

Urinary Bladder Injury Among Patients with Placenta Accreta Spectrum: Comparison Between Wedge Resection and Total Hysterectomy

Tedi Ismayadi, Adhi Pribadi, Andi Kurniadi

Department of Obstetrics and Gynecology, Hasan Sadikin General Hospital – Padjadjaran University, Bandung, Indonesia

Corresponding Author: Tedi Ismayadi, Email: ismayaditedi511@gmail.com

Abstract

Objective: This study aims to assess the incidence of urinary bladder injury among pregnant women with placenta accreta spectrum (PAS) who underwent total hysterectomy and wedge resection.

Methods: This study employed a cross-sectional design by reviewing secondary data of all pregnant women with PAS who underwent total hysterectomy or wedge resection at Hasan Sadikin General Hospital from January 2021 to December 2023. Statistical analysis for categorical data used the Chi-square test or Fisher's exact test, and numerical data were analyzed using the unpaired T-test or Mann-Whitney test.

Results: The sample consists of 116 patients. A total of 84 patients underwent total hysterectomy, and 32 patients underwent wedge resection. There was no significant difference in mean age between the two groups ($p = 0.129$). The results showed a significant difference between the two groups for birth weight ($p = 0.007$) and the incidence of urinary bladder injury ($p = 0.018$). No urinary bladder injury occurred in the wedge resection group, while 13 (15.50%) patients experienced urinary bladder injury in the total hysterectomy group.

Conclusion: Total hysterectomy is associated with a higher incidence of urinary bladder injury compared to wedge resection.

Keywords: Placenta accreta spectrum (PAS), total hysterectomy, wedge resection, urinary bladder injury.

Cedera Vesika Urinaria pada Pasien dengan Spektrum Plasenta Akreta: Perbandingan antara *Wedge Resection* dan Total Histerektomi

Abstrak

Tujuan: Penelitian ini bertujuan untuk menilai angka kejadian cedera vesika urinaria antara wanita hamil dengan spektrum plasenta akreta (SPA) yang menjalani histerektomi totalis dan *wedge resection*.

Metode: Metode yang digunakan dalam penelitian ini adalah metode potong lintang dengan meninjau data sekunder semua ibu hamil dengan SPA yang menjalani histerektomi totalis atau *wedge resection* di Rumah Sakit Umum Pusat Hasan Sadikin periode Januari 2021 - Desember 2023. Analisis statistik untuk data kategorik menggunakan uji Chi-square atau uji Fisher dan data numerik diuji menggunakan uji T-tidak berpasangan atau uji Mann-Whitney.

Hasil: Sampel penelitian ini terdiri atas 116 pasien. Sebanyak 84 pasien menjalani histerektomi totalis dan 32 pasien menjalani *wedge resection*. Tidak ada perbedaan rata-rata usia yang bermakna antar kedua kelompok ($p = 0,129$). Hasil penelitian menunjukkan perbedaan yang signifikan antara kedua kelompok untuk berat badan lahir ($p = 0,007$) dan kejadian cedera vesika urinaria ($p = 0,018$). Tidak ada yang mengalami cedera vesika urinaria pada kelompok *wedge resection*, sedangkan 13 (15,50%) pasien mengalami cedera vesika urinaria pada kelompok histerektomi totalis.

Kesimpulan: Histerektomi totalis berhubungan dengan tingkat kejadian cedera vesika urinaria yang lebih tinggi dibandingkan dengan *wedge resection*.

Kata kunci: Cedera vesika urinaria, histerektomi totalis, spektrum plasenta akreta (SPA), *wedge resection*.

