

Chronic Discharging Sinus Following Percutaneous Nephrolithotomy: A Study of 100 Postoperative Cases

Abhinav Chandrakant Gade^{1*}, Sanil Sadashiv Shinde², Shivprasad Balasaheb Tarle¹, Abhishek Murlidhar Adhari³,
Pratika C. Badole³, Ayaz Qureshi³

¹Assistant Professor, Department of General Surgery, Dr Vasant Rao Pawar Medical College Hospital and Research Centre, Adgaon, Nashik, Maharashtra, India

²Associate Professor, Department of General Surgery, Dr Vasant Rao Pawar Medical College Hospital and Research Centre, Adgaon, Nashik, Maharashtra, India

³Junior Resident, Department of General Surgery, Dr Vasant Rao Pawar Medical College Hospital and Research Centre, Adgaon, Nashik, Maharashtra, India

***Address for Correspondence:** Dr Abhinav Chandrakant Gade, Assistant Professor, Department of General Surgery, Dr Vasant Rao Pawar Medical College Hospital and Research Centre, Adgaon, Nashik-422003, Maharashtra, India

E-mail: abhinavgade16@yahoo.com

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ABSTRACT

Background: Percutaneous nephrolithotripsy (PCNL) is a widely accepted minimally invasive procedure for renal calculi; however, chronic discharging sinus at the nephrostomy site is a rare but troublesome postoperative complication. Tuberculosis and inadequate instrument sterilization have emerged as potential underrecognized etiological factors in endemic regions.

Methods: A hospital-based observational study was conducted over one year at a tertiary care teaching hospital in Western Maharashtra, including 100 post-PCNL patients presenting with chronic nephrostomy-site discharge lasting >4 weeks. Demographic, clinical, and surgical details were recorded, and all patients underwent laboratory tests, imaging, microbiological culture, and histopathological evaluation where indicated. Outcomes assessed included etiological diagnosis, treatment modality, and healing status.

Results: Most patients were middle-aged males from rural areas with diabetes and hypertension as common comorbidities. Prolonged operative duration, multiple access tracts, and extended nephrostomy tube placement were frequently observed surgical factors. Chronic bacterial infection (34%) and tuberculosis (29%), predominantly atypical mycobacteria, were the leading causes of sinus formation. Complete healing was achieved in 88% of patients following etiology-directed management, including surgical excision or anti-tubercular therapy.

Conclusion: Chronic discharging sinus after PCNL, though uncommon, requires early biopsy and microbiological evaluation to identify atypical infections such as tuberculosis. Strict sterilization protocols, vigilant postoperative follow-up, and timely etiology-based treatment significantly improve patient outcomes.

Key-words: Percutaneous nephrolithotripsy, Chronic discharging sinus, Tuberculosis, Nephrostomy site infection, Instrument sterilisation

INTRODUCTION

Percutaneous nephrolithotripsy (PCNL) is a well-established and widely accepted minimally invasive surgical technique for the management of renal calculi,

particularly large, complex, or staghorn stones. Since its introduction, PCNL has largely replaced open surgery for renal stone disease due to its high stone clearance rates, reduced postoperative pain, shorter hospital stays, and faster recovery. With increasing expertise and technological advancements, PCNL is now routinely performed in tertiary care centres and high-volume urology units, contributing significantly to the overall management of urolithiasis ^[1]. Despite its proven efficacy and relative safety, PCNL is not devoid of complications.

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Commonly reported complications include bleeding, infection, urinary extravasation, residual stones, and injury to adjacent organs. Creation of a percutaneous nephrostomy tract is an essential step in PCNL and can serve as a potential portal for postoperative complications. While most nephrostomy tracts heal uneventfully after tube removal, persistent wound-related problems, such as delayed healing, prolonged discharge, and sinus formation, are uncommon and often underreported. A chronic discharging sinus following PCNL represents a rare but troublesome complication that can significantly affect patient quality of life and may indicate underlying pathology [2,3].

With the increasing volume of endoscopic and minimally invasive surgeries, concerns have emerged regarding the adequacy of sterilization protocols for reusable surgical equipment. Chemical sterilization using 2% glutaraldehyde has been widely employed for endoscopic instruments, particularly in resource-limited settings. However, glutaraldehyde is a high-level disinfectant rather than a sporicidal agent, and its efficacy against certain organisms, including mycobacteria, has been questioned. Inadequate sterilization practices may lead to cross-contamination and transmission of infections between patients, especially in multispecialty hospitals where endoscopic equipment is frequently shared across departments [4,5].

