta accreta cases are limited, general management of PAS disorders has shown that antenatal diagnosis and referral to specialized centers can reduce maternal morbidity and mortality. Larger clinical studies and more investigation are required to confirm these results and improve OSCS procedures for wider use.[19]

Overview of MOSCUS

An improved version of OSCS, Modified One Step Conservative Uterine Surgery (MOSCUS) is designed to address uterine diseases even more precisely while maintaining reproductive function. The need to improve conservative surgical methods that provide greater accuracy, fewer difficulties, and better results for women who want to preserve their fertility or steer clear of more involved surgical procedures like hysterectomy is the driving force behind MOSCUS. At our consultant-led obstetric hospital, we perform

either a cesarean hysterectomy or MOSCUS following counseling. Proper management is indicated based on the following factors. First, the patient's desire for future fertility or psychological issues (many Vietnamese women strongly believe that they will lose their femininity if they have no uterus) is noted. Second, consultation with a senior doctor with expertise and experience based on clinical evaluation is required. Third, a multidisciplinary team and the availability of blood banks are potentially necessary.[10]

MOSCUS begins with vesicouterine dissection to separate the bladder from the lower uterine segment, followed by the placement of hemostatic sutures at neovascularized areas to control bleeding before making the uterine incision. The lower uterine segment is then carefully assessed to evaluate the feasibility of uterine conservation. A transverse incision is made at the upper border of the placenta, avoiding direct incision through the placental tissue, and the fetus is delivered. To minimize blood flow, a tourniquet is placed in the paracervical region, and bilateral uterine artery ligation is performed. Manual removal of the placenta is conducted immediately afterward. If the remaining lower uterine segment contains a healthy myometrial layer exceeding 2 cm, partial myometrial resection is performed. The edges of the uterine incision and the placental bed are sutured meticulously to achieve hemostasis. Transverse B-Lynch compression sutures are applied to further control bleeding, followed by complete closure of the uterus to ensure structural integrity. Any bladder injuries sustained during the procedure are repaired as necessary. This technique is designed to preserve the uterus in cases of placenta accreta spectrum, ensuring hemostasis while minimizing surgical morbidity.[11]

After MOSCUS, postoperative care is crucial to promoting healing and assessing the procedure's effectiveness. Compared to standard procedures, patients frequently return to their regular activities more quickly. Nonetheless, regular evaluations of menstrual regularity and uterine integrity, as well as follow-up imaging (such as MRI or ultrasound), are essential. The size and location of the lesion, the surgeon's experience, the patient's age, any comorbidities, and compliance with postoperative instructions are all factors that affect the success of MOSCUS.[10]

The advantages of MOSCUS in treating uterine diseases while reducing the need

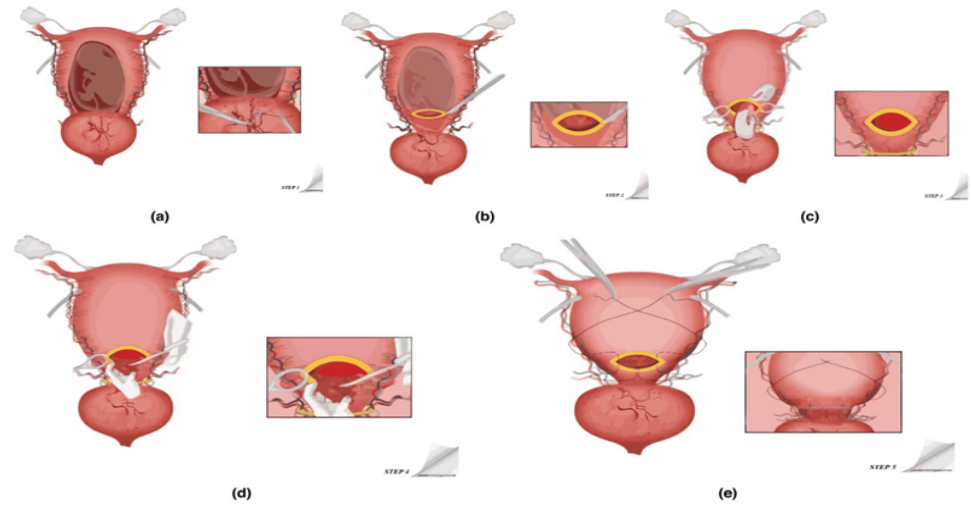


Figure 7 Procedure of MOSCUS[11]

for drastic measures are highlighted by recent study. In a study involving 217 cases managed with MOSCUS, 24 required a secondary hysterectomy, indicating a success rate of 88.9% (95% confidence interval [CI] 84.3%–93.1%). Specific studies on MOSCUS have not reported maternal mortality rates, suggesting that, with proper management, the risk can be minimized. However, despite these encouraging outcomes, more extensive research is required to confirm these results and create standardized procedures for MOSCUS.[12]

OSCS vs MOSCUS

Both One-Step Conservative Surgery (OSCS) and Modified One-Step Conservative Uterine Surgery (MOSCUS) are recognized as effective surgical approaches for uterine preservation in cases of placenta accreta spectrum (PAS). These techniques represent significant advancements in managing PAS, each tailored to different clinical scenarios.

