

# Evaluation of Single-dose Aminoglycoside Therapy for Treatment of Urinary Tract Infections

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**H**istorically, aminoglycoside antibiotics were not preferred for the treatment of urinary tract infections (UTIs) due to their toxicities associated with prolonged use.<sup>1</sup> However, due to poor patient adherence and increasing prevalence of multidrug-resistant organisms (MDRO), interest regarding use of aminoglycosides in this setting is increasing.<sup>2</sup> Specifically, single-dose aminoglycosides may be advantageous for a variety of reasons, including improved patient compliance and reduced length of stay or the need for hospital admission due to a lack of oral antibiotic options.

The 2024 Infectious Diseases Society of America (IDSA) guidance on antimicrobial resistant (AMR) gram-negative infections state that single-dose IV aminoglycosides are an appropriate alternative treatment strategy for uncomplicated cystitis caused by extended-spectrum  $\beta$ -lactamase-producing *Enterobacteriales* (ESBL-E), AmpC  $\beta$ -lactamase-producing *Enterobacteriales* (AmpC-E), carbapenem-resistant *Enterobacteriales* (CRE), and *Pseudomonas aeruginosa* with difficult-to-treat resistance (DTR-P. *aeruginosa*) (tobramycin and amikacin only), however they note that robust clinical data are lacking.<sup>3</sup> The IDSA recommendations stem from a systematic review by Goodlet et al., in which researchers sought to investigate the efficacy of single-dose aminoglycoside antibiotics for the treatment of UTI. Of the 13,804 patients across 13 studies, 94.5%  $\pm$  4.3% achieved microbial cure, and 73.4%  $\pm$  9.6%

## Abstract

**Purpose:** Patients with cystitis due to multidrug-resistant organisms often have few outpatient treatment options. The Infectious Diseases Society of America 2024 Guidance on the Treatment of Antimicrobial Resistant Gram-Negative Infections recommends single-dose aminoglycoside treatment as an alternative for cystitis caused by multidrug-resistant organisms, however robust evidence is lacking. This treatment strategy is used at a Veterans Affairs Medical Center (VAMC), and thus, the purpose of this project is to describe our experience.

**Methods:** This retrospective descriptive cohort included patients at this VAMC who were treated with a single-dose of aminoglycoside for urinary tract infection between April 2019 and April 2024. The primary outcome assessed was successful treatment, defined as no urinary tract infection recurrence within 90 days of single-dose aminoglycoside treatment. Secondary outcomes included microbial cure and adverse effects.

**Results:** Nine patients met the inclusion criteria over the studied period. Five patients received gentamicin, 4 received amikacin, and 0 patients received tobramycin. All patients were treated for uncomplicated urinary tract infection, except one, who was treated for pyelonephritis. Treatment was successful in 6 of the 9 patients. Microbial cure occurred in 1 of the 4 patients in whom it could be assessed. No adverse effects were reported in the electronic health record.

**Conclusions:** Treatment of cystitis with single-dose aminoglycoside therapy is a reasonable treatment consideration for those without other outpatient treatment options. More robust clinical data is needed to further assess the efficacy and safety of this treatment.

had no recurrence at 30 days. Regarding safety, only 0.5% of cases reported an adverse reaction such as nephrotoxicity, vestibular toxicity, and injection site

reactions. The results of this study support the use of single-dose aminoglycosides as both a safe and effective choice for patients with UTIs. Of the thirteen studies included

in this review, 3 used gentamicin and 4 used amikacin. The rest were either netilmicin or kanamycin.<sup>4</sup>

At this Veterans Affairs Medical Center (VAMC), aminoglycosides are currently restricted, with orders requiring a recommendation from the infectious diseases service or a prior authorization drug request submitted for review by an infectious diseases pharmacist. The findings of this medication use evaluation will provide insight into the utility of aminoglycosides for UTIs and further justify their use.

## Objectives

The purpose of this project is to characterize patients who received single-dose aminoglycosides for treatment of cystitis at a VAMC by evaluating treatment success and adverse effects.

