



Surgical film

## Cesarean hysterectomy for placenta accreta spectrum: 3-2-1 approach

Andrew Vallejo<sup>a</sup>, X. Mona Guo<sup>a</sup>, Monica K. Neuman<sup>a</sup>, Ariane C. Youssefzadeh<sup>b</sup>, Lynda D. Roman<sup>a,c</sup>, Koji Matsuo<sup>a,c,\*</sup>

<sup>a</sup> Division of Gynecologic Oncology, Department of Obstetrics and Gynecology, University of Southern California, Los Angeles, CA, USA

<sup>b</sup> Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, University of Southern California, Los Angeles, CA, USA

<sup>c</sup> Norris Comprehensive Cancer Center, University of Southern California, Los Angeles, CA, USA

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### ABSTRACT

Given the high risk of complications associated with cesarean hysterectomy for placenta accreta spectrum (PAS), any surgical approach and technique can yield utility in reducing the surgical morbidity. Here, we propose the 3-2-1 approach as a schema to be implemented in the proper setting for the surgical management of a PAS cesarean hysterectomy. The 3-2-1 approach begins with the surgical dissection of three anatomical landmarks that ultimately facilitate a safe surgical site for the ligation and transection of the uterine vessels. First-step is identification of the three anatomical landmarks which are (i) posterior lower uterine segment peritoneum deserosalization, (ii) identification of the ureters laterally, and (iii) anterior bladder dissection. Posterior-to-anterior progression avoids encountering dense adhesions and hypervascularity in the anterior lower uterine segment early in the surgery. Further, allows better mobilization of the uterus to identify the anatomical landmarks laterally and anteriorly. Second-step is to deploy the 2-hand technique where the surgeon places one hand anteriorly and the other hand posteriorly in the lower uterine segment below the placental bed. The surgeon brings both hands together with flexed fingers perpendicular to the uterine tissue and gently elevates the uterus and placenta out of the pelvis and ensures safe anatomical distance to surrounding structures. Third-step is the consideration of a supracervical hysterectomy. In summary, this 3-2-1 approach to reflect the anatomy of enlarged lower uterine segment in PAS is a stepwise schema that can aid surgeons in the completion of a cesarean hysterectomy, with the goal to improve surgical outcomes.

### 1. Introduction

Placenta accreta spectrum (PAS) involves the pathologic attachment of the placenta to uterine myometrial layer that results in failure of normal placental detachment at delivery (Society of Gynecologic O et al., 2018; Einerson et al., 2023). As many as one in 313 cesarean deliveries have a diagnosis of PAS in the recent United States with continued increasing in the incidence (Matsuzaki et al., 2021). Pregnant patients with PAS frequently undergo cesarean delivery followed by immediate hysterectomy. This surgical procedure is associated with significant maternal morbidity and mortality, including hemorrhage, shock, coagulopathy, urinary tract injury, intensive care unit admission, and prolonged hospitalizations (Matsuzaki et al., 2021; Silver and Branch, 2018). The risk of death among cases of severe forms of PAS is as

high as one in 71 patients (Matsuzaki et al., 2021). Thus, any surgical approach to reduce maternal morbidity and mortality is utmost importance in the management of pregnant patients with PAS (Kingdom et al., 2020).

This significant surgical morbidity and mortality associated with cesarean hysterectomy for PAS primarily attributed to abnormal placental implantation in the lower uterine segment leading to hypervascularity, thin uterine wall, and possible disrupted anatomical architecture (Matsuo et al., 2022; Matsuo et al., 2023). One major difference is seen in the application of the surgical clamps when ligating the uterine vessels. Application at the uterine isthmus seen in an ordinary hysterectomy would be located above the placenta in a PAS surgery (Fig. 1). This leads to serial progression down the lower uterine segment below the placenta increasing risk of severe blood loss due to hypervascularity

\* Corresponding author at: Division of Gynecologic Oncology, Department of Obstetrics and Gynecology, University of Southern California, 2020 Zonal Avenue, IRD 520, Los Angeles, CA 90033, USA.

E-mail address: [koji.matsuo@med.usc.edu](mailto:koji.matsuo@med.usc.edu) (K. Matsuo).

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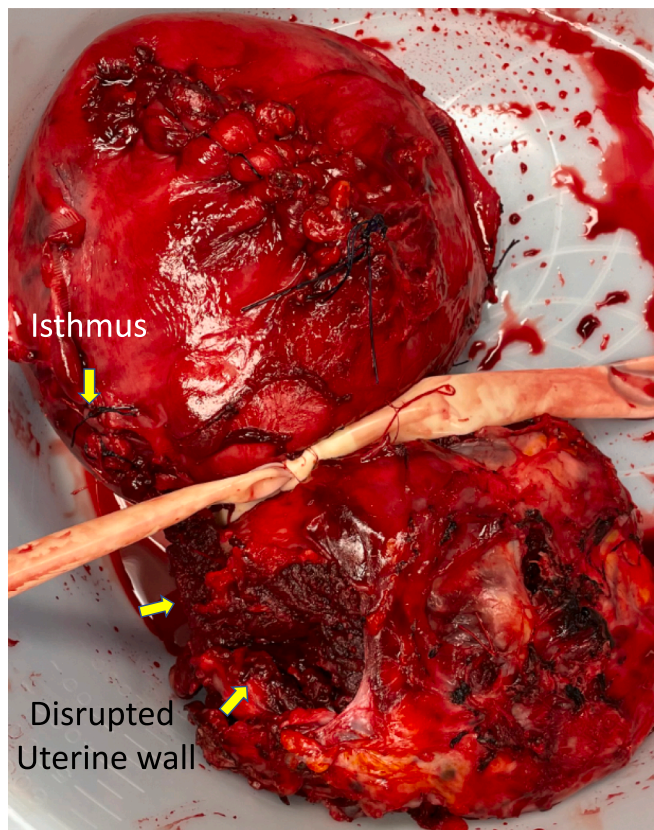


