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Original Research Article

Impact of Pre-Stenting on Ureteral Wall Stress and Surgical Difficulty During Ureteroscopy: A Quantitative Assessment

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Conflict of interest: Nil

Abstract:

Background: Pre-stenting before to ureteroscopy (URS) is routinely conducted to enhance ureteral access and minimize intraoperative problems. Nonetheless, its quantitative effect on ureteral wall stress and surgical complexity remains insufficiently examined.

Objective: To evaluate the impact of pre-stenting on ureteral wall stress measures and intraoperative surgical complexity during ureteroscopy.

Methods: This retrospective comparative study comprised 36 individuals who had ureteroscopy for ureteral calculi. Patients were categorized into two groups: Group A (pre-stented, n=18) and Group B (non-stented, n=18). Ureteral wall stress was indirectly evaluated by assessing the resistance to ureteral access sheath (UAS) insertion and the necessity for active ureteral dilatation. Surgical complexity was assessed using operating duration, a surgeon-reported difficulty score (visual analog scale 1–10), and intraoperative complications.

Results: Pre-stented patients demonstrated significantly lower UAS insertion resistance (mean score 2.0 ± 0.6 vs 5.6 ± 1.3, $p<0.001$) and decreased need for ureteral dilation (11% vs 61%, $p=0.004$). Operative time was shorter in the pre-stented group (40 ± 10 min vs 59 ± 12 min, $p=0.002$), and surgical difficulty scores were significantly lower (3.0 ± 1.3 vs 6.1 ± 1.5, $p<0.001$).

Conclusion: Pre-stenting markedly lowers ureteral wall stress and intraoperative surgical complexity during ureteroscopy. Routine pre-stenting in specific patients may enhance procedure safety and efficiency.

Keywords: Pre-stenting, Ureteroscopy, Ureteral wall stress, Surgical difficulty, Ureteral calculi.

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Introduction

Ureteroscopy (URS) has emerged as the recommended technique for the therapy of ureteral stones. Ureteral access may occasionally provide technical difficulties owing to constricted ureters, edema, or inflammation, which might elevate ureteral wall stress and the risk of injury [1].

Pre-stenting is thought to passively widen the ureter, diminish ureteral resistance, and ease the insertion of the access sheath. Despite clinical application, quantitative evidence assessing its effect on ureteral wall stress and procedural complexity is scarce [2].

Comprehending these impacts is crucial for enhancing surgical planning, minimizing complications, and improving patient outcomes. This study seeks to statistically evaluate the influence of pre-stenting on ureteral wall stress and the complexity of surgery during ureteroscopy [3].

Materials and Methods

Study Design: Retrospective comparative study.

Study Setting: Career institute of medical sciences, UP, India.

Study Duration: One year.

Sample Size

36 patients undergoing ureteroscopy:

- Group A: Pre-stented patients (n=18)
- Group B: Non-stented patients (n=18)

Inclusion Criteria

- Patients aged 18–65 years
- Single ureteral stone (5–15 mm)
- Elective ureteroscopy

Exclusion Criteria

- Prior ureteral surgery
- Congenital ureteral anomalies
- Active urinary tract infection
- Bilateral procedures

Parameters Assessed

Ureteral Wall Stress Indicators:

- UAS insertion resistance score (1–10 scale)
- Need for active ureteral dilation (%)

Surgical Difficulty Indicators:

- Operative time (minutes)
- Surgeon-reported difficulty score (VAS 1–10)
- Intraoperative complications (ureteral injury, mucosal tear)

Statistical Analysis

- Continuous variables expressed as mean ± SD
- Categorical variables expressed as frequency and percentage
- Independent t-test used for continuous variables
- Chi-square test used for categorical variables
- p-value <0.05 considered statistically significant

Results

Table 1: Baseline Characteristics

Variable	Pre-Stented (n=18)	Non-Stented (n=18)	p-value
Mean age (years)	44 ± 11	48 ± 9	0.58
Male (%)	61%	56%	0.74
Mean stone size (mm)	9.4 ± 2.1	9.8 ± 2.3	0.65

No significant baseline differences were observed.

Table 2: Ureteral Wall Stress Parameters

Parameter	Pre-Stented	Non-Stented	p-value
UAS insertion resistance (1–10)	2.0 ± 0.6	5.6 ± 1.3	<0.001*
Need for dilation (%)	11%	61%	0.004*

*Statistically significant

Table 3: Surgical Difficulty Indicators

Parameter	Pre-Stented	Non-Stented	p-value
Operative time (min)	40 ± 10	59 ± 12	0.002*
Difficulty score (VAS)	3.0 ± 1.3	6.1 ± 1.5	<0.001*
Intraoperative complications (%)	6%	28%	0.08

Discussion

This research illustrates that pre-stenting markedly lowers ureteral wall stress and surgical complexity during ureteroscopy. Patients with pre-stenting had significantly less resistance during access sheath insertion, indicating enhanced ureteral compliance and reduced mechanical stress [4]. Passive dilation resulting from stenting presumably accounts for these observations. The decrease in operating duration and diminished difficulty ratings further substantiate the procedural benefits of pre-stenting [5]. Despite decreased complication rates in the pre-stented group, the difference lacked statistical significance, potentially because to the limited sample size [6].

These findings correspond with prior literature suggesting that pre-stenting enhances ureteroscopic access and diminishes the necessity for active dilatation.

Limitations

- Small sample size
- Retrospective design
- Single-centre study
- Indirect measurement of ureteral wall stress

Future randomized trials utilizing biomechanical assessment methods would enhance the data base.

Conclusion

Pre-stenting markedly lowers ureteral wall stress and intraoperative surgical complexity during ureteroscopy. It enhances ureteral access, reduces operational duration, and diminishes resistance to access sheath insertion. Routine pre-stenting may be advantageous in specific patients to improve procedural safety and efficiency.

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