MOSCUS offers refined surgical strategies that make it particularly suitable for severe or fibrotic PAS cases. Its approach integrates advanced hemostatic techniques, such as transverse B-Lynch sutures and selective vascular ligation, allowing for superior control of bleeding. Additionally, its adaptability to handle complex lesions enhances its effectiveness in managing challenging presentations of PAS. This versatility ensures comprehensive management of cases involving extensive invasion or significant fibrosis, which might otherwise necessitate a hysterectomy.[13]

In contrast, OSCS is best suited for moderate PAS cases. It provides a simpler and more straightforward surgical method, making it less technically demanding. The technique typically involves resection of the affected myometrium and a two-stage uterine repair. Its effectiveness and ease of application make it a reliable option for cases where placental invasion is less severe, requiring fewer resources and a shorter operative time.[8]

The decision to employ either OSCS or MOSCUS depends on several critical factors. These include the degree and location of placental invasion, the surgeon's experience with PAS management, and the resources available at the treatment center. Such considerations ensure that the chosen technique is optimally matched to the clinical and logistical circumstances, maximizing patient safety and surgical success.[11]

In complex and advanced cases of PAS, MOSCUS demonstrates a clear advantage. Its comprehensive hemostatic strategies and capacity to address severe lesions make it a preferred option when managing challenging scenarios. This technique not only prioritizes uterine preservation but also minimizes complications, offering an evidence-based approach to addressing the most difficult PAS cases.

Things That Remain Unclear: What We Need to Explore Further

Several aspects of the comparison between One-Step Conservative Surgery (OSCS) and Modified One-Step Conservative Uterine Surgery (MOSCUS) remain unclear and require further exploration. One significant area is the long-term reproductive outcomes, including fertility rates and risks in subsequent pregnancies, as comprehensive data comparing OSCS and MOSCUS are limited.[20,14] Additionally, while MOSCUS has shown promise in managing severe or fibrotic PAS cases, its comparative effectiveness in addressing extreme fibrosis or cervical-trigonal invasion relative to OSCS is not well-documented, necessitating further prospective studies. [13, 15]

The lack of standardized protocols for selecting between OSCS and MOSCUS based on PAS severity or type also highlights an area for improvement, as variability in

surgical expertise and decision-making leads to inconsistent outcomes.[15] Furthermore, the management of postoperative complications such as infection, delayed hemorrhage, or adhesions remains underexplored, particularly in cases where MOSCUS is employed.[13-14] The role of adjunct therapies, including methotrexate or uterine artery embolization, in complementing these techniques also warrants further investigation.[15]

Economic considerations are another area of uncertainty, particularly regarding the cost-effectiveness and resource requirements of implementing MOSCUS versus OSCS in various healthcare settings. The scalability of MOSCUS in low-resource environments and the feasibility of providing adequate training remain unanswered questions.[14] Additionally, the ideal composition and involvement of multidisciplinary teams, including vascular surgeons, urologists, and radiologists, need further clarification to optimize surgical success and reduce complication rates.

Finally, patient-centered outcomes, such as quality of life and psychological well-being following OSCS or MOSCUS, are rarely studied but are critical to understanding the broader impact of these surgical options. Investigating patients' preferences for uterine preservation versus potential risks and recovery times will be invaluable for informed decision-making. Addressing these gaps in knowledge through multicenter trials and collaborative research will help refine indications, enhance techniques, and improve outcomes for OSCS and MOSCUS. Balancing technical advancements with patient-centered care will remain central to optimizing PAS management.

Conclusion

Both One-Step Conservative Surgery (OSCS) and Modified One-Step Conservative Uterine Surgery (MOSCUS) are highly effective approaches for managing placenta accreta spectrum (PAS) while prioritizing uterine preservation. OSCS is particularly well-suited for cases of moderate PAS due to its straightforward methodology, lower technical complexity, and its ability to efficiently preserve reproductive potential. In contrast, MOSCUS demonstrates exceptional adaptability in addressing severe or fibrotic PAS, utilizing advanced hemostatic techniques such as transverse B-Lynch sutures and selective vascular ligation to achieve superior bleeding control and optimal uterine reconstruction.

Despite the promising advancements offered by these surgical techniques, several areas remain unclear. Long-term reproductive outcomes following OSCS and MOSCUS, standardized criteria for selecting the most appropriate technique, and strategies for managing postoperative complications require further investigation. Collaborative research efforts, the establishment of comprehensive clinical guidelines, and a focus on multidisciplinary management are essential to address these knowledge gaps.

The decision to utilize OSCS or MOSCUS should be individualized, based on the extent and location of the placental invasion, the surgeon's expertise, and the resources available at the healthcare facility. While OSCS is ideal for simpler cases due to its efficiency and practicality, MOSCUS is better suited for complex PAS cases, offering reduced complications and improved outcomes. Continued research and refinement of these techniques will enhance their effectiveness and broaden their applications in the management of PAS, ultimately improving maternal and neonatal care.

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