Fig. 1. Lower uterine segment appearance without 2-hand technique.

from the placenta’s presence in the lower uterine segment from inevitable disruption of the thin uterine wall (Matsuo et al., 2022; Matsuo et al., 2023). Here, we propose the 3-2-1 approach for cesarean hysterectomy to address this characteristic anatomical abnormality in the lower uterine segment of PAS to safely proceed hysterectomy and improve surgical outcomes (Matsuo et al., 2022; Matsuo et al., 2023).

## 2. Surgical steps

We utilize this 3-2-1 method in the context of usual preparedness for PAS center-of-excellence approach: (i) interdisciplinary team including members from maternal-fetal medicine specialist, general obstetrician gynecologist, experienced pelvic surgeon, anesthesiologist, acute care shock trauma surgeon, and interventional radiologist, (ii) blood bank services with massive transfusion protocol capability, and (iii) intensive

care unit care (Einerson et al., 2023). Following midline vertical laparotomy, placenta-sparing hysterotomy, delivery of the fetus via cesarean, additional consideration for the PAS hysterectomy includes tranexamic acid injection, diagnostic cystoscopy and ureteral stent placement, and intraoperative uterine artery embolization in selected cases as was described in this video content.

The cesarean hysterectomy is then completed using the 3-2-1 approach over three sequential steps (Table 1). The first-step is to identify and create the three anatomical landmarks: (i) posterior lower uterine segment peritoneum de-serosalization (posterior aspect). (ii) ureteral identification (lateral aspect), and (iii) bladder dissection (anterior aspect) (Fig. 2). The posterior-to-anterior surgical progression avoids encountering dense adhesions and hypervascularity in the anterior lower uterine segment early in the surgery. Further, allows better

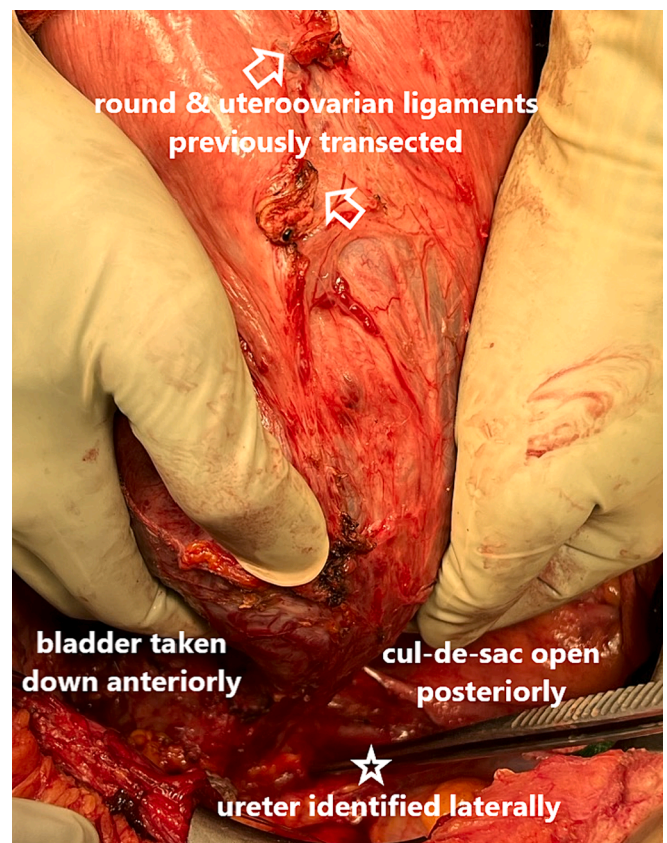


Fig. 2. Identification of 3 anatomical land marks.

Table 1

The 3-2-1 Approach Schema.

### First-step: Identify the 3 anatomical landmarks.

Posterior cul-de-sac: de-serosalize the posterior lower uterine segment beyond the placental bulge, allowing the surgeon to reach below the placental edge.

Lateral ureters: enter retroperitoneal space to identify and lateralize the ureters.

Anterior bladder: Carry down to the level of the endopelvic fascia of the cervix, most easily identified laterally instead of anterior due to adhesive disease.

Modest fluid distention of the urinary bladder with normal saline can help identify the bladder edge.

Gentle traction with dry lap is preferred in lieu of clamps due to the increased friability in a gravid uterus susceptible to avulsion and shearing.