## Methods

This project was determined to be quality improvement project and was exempt from institutional review board review. A report was generated of all patients who received a one-time dose of an aminoglycoside antibiotic (i.e., gentamicin, tobramycin, or amikacin) for a urinary tract infection in an inpatient unit, the emergency department, or the ambulatory infusion clinic at this VAMC between April 2019 and April 2024. Retrospective chart reviews were conducted to collect patient demographic information, admission/visit diagnoses, microbial culture results, antibiotics administered, and reported adverse effects. The primary outcome assessed was successful treatment, defined as no urinary tract infection recurrence within 90 days of single-dose aminoglycoside treatment. Secondary outcomes included microbial cure and adverse effects. Microbial cure was defined as a subsequent urine culture obtained within 90 days of the initial culture showing no isolated organism, or, if an organism was present, it was not the same organism as on the initial culture. Thirty- and 90-day recurrence of cystitis (documentation of symptoms consistent with cystitis) was also assessed. Patients were eligible for inclusion if they received an antibiotic prior to single-dose aminoglycoside, but were excluded if they continued antibiotic treatment with an additional agent after single-dose

aminoglycoside treatment for the same genitourinary organism. Descriptive statistics were performed using Microsoft Excel.

## Results

A total of nine patients received a single-dose aminoglycoside for the treatment of urinary tract infection within the specified time frame. The average patient age was 72 years, with a range of 60 to 77 years. Most patients were white (89%), male (89%), and not Hispanic or Latinx (100%). Additional patient information is detailed in Table 1. The most common comorbidity was a history of recurrent UTIs, followed by chronic catheter use and neurogenic bladder. Approximately half of the patients had a reported antibiotic allergy to sulfamethoxazole/trimethoprim. The degree of kidney function varied; most had normal kidney function, but two patients had chronic kidney disease, with one in end-stage renal disease on dialysis. The single-dose aminoglycosides were prescribed in a variety of settings, including inpatient, emergency department, ambulatory care

clinics, and long-term care facilities. An infectious diseases pharmacist or physician recommended all but one treatment regimen.

Of the nine patients, five received gentamicin, four received amikacin, and no patients received tobramycin. All patients were treated for urinary tract infection except for one, who was treated for pyelonephritis. Treatment results are detailed in Table 2. For the primary outcome of treatment success, defined as no UTI recurrence within 90 days of single-dose aminoglycoside treatment, six of nine patients achieved it. Secondary outcomes included microbial cure and adverse effects. Microbial cure could not be assessed in five patients. Of the four patients in whom microbial cure could be assessed, one achieved it, while the other three did not. Two patients received susceptible antibiotics prior to single-dose aminoglycoside treatment; Patients 2 (P2) and 9 (P9) received 3 and 1 days of antibiotics, respectively. No adverse effects were documented in any of the patients' electronic health records.

**TABLE 1. Baseline Characteristics**

Patient	ABW (kg)	AdjBW (kg)	Antibiotic Allergies	Pertinent Past Medical History	CrCl (ml/min)
P1	77	76	None	Type 2 Diabetes, Prostate cancer, recurrent UTIs, kidney stones	60
P2	68	57	None	Lewy body dementia, recurrent UTIs	81
P3	91	83	Sulfamethoxazole/trimethoprim (GI) Vancomycin	Multiple Sclerosis, Neurogenic bladder, BPH, Chronic indwelling catheter	84
P4	92	86	Sulfamethoxazole/trimethoprim (SJS)	Suprapubic catheter, Blindness, Chronic retention of urine	67
P5	76	74	Sulfa drugs (rash) Minocycline (GI) Ciprofloxacin (GI)	Neurogenic bladder, End stage renal disease, Type 2 diabetes	Dialysis
P6	135	109	None	Kidney stones, Recurrent UTIs	100
P7	96	79	Sulfa drugs (muscle pain/weakness)	BPH, neurogenic bladder, neurocognitive disorder, MDRO P. aeruginosa infection, Recurrent UTIs	102
P8	94	80	None	Recurrent UTIs, Chronic catheter	69
P9	167	120	None	CKD, Left nephrectomy	48

Abbreviations: ABW, actual body weight; AdjBW, adjusted body weight; BPH, benign prostatic hypertrophy; CKD, chronic kidney disease; CrCl, creatine clearance; GI, gastrointestinal; SJS, Stevens-Johnson syndrome.

## Discussion

This medication use evaluation revealed that single-dose aminoglycosides may be a useful strategy in patients with UTIs caused by multidrug-resistant organisms. Of the patients who had unsuccessful treatment, patient 4 (P4) was treated for pyelonephritis with amikacin, which is not supported by current guidelines. Additionally, the susceptibility of the bacterial organism, ESBL *K. pneumoniae*, demonstrated resistance to both gentamicin and tobramycin. Patients 6 (P6) and 7 (P7) demonstrated susceptibility to gentamicin and tobramycin; however, due to a history of recurrent UTIs, these patients were inherently at a higher risk of recurrence regardless of the antibiotic used. Several patients avoided hospital admission or were discharged from the inpatient unit sooner due to the convenience of a single-dose antibiotic. This benefited patients by reducing length of stay and the risk of nosocomial infection, while also reducing costs to the healthcare system.

