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ORIGINAL PAPER

Success rate of Double J stent insertion in patients with advanced cervical cancer and hydronephrosis at tertiary Hospital

Djodie Depati Singalaga, Besut Daryanto, Athaya Febriantyo Purnomo

Department of Urology, Faculty of Medicine Universitas Brawijaya, Dr. Saiful Anwar General Hospital, Malang, Indonesia.

Summary ***Introduction: Obstructive uropathy is a common complication in advanced cervical cancer, occurring because of ureteral compression by the tumour mass and often leading to hydronephrosis and impaired renal function. Double-J (DJ) stent insertion is frequently used as the first-line decompression method to restore ureteral patency; however, its technical success is influenced by anatomical distortion and severity of obstruction. Understanding the factors associated with successful stent placement is essential to guide appropriate urinary diversion strategies.***

Materials and methods: This retrospective cross-sectional study included 275 patients with confirmed advanced cervical cancer and hydronephrosis treated at Dr. Saiful Anwar General Hospital, Malang, from January 2019 to July 2025. Data collected included age, cervical cancer stage, hydronephrosis grade, DJ stent insertion status, histopathology findings, and survival status. Statistical analysis using the Kruskal-Wallis test and Spearman correlation assessed the association between clinical variables and DJ stent insertion.

Results: DJ stent insertion was successfully performed in 56.7% of patients. Hydronephrosis grade ($p = 0.027$) and cervical cancer stage ($p = 0.046$) were significantly associated with successful stent insertion in univariate analysis, whereas histopathological subtype was not ($p = 0.970$). Patients with higher-grade hydronephrosis had significantly lower odds of successful stent insertion. Correlation analysis showed no significant monotonic relationship between hydronephrosis severity and cancer stage ($\rho = -0.041$, $p = 0.503$). In multivariate logistic regression analysis, severe hydronephrosis emerged as an independent predictor of DJ stent insertion failure (OR 0.30, 95% CI 0.11-0.83, $p = 0.021$), while cervical cancer stage and histopathological subtype were not significant after adjustment.

Conclusion: Hydronephrosis severity and cervical cancer stage influence the success of DJ stent insertion in advanced cervical cancer; however, hydronephrosis severity appears to be a more direct determinant of stenting feasibility than cancer stage alone, whereas histopathological subtype shows no significant association.

KEY WORDS: Advanced cervical cancer; DJ stent insertion; Hydronephrosis; Success rate.

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INTRODUCTION

Cervical carcinoma is a malignant neoplasm originating from the cervical epithelium, characterized by uncontrolled proliferation of abnormal cells and the ability to invade surrounding tissues (1). The early phase of cervical cancer is often asymptomatic, resulting in many patients being diagnosed only at an advanced stage. The five-year survival rate reaches 93% in stage IA but drops dramatically to 15% in stage IV (*Kemenkes, 2016*). Disease progression begins with precancerous lesions such as *Cervical Intraepithelial Neoplasia* (CIN) and may advance to late-stage disease with metastasis, typically encompassing stages IIIB to IVA (2).

Advanced cervical cancer is frequently accompanied by severe complications, including massive bleeding, thrombosis, and renal failure (*Mukesh et al.*, 2010*; Tsai et al.*, 2011; *Eleje et al.*, 2015). Urinary tract obstruction due to tumor compression has been reported in 11-44% of cases (3). Obstructive uropathy may result in hydronephrosis and significant renal impairment, both of which are associated with poor prognosis. Subsequent complications such as sepsis and uremia can further worsen the patient's condition and increase mortality risk (4). Patients with hydronephrosis are known to have lower survival rates than those without hydronephrosis (5).

A study by *Dhani et al.* (2023) reported that most patients with advanced-stage cervical cancer present with moderate to severe hydronephrosis, predominantly bilateral. The study also showed that urinary diversion procedures, including ureteral stenting or *percutaneous nephrostomy* (PCN), result in comparable median survival (11 months vs. 15 months), with no significant difference. Factors such as age > 60 years, stage IVA-IVB disease, type 2 diabetes mellitus, and bilateral hydronephrosis were associated with reduced survival.

These findings are consistent with those of *Daryanto et al.* (2024), who demonstrated that cervical cancer patients with obstructive uropathy who underwent decompressive procedures – such as DJ stent insertion, PCN, or ureterocutaneostomy – had better survival outcomes compared with those who did not undergo such interventions. Restoration of renal function through these procedures also plays a crucial role in enabling optimal delivery of systemic therapy.