Introduction

Placenta Accreta Spectrum (PAS), also referred to as Abnormally Invasive Placenta (AIP), is characterized by the abnormal invasion of trophoblastic tissue through the decidua basalis into the uterine myometrium, serosa, and potentially beyond, affecting nearby pelvic organs.¹ The incidence of PAS has risen significantly over the past few decades, increasing from approximately 1 in 30,000 pregnancies in the 1960s to 1 in 533 by 2000. A recent study highlighted that PAS affects approximately 0.2% of all pregnancies, with incidence rates rising from 1 in 2,500 to as frequent as 1 in 500 pregnancies.^{2,3}

The incidence of PAS is closely related to a history of previous uterine procedures that cause damage to the endometrium, such as curettage, manual extraction of the placenta, uterine-arterial embolization, or myomectomy. However, the most significant risk factor is a prior cesarean section. The likelihood of developing PAS escalates with each subsequent cesarean section, affecting approximately 11% of pregnancies after two cesarean procedures, and increasing to 67% in women with four prior cesarean sections. The increasing global and national rates of cesarean delivery have significantly contributed to the rise in PAS cases.²⁻⁴ In Indonesia, the 2018 National Basic Health Research (RISKESDAS) reported a cesarean delivery rate of 17.6%, which corresponds with a rise in PAS incidence, doubling from 2% in 2016 to 4% in 2018.⁵

Management strategies for PAS range from radical to conservative approaches. The American College of Obstetricians and Gynecologists (ACOG) recommends cesarean hysterectomy as the standard treatment; however, this method is associated with high maternal morbidity (40–50%) and risks such as massive hemorrhage, permanent infertility, injury to the bladder and vascular

structures, and mortality rates of up to 7%.⁶ For women of reproductive age who wish to preserve fertility, conservative surgical approaches such as wedge resection, also referred to as One-Step Conservative Surgery (OCS), may be a preferred alternative to hysterectomy.⁷ Nonetheless, the success of conservative management heavily depends on the surgeon's expertise and the extent of placental invasion; therefore, this procedure may have a lower reproducibility rate compared to other conservative treatment options.⁸

PAS surgery carries a high risk of morbidity, due to both the severity of the condition and potential surgical complications. A primary concern is urological injury, as PAS can extend to involve the urinary tract.⁹ A recent study by Hage *et al.* highlighted the significant urologic morbidity associated with PAS surgery, particularly regarding the depth of placental invasion and emergency hysterectomy.¹⁰ Given the known association between hysterectomy and urologic complications, this study aims to assess and compare the incidence of urinary bladder injury in women with PAS who underwent total hysterectomy versus wedge resection as an alternative conservative management.

Method

This study employed a cross-sectional design by reviewing secondary data of pregnant women diagnosed with Placenta Accreta Spectrum (PAS) who delivered at the Department of Obstetrics and Gynecology, Hasan Sadikin General Hospital, Bandung, between January 2021 and December 2023. PAS was defined according to the criteria established by the American College of Obstetricians and Gynecologists (ACOG).

The study inclusion criteria were pregnant women diagnosed with placenta accreta who were treated with total hysterectomy or wedge resection. Patients

with incomplete medical records were excluded from this study. The sample was drawn from the accessible population that met the inclusion and exclusion criteria, using a consecutive sampling method, which means that all eligible cases during the study period were included.

Patient characteristics were described as means with standard deviations for normally distributed numerical data and percentages for categorical variables. The characteristics observed in this study included age, body weight, height, and nutritional status. Nutritional status was assessed based on the Body Mass Index (BMI). In addition, the study observed neonatal outcomes including birth weight, birth height, and APGAR score at 1, 5, and 10 minutes. Statistical analysis for categorical data was performed using the Chi-square test when the requirements were met, or Fisher’s test when they were not. Unpaired T-test statistics were applied for numerical data analysis when the data was normally distributed, while the Mann-Whitney statistical test was used when the data was not normally distributed. A p-value < 0.05 was considered statistically significant. All data analysis was carried out using IBM SPSS version 25.0.

Result

Among 120 patients initially identified with PAS during the study period, 116 met the inclusion criteria. It was included in the final analysis after excluding those who had incomplete medical records. The characteristics of the research subjects are illustrated in Table 1.

Table 1 presents the baseline characteristics of the research subjects who underwent either total hysterectomy (n=84) or wedge resection (n=32) for the management of PAS. The p-value was calculated using the unpaired t-test for numerical data and the Chi-square test for categorical data. There were no statistically significant differences between the two groups regarding age, body weight, height, or nutritional status (p > 0.05 for all variables).