### Cure Rates

Cure rates of urinary tract infections due to CRE or ESBL-producing organisms are not precisely quantified in guidelines, but observational data for ESBL-producing

Enterobacterales suggest clinical cure rates of approximately 83%, microbial cure rates around 64%, and recurrence rates of 15% overall. The systematic review by Goodlet et al. found high microbiologic cure rates and low recurrence rates within the 30-day timeframe.<sup>3</sup> Our evaluation was able to assess treatment success by noting recurrence of patient symptoms, which the Goodlet et al. paper could not. A recent retrospective cohort study by Bouwman et al. evaluated the rate of relapse for patients with an ESBL-E or *P. aeruginosa* UTI who received a single-dose aminoglycoside compared to those who received 3 or more days of standard of care (SOC) antibiotics. The authors found no difference in relapse rate between a single dose of an aminoglycoside and the standard of care (1/33, 3.03% vs. 3/33, 9.09%; 95% CI 0.03–3.04;  $p = 0.6$ ). The SOC group received antibiotics for a mean duration of  $6.91 \pm 2.35$  days. Of importance, 45% of patients in the aminoglycoside group received effective antibiotics for a mean duration of  $3.2 \pm 1.4$  days prior to receiving the single-dose aminoglycoside. Additionally, there were significant differences in baseline characteristics between groups. Differences included more patients requiring a higher level of

care and more patients with complicated UTI (defined as male, urinary catheter, obstruction, renal tract calculi, colovesical fistula, or uncontrolled diabetes) in the SOC group. No difference in adverse effect rates was found, and microbiologic cure was not assessed.<sup>6</sup> We were unable to establish microbiologic cure for most patients in our evaluation due to lack of follow-up culture; however, this is consistent with current practice, as follow-up cultures as a test of cure are not routinely recommended. While these findings provide insight into the use of single-dose aminoglycosides for UTI, the small sample size and predominance of male patients, with only one female included, limit the generalizability of our conclusions and indicate a need for future studies with larger, more diverse populations to validate these findings. It should also be noted that patients that did not report recurrent symptoms to the ZVAMC either via phone call or visit were determined to be treatment successes, thus the success could have been overstated if the patient did in fact have persistent or recurrent symptoms but did not report them to our institution.

A potential limitation to our project is that our patient population does not strictly fit the guideline definition of uncomplicated urinary tract infection

**TABLE 2. Outcomes and Treatment Information**

Patient	Location	Antibiotics prior to AG?	Reason for Antibiotic	ID Rec?	Antibiotic and Dosing	Microbial Cure	Recurrence within 30 Days?	Recurrence within 90 Days?	Adverse Effects Reported
P1	Inpatient	No	UTI	Yes	Amikacin 1000 mg (13 mg/kg ABW)	Unable to assess	No	No	No
P2	Inpatient	Yes – 3 days piperacillin/tazobactam	UTI	Yes	Gentamicin 340 mg (5 mg/kg ABW)	Unable to assess	No	No	No
P3	ED	No	UTI	Yes	Gentamicin 300 mg (3.6 mg/kg AdjBW)	Unable to assess	No	No	No
P4	ED	No	Pyelonephritis	Yes	Amikacin 1250 mg (15 mg/kg AdjBW)	No	Yes	Yes	No
P5	Long Term Care	No	UTI	No	Gentamicin 375 mg (5 mg/kg ABW)	Yes	No	No	No
P6	Long Term Care	No	UTI	Yes	Gentamicin 500 mg (4.6 mg/kg AdjBW)	No	Yes	Yes	No
P7	Clinic	No	UTI	Yes	Amikacin 1200 mg (15 mg/kg AdjBW)	No	Yes	Yes	No
P8	Clinic	No	CA-UTI	Yes	Gentamicin 400 mg (5 mg/kg AdjBW)	Unable to assess	No	No	No
P9	Clinic	Yes – 1 day ciprofloxacin	UTI	Yes	Amikacin 1000 mg (8 mg/kg AdjBW)	Unable to assess	No	No	No