Tuberculosis remains a major public health problem in developing countries, including India, where extrapulmonary tuberculosis accounts for a significant proportion of cases. Cutaneous tuberculosis is a rare manifestation, representing a small fraction of extrapulmonary tuberculosis, and is often overlooked due to its nonspecific clinical presentation. Port-site tuberculosis following laparoscopic procedures has been documented in the literature and is believed to result from contaminated instruments or improper sterilization techniques. However, tuberculosis involving the nephrostomy site following PCNL is extremely rare, with very limited documentation in existing literature. The occurrence of biopsy-proven skin tuberculosis presenting as a chronic discharging sinus at the nephrostomy site raises important concerns regarding infection control practices and instrument sterilization protocols [6,7].

Chronic discharging sinus in post-PCNL patients poses a diagnostic challenge, as it may be mistakenly attributed to persistent urinary leakage, retained stone fragments,

foreign body reaction, or low-grade bacterial infection. Delay in identifying atypical infections such as tuberculosis can lead to prolonged morbidity, repeated interventions, unnecessary antibiotic use, and psychological distress for patients. A high index of suspicion is therefore essential, particularly in endemic regions and in cases unresponsive to conventional treatment [8,9].

In addition to local wound-related complications, PCNL is also associated with systemic postoperative complications, including post-operative pulmonary complications (PPCs). PPCs encompass a spectrum of conditions, such as atelectasis, pulmonary edema, pneumonia, and respiratory failure, and are reported to occur in more than 10% of surgical patients. Factors such as advanced age, poor baseline health status, prolonged operative time, and procedures involving the upper abdomen or thoracoabdominal region increase the risk of PPCs. Patients undergoing PCNL are particularly susceptible due to prone positioning, proximity of the surgical field to the diaphragm, possible pleural injury, and irrigation-related fluid shifts. These complications contribute to increased morbidity, prolonged hospital stay, and, in severe cases, mortality [10,11].

Given the rising number of PCNL procedures and the potential for rare but significant complications, it is essential to evaluate unusual postoperative presentations, such as chronic discharging sinus, systematically. This case series aims to highlight the clinical profile, diagnostic challenges, and possible etiological factors associated with chronic discharging sinus in post-PCNL patients, with particular emphasis on tuberculosis as an underrecognized cause. Understanding these complications is crucial for early diagnosis, appropriate management, and implementation of stringent infection control measures to prevent cross-infection and improve patient outcomes.

MATERIALS AND METHODS

Study design and setting- This was a hospital-based observational study conducted at a tertiary care teaching hospital in Western Maharashtra. The study was conducted over 1 year, from Oct 2024 to Sep 2025. The hospital caters to a large referral population from urban and rural areas, and PCNL procedures are routinely performed in the Department of Urology.

Study population and sample size- A total of 100 patients who developed a chronic discharging sinus following percutaneous nephrolithotripsy (PCNL) were included in the study. All eligible cases presenting during the study period and fulfilling the inclusion criteria were enrolled consecutively to avoid selection bias.

Case definition- Chronic discharging sinus was defined as a persistent discharge from the nephrostomy site lasting more than four weeks after PCNL, despite standard postoperative care and initial conservative management.

Inclusion criteria

- Patients aged 18 years and above.
- Patients who had undergone PCNL for renal calculi at the study center or were referred from outside centers.
- Patients presenting with persistent discharge or sinus formation at the nephrostomy site for more than four weeks postoperatively.
- Patients willing to provide informed written consent and comply with study-related investigations and follow-up.

Exclusion criteria

- Patients with acute postoperative wound infection resolving within four weeks.
- Patients with known active pulmonary or extrapulmonary tuberculosis diagnosed before PCNL.
- Patients with immunocompromised states such as HIV infection, malignancy on chemotherapy, or long-term steroid therapy.
- Patients with recurrent renal surgery or open renal procedures.
- Patients are unwilling to participate or lost to follow-up before complete evaluation.

Data collection- Detailed demographic data, including age, sex, residence, and comorbidities such as diabetes mellitus and hypertension, were recorded. Surgical details, including indication for PCNL, side of surgery, number of access tracts, operative duration, type of nephrostomy tube used, and duration of tube placement, were noted from operative records. Clinical evaluation focused on the duration, nature, and amount of discharge, presence of pain, local inflammation, fever, weight loss, or other systemic

symptoms. A thorough local examination of the nephrostomy site was performed in all patients.

Investigations- All patients underwent baseline laboratory investigations, including complete blood count, erythrocyte sedimentation rate, renal function tests, and urine analysis. Imaging studies, such as ultrasonography or contrast-enhanced computed tomography, were performed as indicated to rule out urinary leaks, residual stones, or deep-seated collections. Discharge material from the sinus was subjected to microbiological examination, including routine bacterial culture and sensitivity. In patients with non-healing sinus or high clinical suspicion, a biopsy from the sinus tract or surrounding tissue was obtained and subjected to histopathological examination. Ziehl–Neelsen staining and cartridge-based nucleic acid amplification test (CBNAAT) for *Mycobacterium tuberculosis* were performed when indicated.