Despite the high prevalence of obstructive uropathy in advanced cervical cancer, clinical data from Indonesia remain limited regarding factors that determine the success or failure of DJ stent insertion, particularly in resource-limited settings where DJ stenting is commonly used as the first-line decompression method. The aim of the study was to assess if severity of hydronephrosis was a predictor of DJ stent insertion failure.

Methods

Ethical considerations

This retrospective study was approved by *The Ethics Commission of General Hospital Dr. Saiful Anwar* (No. 400/350/K.3/102.7/2025) given the non-interventional design and the use of existing medical records. All data were extracted and analysed in a de-identified form to protect patient privacy.

Study design

This study employed a retrospective descriptive and analytic cross-sectional design to evaluate the success rate of DJ stent insertion among patients with advanced cervical cancer complicated by hydronephrosis. The research was conducted at Dr. Saiful Anwar General Hospital, Malang, by reviewing medical records of eligible patients treated between January 2019 and July 2025. All data were collected using a standardized extraction framework to ensure consistency and accuracy in evaluating clinical characteristics, procedural outcomes, and post-intervention findings.

Participants

Participants consisted of patients with a confirmed diagnosis of cervical cancer who presented with hydronephrosis as documented by ultrasonography or computed tomography. Patients were eligible for inclusion if they had undergone an attempted retrograde DJ stent insertion and had complete medical records available for review. Patients who refused DJ stent insertion or did not undergo an attempted DJ stent procedure were excluded from the primary feasibility analysis. Patients were excluded if their medical records were incomplete or if they underwent immediate percutaneous nephrostomy without an attempt at DJ stent placement. Sample selection followed a retrospective consecutive sampling approach, in which all patients meeting the inclusion criteria and having complete inpatient and outpatient documentation were evaluated.

Procedures

Patients who underwent DJ stent insertion received the standard institutional protocol for ureteral stenting, which included cystoscopic access to the ureteral orifice followed by insertion of a double-J ureteral stent to relieve upper urinary tract obstruction. The procedure was performed by the urology team in an operating theatre using standard aseptic and endoscopic techniques.

Outcome measures

The primary outcome evaluated in this study was the technical success rate of DJ stent insertion, defined as the ability to achieve successful retrograde placement of the stent with documented restoration of ureteral patency based on intraoperative findings or follow-up imaging.

Statistical analysis

Descriptive statistics were used to summarize baseline patient characteristics, including age distribution, hydronephrosis grade, cervical cancer stage, histopathological subtype, and DJ stent insertion outcome. Continuous data were presented as mean ± standard deviation, while categorical data were presented as frequencies and percentages. Because cervical cancer stage and hydronephrosis grade were ordinal variables, comparisons between successful and failed DJ stent insertion groups were performed using the Kruskal-Wallis test. Correlations between hydronephrosis grade and cervical cancer stage were assessed using Spearman's rho and Kendall's tau-b correlation analyses. Multivariate logistic regression analysis was performed to identify independent predictors of successful DJ stent insertion. Variables included in the model were age, cervical cancer stage, hydronephrosis grade, and histopathological subtype. *Odds ratios* (ORs) with 95% *confidence intervals* (CIs) were reported. A p-value < 0.05 was considered statistically significant. All statistical analyses were conducted using SPSS version 26.

Results

Patient characteristics

A total of 275 patients meeting the eligibility criteria were included in the analysis. The characteristics of the study participants are presented in Table 1.

Table 1.
Characteristics of study subjects.

Subject Characteristics	Frequency (N)	Percentage (%)
Age (Mean ± SD)	50.88 ± 9.54	
≤ 30	4	1.5
31-40	35	12.7
41-50	87	31.6
51-60	105	38.2
61-70	40	14.5
> 70	4	1.5
Histopathological Findings		
Squamous Cell Carcinoma	228	82.9
Adenocarcinoma	43	15.6
Small Cell Carcinoma	4	1.5
Cancer Stage		
IIIB	175	63.6
IVA	83	30.2
IVB	17	6.2
Hydronephrosis Grade		
Mild	30	10.9
Moderate	186	67.6
Severe	59	21.5
Procedure		
DJ stent insertion	156	56.7
No DJ stent insertion	119	43.3

Table 2.
Distribution of DJ stent insertion across cervical cancer stages.