Table 2 summarizes the comparison of neonatal outcomes between the total hysterectomy group (n = 84) and the wedge resection group (n = 32). The mean birth weight in the wedge resection group was significantly higher (2780 ± 407.21 grams) compared to that in the total hysterectomy group (2440.25 ± 620.43 grams), showing a statistically significant difference (p = 0.007). No significant differences were observed in

Table 1 Characteristics of Research Subjects

Variable	Group		p-value
	Total Hysterectomy (n = 84)	Wedge Resection (n = 32)	
Age (years), mean ± SD	34.18 ± 4.72	32.63 ± 5.34	0.129
Body Weight (kg), median (range)	62.25 ± 2.53	60.38 ± 1.19	0.157
Height (cm), median (range)	153.23 ± 2.34	154.12 ± 2.07	0.124
Nutritional Status, n (%)			
Normal	57 (67.9%)	23 (71.9%)	0.116
Malnutrition	3 (3.6%)	1 (3.1%)	
Overweight	24 (28.6%)	8 (25.0%)	

Table 2 Comparison of Neonatal Outcomes

Variable	Total Hysterectomy n = 84		Wedge Resection n =32		p-value
	Mean	SD	Mean	SD	
Birth weight (gram)	2,440.25	620.43	2780	407.21	0.007*
Birth height (cm)	45.17	4.47	46.87	2.34	0.116
1-minute APGAR score	4.96	1.65	5.53	1.05	0.154
5-minute APGAR score	6.92	2.11	7.78	1.01	0.055
10-minute APGAR score	8.36	1.76	8.84	0.45	0.180

*p-value is statistically significant; analysis results using the Mann-Whitney test

Table 3 Comparison of The Incidence of Urinary Bladder Injury

Variable N	Total Hysterectomy n = 84			Wedge Resection n =32		p value
		n = 84		n =32		
		%	n	%		
The incidence rate of urinary bladder injury	No	71	84.50%	32	100.00%	0.018**
	Yes	13	15.50%	0	0.00%	

**p-value is statistically significant; analysis results using Fisher’s exact test

birth height or APGAR scores at 1, 5, and 10 minutes between the two groups. The analysis was conducted using the Mann–Whitney test due to the non-parametric distribution of the data.

Table 3 presents a comparison of the incidence of urinary bladder injury between patients who underwent total hysterectomy (n = 84) and those who underwent wedge resection (n = 32). In the total hysterectomy group, 13 patients (15.5%) experienced urinary bladder injury, whereas no cases of bladder injury were reported in the wedge resection group (0%). Statistical analysis using Fisher’s exact test revealed a significant difference between the two groups (p = 0.018). This indicates that the incidence of urinary bladder injury was significantly higher in the total hysterectomy group compared to the wedge resection group.

Discussion

This study examined the incidence of urinary bladder injury in PAS patients undergoing total hysterectomy or wedge resection, along with associated neonatal outcomes. This

study found a significant difference in birth weight between the two groups. Kasraeian *et al.* reported a mean gestational age of 34 weeks and a mean birth weight of 2,213 g in 198 patients with PAS managed with cesarean hysterectomy. A study by Toussia-Cohen *et al.* demonstrated higher rates of low Apgar scores, NICU admissions, and composite adverse neonatal outcomes in PAS pregnancies compared to controls. These findings suggest that pregnancies complicated by PAS and managed with cesarean hysterectomy are associated with preterm delivery and adverse neonatal outcomes.^{11,12}

