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Advances in the management of placenta accrete spectrum disorder using minimally invasive and robotic gynecologic surgery.

Aln Cher*

Department of Obstetrics, University of Yale, Canada

***Correspondence to:** Aln Cher, Department of Obstetrics, University of Yale, Canada, Turkey, E-mail: aln@cher.co.ca

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Introduction

Placenta accreta spectrum (PAS) disorder is a complex obstetric condition characterized by abnormal adherence of the placenta to the uterine wall, which can lead to severe maternal morbidity and mortality. Traditionally, PAS has been managed with cesarean hysterectomy, often associated with significant blood loss and prolonged recovery. However, recent advances in minimally invasive and robotic gynecologic surgery are transforming the management of PAS, offering precision, reduced surgical trauma, and improved outcomes [1].

The rising incidence of PAS, partly due to increasing cesarean delivery rates worldwide, has highlighted the need for improved diagnostic and surgical strategies. Early recognition and multidisciplinary planning are critical to optimizing maternal and fetal outcomes. Imaging modalities, including ultrasound and magnetic resonance imaging (MRI), play an essential role in preoperative diagnosis, allowing surgeons to stratify risk and plan appropriate interventions.

Minimally invasive surgery (MIS), including laparoscopy and robotic-assisted surgery, has revolutionized the approach to complex gynecologic procedures. These techniques provide enhanced visualization, precision in dissection, and the ability to preserve uterine function in select cases. In the context of PAS, MIS approaches are being explored to minimize operative morbidity while ensuring safe delivery of both mother and child [2].

Robotic surgery, with its three-dimensional visualization, tremor filtration, and articulating instruments, offers significant advantages over conventional laparoscopy. These features are particularly beneficial in managing PAS, where delicate dissection near major vessels and the bladder is often required. Robotic platforms allow surgeons to perform complex procedures with greater accuracy and control.

Recent studies have demonstrated the feasibility of robotic-assisted cesarean hysterectomy and conservative uterine-preserving procedures in selected PAS cases. These reports suggest that, when performed in specialized centers with experienced surgical teams, robotic approaches can reduce intraoperative blood loss, shorten hospital stays, and enhance recovery compared to traditional open surgery [3].

Patient selection remains a cornerstone of MIS and robotic surgery in PAS management. Not all cases are suitable for minimally invasive approaches, particularly those with extensive placental invasion or coexisting uterine abnormalities. Multidisciplinary evaluation, including maternal-fetal medicine specialists, anesthesiologists, and experienced gynecologic surgeons, is essential to identify candidates who may benefit from these advanced techniques.

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Training and surgical expertise are critical factors in the successful adoption of MIS and robotic surgery for PAS. Surgeons must be proficient in both obstetric and gynecologic surgical principles, including advanced laparoscopic techniques and robotic platform utilization. Simulation-based training and mentorship programs have emerged as effective methods to enhance surgeon skills and confidence [4].

Conservative surgical approaches, such as partial myometrial resection or localized placental excision, have gained attention in PAS management. When combined with MIS or robotic assistance, these techniques aim to preserve fertility while minimizing maternal morbidity. Careful intraoperative planning, hemostasis management, and readiness for conversion to open surgery remain essential components of patient safety.

Despite the potential advantages, challenges persist in implementing MIS and robotic strategies for PAS. High costs, limited availability of robotic systems, and the steep learning curve remain barriers, particularly in low-resource settings. Collaborative efforts and establishment of referral centers may help overcome these limitations and expand access to advanced surgical care for high-risk pregnancies [5].

Conclusion

Placenta accreta spectrum disorder represents one of the most challenging conditions in obstetrics, with significant risks to maternal and fetal health. Minimally invasive and robotic gynecologic surgery are emerging as valuable tools in the management of PAS, offering precision, reduced blood loss, and improved recovery. Careful patient selection, multidisciplinary collaboration, and specialized surgical expertise are essential for optimizing outcomes. As technology advances and surgical experience grows, MIS and robotic approaches are likely to play an increasingly important role in the safe and effective management of placenta accreta spectrum disorder.

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