Cervical Cancer Stage	DJ stent insertion (n)	Percentages (%)
AIIIB	92	59
IVA	52	33.3
IVB	12	7.7

The mean age of the subjects was 50.88 ± 9.54 years, with the majority falling within the 51-60-year age group (38.2%), followed by 41-50 years (31.6%) and 61-70 years (14.5%). Only a small proportion of patients were younger than 30 years or older than 70 years (each 1.5%). Regarding histopathological findings, squamous cell carcinoma constituted the predominant tumor type, accounting for 82.9% of cases, while adenocarcinoma was found in 15.6% of patients and small cell carcinoma in 1.5%.

In terms of cancer staging, most patients presented at FIGO stage IIIB (63.6%), followed by stage IVA (30.2%) and stage IVB (6.2%), indicating that the majority of cases were already at an advanced stage at the time of diagnosis.

Hydronephrosis severity was also documented, with moderate hydronephrosis being the most common finding (67.6%), followed by severe (21.5%) and mild (10.9%).

Regarding clinical management, 56.7% of patients underwent DJ stent insertion.

Association between DJ Stent insertion and cervical cancer stage

The comparison of cervical cancer stage between patients who underwent DJ stent insertion and those who did not is presented in Table 3.

The mean rank for cancer stage was slightly higher in the DJ stent group (144.77) compared with the non-stented group (129.13). Although the difference in mean ranks appeared modest, the Kruskal-Wallis test demonstrated a statistically significant difference between the two groups (H = 3.655, p = 0.046).

These results indicate that cervical cancer stage differs between patients who received DJ stent placement and those who did not, with the stented group tending to present with more advanced disease.

Table 3.
Comparison of cervical cancer stage between the procedures.

	Mean Rank		P value
	Stent Group	Non-Stent Group	
Ca Cervix Stage	144.77	129.13	0.046

Table 4.
Distribution of DJ stent insertion across hydronephrosis grade.

Hydronephrosis Grade	DJ stent insertion (n)	Percentages (%)
Mild	23	14.7
Moderate	104	66.7
Severe	29	18.6

Association between DJ Stent insertion and hydronephrosis grade

A significant difference in hydronephrosis severity was observed between the stented and non-stented groups as seen in Table 5. Patients who did not undergo DJ stent insertion demonstrated higher mean ranks of hydronephrosis grade (148.03) compared with patients who received DJ stents (130.35). The Kruskal-Wallis test confirmed this difference to be statistically significant (H = 4.910, p = 0.027). This indicates that more severe hydronephrosis was more prevalent among patients who did not receive DJ stent placement.

Table 5.
Comparison of hydronephrosis grade between the procedures.

	Mean Rank		P value
	Stent Group	Non-Stent Group	
Hydronephrosis Grade	130.35	148.03	0.027

Table 6.
Distribution of DJ stent insertion across histopathological findings.

Histopathological Findings	DJ stent insertion (n)	Percentages (%)
Squamous Cell Carcinoma	129	82.7
Adenocarcinoma	26	16.7
Small Cell Carcinoma	1	0.6

Association between DJ Stent insertion and histopathological findings

Histopathological findings, including squamous cell carcinoma, adenocarcinoma, and small cell carcinoma, were also compared between groups as presented in Table 7. The mean ranks for pathology results were similar between the DJ stent group (138.10) and the non-stented group (137.87). The Kruskal-Wallis test showed no significant difference between the two groups (H = 0.001, p = 0.970). Thus, histopathological tumour type was not associated with whether or not DJ stent insertion was performed.

Table 7.
Comparison of histopathological findings between the procedures.

	Mean Rank		P value
	Stent Group	Non-Stent Group	
Histopathological findings	138.10	137.87	0.970

Hydronephrosis grade across cervical cancer stages

Further analysis using the Kruskal-Wallis test was conducted to evaluate whether hydronephrosis severity differed across cervical cancer stages (IIIB, IVA, and IVB). The test revealed a statistically significant difference (H = 14.293, df = 2, p = 0.001), indicating that hydronephrosis grade varied among the three cancer stage groups. This finding suggests that the distribution of hydronephrosis

severity across cancer stages was not uniform, with certain stages demonstrating disproportionately higher severity.