Specific treatment information, as well as primary and secondary outcomes, is listed above for each patient. Abbreviations: ABW, actual body weight; AdjBW, adjusted body weight; CA-UTI, catheter-associated urinary tract infection; ED, emergency department.

according to the IDSA AMR guidance nor the newly published IDSA complicated urinary tract infection guidelines. Of note, the complicated urinary tract infection guidelines were published after the completion of this project. The IDSA AMR guidance defines complicated UTIs as those “occurring in association with a structural or functional abnormality of the genitourinary tract, or any urinary tract infection in an adolescent or adult male”.<sup>3</sup> However, the only paper cited in these guidelines for recommending a single dose of aminoglycosides for uncomplicated urinary tract infection is the paper by Goodlet et al., which has been previously discussed. This paper included male patients (~20%), patients with urinary malformations, and some patients with pyelonephritis; thus, the infectious diseases service at our VAMC often felt comfortable applying the findings to a broader population than recommended by the IDSA AMR guidance.<sup>4</sup> Additionally, the IDSA published complicated urinary tract infection guidelines in July 2025, providing updated classifications for complicated and uncomplicated UTIs. Uncomplicated UTIs are now defined as “infection confined to the bladder in afebrile women or men,” whereas complicated urinary tract infection is defined as infection beyond the bladder in women or men, including pyelonephritis, febrile or bacteremic UTI, catheter-associated UTI, and prostatitis. They further note that patients with neurogenic bladder may also be considered complicated.<sup>5</sup> In our patient population, a single IV aminoglycoside dose is often used as a last resort for patients with non-severe infections deemed treatable in the outpatient setting when no oral options are available. Thus, while patients may not have strictly met the guideline-recommended population, the benefits of providing an outpatient therapy were often deemed to outweigh the risks of providing prolonged inpatient IV antimicrobials. Ultimately, many of the patients included in this project had neurogenic bladder or catheters and thus represent a more complicated population; however, the findings of this project provide insight into the use of this intervention in a patient population similar to that which was previously studied and more closely match a real-world application of this intervention.

The IDSA AMR guidance recommends

**FIGURE 1. Initial Culture Results**

KEY		P1	P2	P3	P4	P5	P6	P7	P8	P9
Susceptible	Green									
Intermediate	Yellow									
Resistant	Red									
Not Reported	Black									
		PSEUDOMONAS AERUGINOSA	KLEBSIELLA PNEUMONIAE *ESBL*	ESCHERICHIA COLI *ESBL*	KLEBSIELLA PNEUMONIAE *ESBL*	SERRATIA MARCESCENS	MORGANELLA MORGANII	PSEUDOMONAS AERUGINOSA	ESCHERICHIA COLI *ESBL*	PSEUDOMONAS AERUGINOSA
ANTIBIOTIC	AMIKACIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	AMOXICILLIN/K CLAVULANATE	Green	Green	Green	Green	Green	Green	Green	Green	Green
	AMPICILLIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	AMPICILLIN/SULBACTAM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	AZTREONAM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFAZOLIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFEPIME	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFOTAXIME	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFOXITIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFTAZIDIME	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFTAZIDIME/AVIBACTAM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFTOZANONE/TAZOBACTAM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFTRIAZONE	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFUROXIME	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CIPROFLOXACIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	ERTAPENEM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	FOSFOMYCIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	GENTAMICIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	LEVOFLOXACIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	IMIPENEM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	MEROPENEM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	MEROPENEM/VABORBACTAM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	NITROFURANTOIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	PENICILLIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	PIPERACILLIN/TAZOBACTAM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	TETRACYCLINE	Green	Green	Green	Green	Green	Green	Green	Green	Green
	TOBRAMYCIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	TRIMETHOPRIM/SULFAMETHOXAZOLE	Green	Green	Green	Green	Green	Green	Green	Green	Green
	VANCOMYCIN	Green	Green	Green	Green	Green	Green	Green	Green	Green

Individual susceptibility results for isolated bacteria are depicted above for initial cultures.