Regardless of the type of surgical approach adopted, women undergoing surgery for PAS are at a higher risk of peri- and post-operative complications, especially those involving the urinary tract. Extensive neovascularization, fibrosis, and the lack of a clear separation between the anterior lower uterine wall and the posterior bladder, often exacerbated by abnormal pelvic anatomy, significantly increasing the risk of urologic complications in women with PAS.¹³ The incidence of lower urinary tract injuries

during hysterectomy ranges from 0.13 to 3.6% for bladder injuries and from 0.1 to 1.8% for ureteral injuries.¹⁴ In cases of PAS, the risk is notably higher. Giuseppe *et al.* reported the incidence of lower urinary tract injuries during cesarean section hysterectomy in PAS cases. Among 156 women with PAS who underwent cesarean section hysterectomy, the incidence of urinary bladder injury was 7.6%, including 8 cases of urinary bladder injury and 12 ureteral injuries.¹³ Similarly, Kasraeian *et al.* reported that among 198 pregnancies undergoing peripartum hysterectomy for PAS, bladder rupture was the most common postoperative complication, occurring in 31 cases (15%).¹¹ A systematic review and meta-analysis by D'Antonio *et al.* analyzed 62 studies and found that urologic complications occurred in approximately 15.3% of women undergoing surgery for PAS. Specifically, cystotomy was reported in 13.0% of cases, with higher rates observed in patients with placenta percreta (38.5%) compared to those with accreta or increta (9.4%).¹⁵

Previous studies have identified several risk factors for lower urinary tract injuries during hysterectomy, including advanced maternal age, elevated body mass index, prolonged operative time, increased blood loss, and enlarged uterine size.^{16,17} In a series of 76 cases of cesarean section hysterectomy for placenta accreta, Eller *et al.* found that the transfusion rate was 42.1% (≥ 4 packed red cell), the rate of cystotomy was 28.9%, the rate of ureteral injury was 6.6%, the rate of infectious complications was 33.3%, and the rate of all major morbidities was 59%.¹⁸ Several studies have also demonstrated that the risk of urinary bladder injury is highest in laparoscopic-assisted vaginal hysterectomy (LAVH) and total vaginal hysterectomy (TVH).^{16,19}

Conservative management for PAS is often associated with fewer complications, as it typically involves less extensive dissection. However, outcomes may still vary depending

on case complexity and the surgeon's level of expertise.²⁰ Conservative surgical management, including wedge resection, has a lower incidence of urinary bladder injury than more radical procedures such as total hysterectomy. The reported incidence of lower urinary tract injuries (bladder and ureter injuries) during conservative management ranges from 5% to 10%.^{7,21} In this study, there was no incidence of urinary bladder injury in the group of patients who underwent wedge resection. The statistics revealed a significant difference between the two groups ($p = 0.018$), indicating that the incidence of urinary bladder injury was significantly higher in the total hysterectomy group compared to the wedge resection group.

Conservative surgical approaches, such as wedge resection, may be recommended in select cases. In rare instances where PAS is localized or situated in the upper uterine segment, wedge resection may serve as a viable treatment option.²² Wedge resection with complete removal of the placenta and repair of the uterus (triple-P procedure) is recommended in focal central PAS.²³ In cases where the Triple-P procedure is performed and the placenta invades the posterior wall of the bladder, the affected placental tissue is intentionally left in place to avoid surgical injury to the bladder. Texidor Viñas *et al.* reported that the triple-P procedure has been associated with a lower rate of hysterectomy, PPH, and shorter hospital stays in patients with PAS. Additionally, no neonatal complications or urinary tract injuries have been reported in association with this procedure.²⁴ Furthermore, a study by Mahdavi *et al.* reported that among women who underwent hysterectomy for PAS, cystotomy occurred in 17 cases (20.2%), ureteral injury in 5 cases (6.0%), and bladder fistula in 1 case (1.2%). Notably, nearly half of these women developed postoperative symptoms such as urinary urgency and frequency, indicative

of overactive bladder, within 6 to 30 months after surgery.²⁵ These findings underscore the importance of multidisciplinary surgical planning and the consideration of conservative management approaches to minimize urologic complications in PAS cases.