Correlation between hydronephrosis grade and cervical cancer stage

To examine whether a linear or monotonic relationship existed between hydronephrosis severity and cervical cancer stage, a non-parametric correlation analysis was performed using Spearman's rho and Kendall's tau-b. Spearman's correlation showed no significant monotonic association (ρ = -0.041, p = 0.503), and Kendall's tau-b yielded a similarly non-significant result (τ = -0.041, p = 0.472).

These findings indicate that although hydronephrosis severity differed across stage categories, the relationship did not follow a linear increasing or decreasing pattern.

Multivariate logistic regression analysis of DJ Stent insertion success

A multivariate logistic regression analysis was performed to identify independent factors associated with DJ stent insertion success. Age, cervical cancer stage, hydronephrosis grade, and histopathological subtype were included as covariates in the model. The overall model was statistically significant (Omnibus test χ^2 = 15.925, p = 0.026) and demonstrated good calibration based on the Hosmer-Lemeshow test (p = 0.857). Hydronephrosis grade remained an independent predictor of DJ stent insertion outcome. Patients with higher-grade hydronephrosis had significantly lower odds of successful stent insertion (OR 0.30, 95% CI 0.11-0.83, p = 0.021). Increasing age was also independently associated with reduced odds of stent success (OR 0.97 per year, 95% CI 0.95-0.99, p = 0.042).

In contrast, cervical cancer stage (p = 0.275) and histopathological subtype (p = 0.319) were not significantly associated with DJ stent insertion success after multivariate adjustment.

Discussion

This study investigated the association between success of DJ stent insertion and several clinical characteristics – namely cervical cancer stage, hydronephrosis grade, and histopathological findings – in patients with advanced cervical cancer complicated by obstructive uropathy.

Overall, the findings demonstrate that hydronephrosis severity shows the strongest association with whether DJ stent placement was successfully performed. In addition, cervical cancer stage was also significantly associated with stent insertion feasibility, whereas pathology subtype did not show a meaningful relationship with stenting outcomes.

The significant association between cervical cancer stage and DJ stent insertion suggests that more advanced tumor stages may influence the technical difficulty of accessing the ureteric orifice during stent placement. Although tumor stage does not always translate linearly into the degree of mechanical obstruction, higher stages typically indicate greater parametrial invasion and lateral spread, which can distort pelvic anatomy and hinder endoscopic access (6, 7). This finding aligns with established knowledge according to which hydronephrosis is integrated into the FIGO staging system starting at stage IIIB because it reflects lateral extension to the pelvic wall (2). Prior studies similarly noted that although not all stage IIIB-IVA tumors produce the same degree of obstruction, increasing stage generally correlates with greater anatomical distortion and a higher likelihood of stenting difficulty (3, 6).

Hydronephrosis grade demonstrated a significant association with DJ stent insertion (p = 0.027). Patients who did not undergo DJ stent placement had higher mean hydronephrosis ranks, indicating more severe obstruction. This is expected, as pronounced hydronephrosis reflects longstanding or severe ureteric compression, often accompanied by marked distortion of the trigone or obliteration of the ureteric orifice – both known predictors of difficult stent placement (8).

Similar findings were reported by *Daryanto et al.* (2024), who noted that patients with severe bilateral hydronephrosis frequently required percutaneous nephrostomy due to failed retrograde stenting (7). Furthermore, other studies have shown that technical failure of DJ stent insertion is common in malignancy-associated obstruction, occurring in up to 30-40% of patients, especially when the tumor burden is extensive (9, 10). The present study reinforces this evidence by demonstrating that the success of retrograde stenting is strongly influenced by the severity of hydronephrosis.

In contrast, histopathological subtype did not show any significant association with stent insertion (p = 0.970). The majority of patients in this study had squamous cell carcinoma – the most common subtype of cervical cancer – while adenocarcinoma and small cell carcinoma constituted smaller proportions.

Since ureteric obstruction in cervical cancer is primarily a mechanical consequence of tumor spread rather than a function of tumor cell type, the absence of association is consistent with biological expectations. Previous pathological studies similarly indicate that histological subtype does not influence patterns of ureteric involvement (1, 11).