**FIGURE 2. Repeat Culture Results**

KEY		P1	P2	P3	P4	P5	P6	P7	P8	P9
Susceptible	Green									
Intermediate	Yellow									
Resistant	Red									
Not Reported	Black									
		N/A	N/A	N/A	KLEBSIELLA PNEUMONIAE *ESBL*	N/A	MORGANELLA MORGANII	ENTEROBACTER CLOACAE COMPLEX	N/A	N/A
ANTIBIOTIC	AMIKACIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	AMOXICILLIN/K CLAVULANATE	Green	Green	Green	Green	Green	Green	Green	Green	Green
	AMPICILLIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	AMPICILLIN/SULBACTAM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	AZTREONAM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFAZOLIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFEPIME	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFOTAXIME	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFOXITIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFTAZIDIME	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFTAZIDIME/AVIBACTAM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFTOZANONE/TAZOBACTAM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFTRIAZONE	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CEFUROXIME	Green	Green	Green	Green	Green	Green	Green	Green	Green
	CIPROFLOXACIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	ERTAPENEM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	FOSFOMYCIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	GENTAMICIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	LEVOFLOXACIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	IMIPENEM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	MEROPENEM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	MEROPENEM/VABORBACTAM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	NITROFURANTOIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	PENICILLIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	PIPERACILLIN/TAZOBACTAM	Green	Green	Green	Green	Green	Green	Green	Green	Green
	TETRACYCLINE	Green	Green	Green	Green	Green	Green	Green	Green	Green
	TOBRAMYCIN	Green	Green	Green	Green	Green	Green	Green	Green	Green
	TRIMETHOPRIM/SULFAMETHOXAZOLE	Green	Green	Green	Green	Green	Green	Green	Green	Green
	VANCOMYCIN	Green	Green	Green	Green	Green	Green	Green	Green	Green

Individual susceptibility results by isolated bacteria are depicted above for repeat cultures.

a dose of gentamicin 5 mg/kg/dose and amikacin 15 mg/kg/dose as a single dose for uncomplicated cystitis.<sup>3</sup> These are consistent with the recommendations from Goodlet et al.<sup>3</sup> Most of the doses used in our project were consistent with these recommendations. Of note, if patients were obese, adjusted body weight was used rather

than actual body weight per local dosing protocols. As discussed above, utilizing the IDSA AMR guidance definition or the new IDSA complicated urinary tract infection guidelines, many of our patients could have been classified as complicated, and thus the dosing scheme (dose and duration) could have been considered too low.<sup>3,5</sup>

## Conclusion

Overall, the majority of patients achieved treatment success and did not have a recurrence of UTI within 90 days, demonstrating that single-dose aminoglycosides may be a reasonable option for the treatment of UTIs caused by multidrug-resistant organisms, but further research is warranted.

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## References

1. Ababneh M, Harpe S, Oinonen M, Polk RE. Trends in aminoglycoside use and gentamicin-resistant gram-negative clinical isolates in US academic medical centers: implications for antimicrobial stewardship. *Infect Control Hosp Epidemiol.* 2012 Jun;33:594-601. doi: 10.1086/665724
2. Centers for Disease Control and Prevention. Antimicrobial resistance threats in the United States, 2021-2022. Atlanta, GA: U.S. Department

of Health and Human Services, CDC; 2024.

3. Tamma PD, Heil EL, Justo JA, Mathers AJ, Satlin MJ, Bonomo RA, Infectious Diseases Society of America 2024 guidance on the treatment of antimicrobial resistant gram-negative infections. *Clin Infect Dis.* 2024 Aug 7:ciae403. doi: 10.1093/cid/ciae403
4. Goodlet KJ, Benhalima FZ, Nailor MD. A systematic review of single-dose aminoglycoside therapy for urinary tract infection: Is it time to resurrect an old strategy? *Antimicrob Agents Chemother.* 2018 Dec;63(1):e02165-e02218. doi: 10.1128/AAC.02165-18
5. Trautner BW, Cortes-Penfield NW, Gupta K, et al. "Complicated Urinary Tract Infections (cUTI): Clinical Guidelines for Treatment and Management." The Infectious Diseases Society of America, 17 Jul. 2025, <https://www.idsociety.org/practice-guideline/complicated-urinary-tract-infections/>.
6. Montelin H, Camporeale A, Hallgren A, et al. Treatment, outcomes and characterization of pathogens in urinary tract infections caused by ESBL-producing *Enterobacteriales*: a prospective multicentre study. *J Antimicrob Chemother.* 2024 Mar 1;79(3):531-538. doi: 10.1093/jac/dkad402
7. Bouwman K, George M. Clinical outcomes in patients who received a one-time aminoglycoside dose for extended-spectrum beta-lactamase-producing *Enterobacteriales* or *Pseudomonas aeruginosa* cystitis. *Antibiotics (Basel).* 2024 Jun 13;13(6):552. doi: 10.3390/antibiotics13060552



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