### Second-step: Deploy the 2-hand technique.

The surgeon hands, on the contra-lateral side, are placed antero-posteriorly at the lower uterine segment, meeting at the cardinal ligament below the placental bed at the level of the upper cervix or vagina.

Surgeon fingers are flexed (approximately 90 degrees) and perpendicular to the uterine tissue. Fingertips palpating contralateral hands with minimal tissue in between to confirm no placental tissue is in between.

Two hands gently elevate the placenta-containing lower uterine segment out of the pelvis, safely isolating the cardinal ligament from the surrounding structures (ureters, bladder, and rectum).

### Third-step: Supracervical hysterectomy, 1 consideration.

Place clamps beneath caudally from fingertips and confirm safe anatomical distance from surrounding organs and structures.

Complete hysterectomy: supracervical hysterectomy can minimize surgical morbidity and time.

Individualized considerations must be taken with a patient’s cervical dysplasia history.





Fig. 3. Deploying 2-hand technique.



Fig. 5. Lower uterine segment appearance with 2-hand technique.

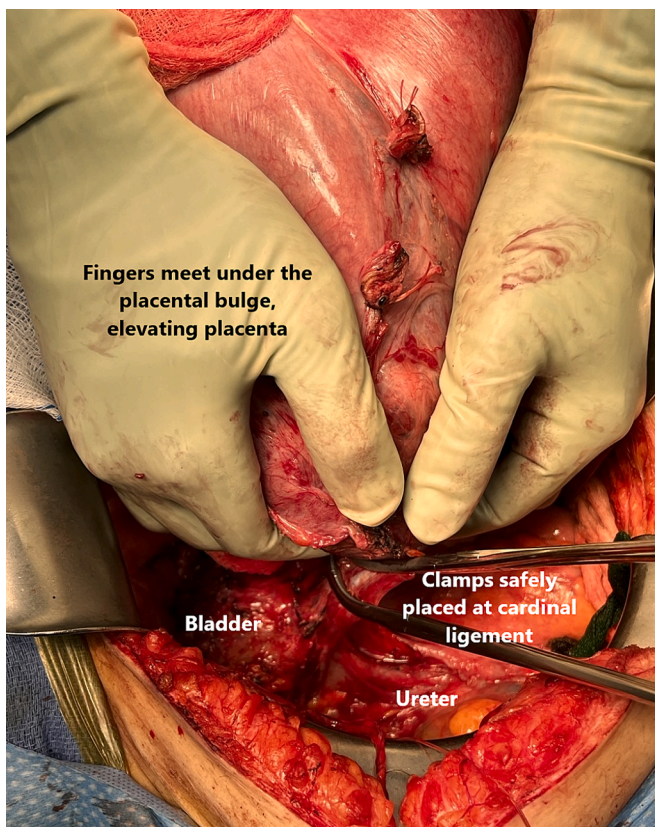


Fig. 4. Application of surgical clamp following 2-hand technique.

mobilization of the uterus to identify the anatomical landmarks laterally and anteriorly.

The second-step is to deploy the 2-hand technique (Fig. 3). The surgeon places one hand anteriorly and the other hand posteriorly in the lower uterine segment below the placental bed. The surgeon brings both hands together with flexed fingers perpendicular to the uterine tissue and gently elevates the uterus and placenta out of the deep pelvis. The prior peritoneal de-serosalization process enable smooth elevation of placenta-containing lower uterine segment leaving the ureters in place. Confirming that there is adequate distance from both ureters / bladder prior to ligation and identification of the proper site for clamp placement to transect the cardinal ligaments, surgeons proceed hysterectomy (Fig. 4). In the third-step, supracervical hysterectomy is a possible consideration to reduce surgical morbidity weighing patient risk factor (Fig. 5).

### 3. Conclusion

In summary, this simple, reproducible, and anatomy-based 3-2-1 approach is a stepwise schema that can aid surgeons in the completion of a cesarean hysterectomy for PAS, with the goal to improve surgical outcomes.

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#### Informed consent

Signed informed consents were obtained from the patients.

**Transparency:** The manuscript's corresponding author (K.M.) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

**Tweetable statement:** This simple and reproducible 3-2-1 approach to reflect the abnormally enlarged lower uterine segment in placenta accreta spectrum may be useful for cesarean hysterectomy.

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#### CRediT authorship contribution statement

**Andrew Vallejo:** Data curation, Formal analysis, Investigation, Project administration, Software, Visualization, Writing – original draft. **X. Mona Guo:** Data curation, Investigation, Methodology, Resources, Writing – review & editing. **Monica K. Neuman:** Investigation, Resources, Writing – review & editing. **Ariane C. Youssefzadeh:** Investigation, Resources, Writing – review & editing. **Lynda D. Roman:** Funding acquisition, Investigation, Resources, Supervision, Writing – review & editing. **Koji Matsuo:** Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft.

#### Declaration of competing interest

Lynda D. Roman served as consultant for Cardiff Oncology and

Nutcracker, and participates in the Steering Committee for the Global Coalition of Adaptive Research. The other authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.gore.2024.101366>.

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