Study Limitation

To the best of our knowledge, this study is the first to compare the incidence of urinary bladder injury in patients with PAS who underwent total hysterectomy and wedge resection. However, this study has several limitations. First, the study population may not be representative of the broader PAS population, as it is limited to patients from a single tertiary care center, which may limit the generalizability of the findings. Second, retrospective studies rely on existing medical records, which may be incomplete, inconsistent, or inaccurate. Thus, missing data and errors in documentation may affect the validity of findings. Third, without randomization, it is difficult to control confounding variables, which can result in biased results due to differences in patient characteristics or other factors. Several confounding variables may influence the findings in this study, including the severity of PAS, the experience and skills of the surgeon, history of previous abdominal surgery, comorbidities, gestational age at delivery, location and anatomy of the placenta, and intraoperative factors. Finally, findings from one health center may not be applicable to other centers with different patient demographics, practices, and healthcare resources. This limits the ability to generalize the results to a wider population.

Conclusion

This study suggests that total hysterectomy is associated with a higher risk of urinary

bladder injury. The complexity and invasiveness of removing the entire uterus consequently increase the risk of injury to surrounding organs. Given these findings, conservative surgical approaches such as wedge resection may be recommended in select cases, particularly when the placental invasion is focal and fertility preservation is desired.

Conflict of Interest

All authors declare no conflicts of interest. We certify that the submission is original work and is not under review at any other publication.

Acknowledgement

The authors would like to thank the research team in the Department of Obstetrics and Gynecology, Faculty of Medicine, Universitas Padjadjaran/Hasan Sadikin General Hospital, Bandung, and Prof. Dr. Margono Soekardjo Hospital for managing the study and data activities.

References

1. Piñas Carrillo A, Chandharan E. Placenta accreta spectrum: Risk factors, diagnosis and management with special reference to the Triple P procedure. *Women's Health (Lond). United States*; 2019;15:1745506519878081.
2. Shepherd AM, Mahdy H. *Placenta Accreta*. Central Michigan University: StatPearls Publishing, Treasure Island (FL); 2023.
3. Cnota W, Banas E, Dziechcinska-Poletek D, Janowska E, Jagielska A, Piela B, et al. "The Killer Placenta" - a threat to the lives of young women giving birth by cesarean section. *Ginekol Pol. Poland*; 2022;93(4):314–20.
4. Morlando M, Collins S. *Placenta Accreta*