From a clinical standpoint, these findings underscore the importance of considering both hydronephrosis severity and cancer stage when determining the optimal urinary diversion approach. While DJ stent insertion remains the preferred initial method due to its minimally invasive nature, lower cost, and shorter hospitalization (9), patients with very advanced disease or severe hydronephrosis may be better managed with early percutaneous nephrostomy, which offers a higher success rate of decompression (4). This consideration is essential because restoring renal function is crucial to enable definitive oncologic therapy such as chemoradiation (5) and is associated with improved survival outcomes (7).

The lack of a significant correlation between hydronephrosis grade and cervical cancer stage in this study suggests that disease stage does not uniformly reflect the severity of ureteral obstruction. Although advanced stages are generally associated with higher obstruction rates, previous studies have reported considerable variability in hydronephrosis severity within the same FIGO stage (5, 6). This variability may be explained by unilateral or partial ureteral involvement, asymmetric parametrial invasion, and differences in obstruction chronicity, particularly

among stage IIIB patients (8, 10). Consequently, hydronephrosis grade appears to represent a more direct measure of functional obstruction than cancer stage alone.

This study also supports the concept that de-obstruction – whether through DJ stenting or percutaneous nephrostomy – plays a significant role in improving clinical outcomes, consistent with prior observations that urinary diversion may improve survival and facilitate systemic therapy (6, 12). However, since the present study specifically examined factors associated with the technical success of DJ stent insertion rather than post-diversion outcomes, further research evaluating renal recovery and patient-centered outcomes in both stented and non-stented groups is warranted.

Notably, when all clinical variables were analyzed simultaneously using multivariate logistic regression, hydronephrosis severity emerged as the only independent predictor of DJ stent insertion failure, while cervical cancer stage lost its statistical significance after adjustment. This finding suggests that although cancer stage may reflect overall disease extent, it does not independently determine the mechanical severity of ureteral obstruction or the technical feasibility of retrograde stenting. Advanced-stage cervical cancer encompasses a heterogeneous spectrum of pelvic involvement; in particular, many patients with stage IIIB disease may present with unilateral or partial ureteral compression, resulting in mild-to-moderate hydronephrosis rather than severe bilateral obstruction (13). Consequently, hydronephrosis grade serves as a more direct surrogate of functional obstruction and procedural difficulty than FIGO stage alone, explaining its dominant role in predicting stent failure in multivariate analysis (5, 8, 10).

Taken together, the results highlight that hydronephrosis grade is the most relevant predictor of DJ stent insertion feasibility, whereas cervical cancer stage and histopathology subtype do not independently determine likelihood of successful stenting. The integration of previous evidence on hydronephrosis patterns and anatomical causes of obstruction further strengthens the clinical relevance of these findings, particularly when determining which patients may benefit from DJ stent attempts versus those who require alternative diversion strategies.

Conclusions

This study demonstrates that hydronephrosis severity is the primary independent predictor of DJ stent insertion success in patients with advanced cervical cancer and obstructive uropathy, while increasing age is also associated with reduced stenting success. In contrast, cervical cancer stage and histopathological subtype were not independently associated with stent insertion outcomes after multivariate adjustment. These findings highlight the importance of incorporating hydronephrosis grade into clinical decision-making, particularly in resource-limited settings where DJ stenting is used as the first-line approach. Patients with severe hydronephrosis may benefit from early percutaneous nephrostomy to achieve timely decompression and improve cost and time efficiency.

Declarations

Ethical approval and consent for participate: *The author has ethical clearance No. 400/350/K.3/102.7/2025 from Health Research Ethics Committee, Saiful Anwar General Hospital, Malang, Indonesia.*

Consent for publication: *Not applicable.*

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Correspondence
Djodie Depati Singalaga
dr.djodie@yahoo.com
Department of Urology, Faculty of Medicine Universitas Brawijaya,
Dr. Saiful Anwar General Hospital, Malang, Indonesia

Besut Daryanto (Corresponding Author)
urobes.fk@ub.ac.id
Department of Urology, Dr. Saiful Anwar General Hospital Malang,
Jalan Jaksa Agung Suprapto 2, Klojen, Malang, East Java 65112, Indonesia

Athaya Febriantyo Purnomo
athayafp@ub.ac.id
Department of Urology, Faculty of Medicine Universitas Brawijaya, Dr.
Saiful Anwar General Hospital, Malang, Indonesia