- Spectrum Disorders: Challenges, Risks, and Management Strategies. *Int J Womens Health*. New Zealand; 2020;12:1033–45.
5. Yeni CM, Andayani H, Indirayani I, Razali R. The Association between Cesarean Section and Placenta Accreta. *Indonesian Journal of Obstetrics and Gynecology*. 2022 Jul;10(3).
 6. Mohammad Jafari R, Najafian M, Barati M, Saadati N, Jalili Z, Poolad A. Comparison of uterine preservation versus hysterectomy in women with placenta accreta: A cross-sectional study. *Int J Reprod Biomed*. Iran; 2022 Sep;20(9):739–44.
 7. Sentilhes L, Kayem G, Chandrharan E, Palacios-Jaraquemada J, Jauniaux E, Duncombe G, et al. FIGO consensus guidelines on placenta accreta spectrum disorders: Conservative management. *International Journal of Gynecology and Obstetrics*. John Wiley and Sons Ltd.; 2018 Mar 1;140(3):291–8.
 8. Palacios-Jaraquemada JM, Fiorillo A, Hamer J, Martínez M, Bruno C. Placenta accreta spectrum: a hysterectomy can be prevented in almost 80% of cases using a resective-reconstructive technique. *The Journal of Maternal-Fetal & Neonatal Medicine*. Taylor & Francis; 2022;35(2):275–82.
 9. Friedrich L, Mor N, Weissmann-Brenner A, Kassif E, Friedrich SN, Weissbach T, et al. Risk factors for bladder injury during placenta accreta spectrum surgery. *International Journal of Gynecology & Obstetrics*. Wiley Online Library; 2023;161(3):911–9.
 10. Hage L, Athiel Y, Barrois M, Cojocariu V, Peyromaure M, Goffinet F, et al. Identifying risk factors for urologic complications in placenta accreta spectrum surgical management. *World J Urol*. Springer Science and Business Media Deutschland GmbH; 2024 Dec 1;42(1):1–9.
 11. Kasraeian M, Hashemi A, Hessami K, Alamdarloo SM, Vahdani R, Vafaei H, et al. A 5-year experience on perinatal outcome of placenta accreta spectrum disorder managed by cesarean hysterectomy in southern Iranian women. *BMC Womens Health*. BioMed Central Ltd; 2021 Dec 1;21(1).
 12. Toussia-Cohen S, Castel E, Friedrich L, Mor N, Ohayon A, Levin G, et al. Neonatal outcomes in pregnancies complicated by placenta accreta- a matched cohort study. *Arch Gynecol Obstet*. Springer Science and Business Media Deutschland GmbH; 2024 Jul 1;310(1):269–75.
 13. Giuseppe C, Salvatore P, Federica C, Francesco L, Francesco DA, Alessandro L, et al. Urinary tract injuries during surgery for placenta accreta spectrum disorders. *European Journal of Obstetrics and Gynecology and Reproductive Biology*. 2023;287.
 14. Mamik MM, Antosh D, White DE, Myers EM, Abernethy M, Rahimi S, et al. Risk factors for lower urinary tract injury at the time of hysterectomy for benign reasons. *Int Urogynecol J Pelvic Floor Dysfunct*. 2014;25(8):1031–6.
 15. Rosario CB Del, Espino-Aquino M, Wang L, Xue J, Wu Q, Xuan Y, et al. EP16.07: Urologic complications placenta accreta spectrum disorders: a systematic review and meta-analysis. *Ultrasound in Obstetrics & Gynecology*. John Wiley & Sons, Ltd; 2023 Oct;62(S1):198–9.
 16. Ibeanu OA, Chesson RR, Echols KT, Nieves M, Busangu F, Nolan TE. Urinary tract injury during hysterectomy based on universal cystoscopy. *Obstetrics and Gynecology*. 2009;113(1).
 17. Vakili B, Chesson RR, Kyle BL, Shobeiri SA, Echols KT, Gist R, et al. The incidence of urinary tract injury during hysterectomy: A prospective analysis based on universal cystoscopy. *Am J Obstet Gynecol*. 2005;192(5 SPEC. ISS.).

18. Eller AG, Porter TT, Soisson P, Silver RM. Optimal management strategies for placenta accreta. *BJOG*. 2009;116(5).
19. Frankman EA, Wang L, Bunker CH, Lowder JL. Lower urinary tract injury in women in the United States, 1979-2006. *Am J Obstet Gynecol*. 2010;202(5).
20. Palacios-Jaraquemada JM. Diagnosis and management of placenta accreta. *Best Pract Res Clin Obstet Gynaecol*. 2008;22(6):1133–48.
21. Sentilhes L, Goffinet F, Kayem G. Management of placenta accreta. *Acta Obstet Gynecol Scand*. 2013;92(10):1125–34.
22. Touhami O, Allen L, Mendoza HF, Murphy MA, Hobson SR. Placenta accreta spectrum: a non-oncologic challenge for gynecologic oncologists. *International Journal of Gynecological Cancer*. 2022;32(6):788–98.
23. Hobson SR, Kingdom JC, Murji A, Windrim RC, Carvalho JCA, Singh SS, et al. No. 383-Screening, Diagnosis, and Management of Placenta Accreta Spectrum Disorders. *Journal of Obstetrics and Gynaecology Canada*. Elsevier Inc.; 2019;41(7):1035–49.
24. Teixidor Viñas M, Belli AM, Arulkumaran S, Chandraran E. Prevention of postpartum hemorrhage and hysterectomy in patients with morbidly adherent placenta: a cohort study comparing outcomes before and after introduction of the Triple-P procedure. *Ultrasound in Obstetrics & Gynecology*. John Wiley & Sons, Ltd; 2015 Sep 1;46(3):350–5.
25. Vatanchi A, Mottaghi M, PeivandiNajar E, Pourali L, Maleki A, Mehrad-Majd H. Overactive Bladder Syndrome Following Cesarean Hysterectomy for Placenta Accreta Spectrum, A Cohort Study. *Int Urogynecol J*. Springer Nature; 2025 Apr 10;1–8.