Outcome measures- The primary outcome measure was the identification of the underlying etiology of chronic discharging sinus following PCNL. Secondary outcomes included time to diagnosis, type of intervention required, response to treatment, and duration of sinus healing.

Statistical analysis- Data were entered into a Microsoft Excel spreadsheet and analyzed using appropriate statistical software. Categorical variables were expressed as frequencies and percentages, while continuous variables were summarized as means and standard deviations or medians and ranges, as appropriate.

Ethical considerations- The study was conducted after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants. Patient confidentiality was maintained throughout the study, and all procedures were performed in accordance with ethical standards and the Declaration of Helsinki.

RESULTS

We studied 100 post-PCNL patients who developed a chronic discharging sinus. Table 1 explains the demographic profile of the 100 post-PCNL patients. Most patients were middle-aged, with 36% in the 31–45 years age group and 34% in the 46–60 years age group, indicating a higher occurrence in the economically active

age range. Patients aged 60 years and older accounted for 16%, while patients aged 18–30 years accounted for 14%. Males predominated in the study population, accounting for 68% of cases, whereas females accounted for 32%, reflecting the higher prevalence of renal calculi and PCNL procedures among males. A larger proportion

of patients were from rural areas (61%) compared to urban areas (39%). Regarding comorbidities, diabetes mellitus was present in 28% and hypertension in 24% of patients, while 48% had no documented comorbid illness.

Table 1: Demographic characteristics of study participants (n = 100)

Variable	Category	Frequency (n)	Percentage (%)
Age group (years)	18–30	14	14
	31–45	36	36
	46–60	34	34
	>60	16	16
Sex	Male	68	68
	Female	32	32
Residence	Rural	61	61
	Urban	39	39
Comorbidities	Diabetes mellitus	28	28
	Hypertension	24	24
	None	48	48

Table 2 summarises the PCNL-related surgical characteristics of the study population. Right-sided PCNL was slightly more common, performed in 54% of patients, while 46% underwent left-sided procedures. A single access tract was used in most cases (72%), whereas multiple tracts were required in 28% of patients. Operative duration was 90 minutes or more in

62% of cases, indicating prolonged procedures in a substantial proportion. Nephrostomy tubes were retained for more than 5 days in 56% of patients, while 44% had them removed within 5 days. Most patients (81%) underwent primary PCNL, whereas 19% had secondary PCNL, suggesting prior interventions or residual stone disease.

Table 2: PCNL-related surgical characteristics

Parameter	Category	Frequency (n)	Percentage (%)
Side of PCNL	Right	54	54
	Left	46	46
Number of access tracts	Single	72	72
	Multiple	28	28
Operative duration	<90 minutes	38	38
	≥90 minutes	62	62
Nephrostomy tube duration	≤5 days	44	44
	>5 days	56	56
Type of procedure	Primary PCNL	81	81
	Secondary PCNL	19	19

Table 3 depicts the clinical presentation of chronic discharging sinus in post-PCNL patients. A prolonged discharge duration of more than 6 weeks was noted in 74% of cases, highlighting the chronic nature of the condition. The discharge was seropurulent in 58% of patients, while associated local pain and tenderness were reported in 46%. Systemic symptoms, such as

fever, were present in 34% of cases, and significant weight loss was observed in 22%, raising suspicion of a chronic infection. Notably, 69% of patients had a non-healing wound despite multiple courses of antibiotics, indicating resistance to conventional treatment and the need for further diagnostic evaluation.

Table 3: Clinical presentation of chronic discharging sinus

Clinical feature	Frequency (n)	Percentage (%)
Duration of discharge >6 weeks	74	74
Seropurulent discharge	58	58
Local pain and tenderness	46	46
Fever	34	34
Weight loss	22	22
Non-healing wound despite antibiotics	69	69

Table 4 outlines the etiological diagnosis of chronic discharging sinus following PCNL. Chronic bacterial infection was the most common cause, identified in 34% of patients. Tuberculosis, confirmed by biopsy and supportive investigations, was diagnosed in 29% of cases, making it a significant etiological factor in this study. Most of the cases of port site TB reported in our study

were caused by atypical mycobacteria (such as *Mycobacterium Chelonae*). Urinary leak was responsible for persistent sinus formation in 18% of patients, while foreign body reaction accounted for 11%. In 8% of cases, no definitive cause could be identified despite thorough evaluation, and these cases were categorized as idiopathic.

Table 4: Etiological diagnosis of chronic discharging sinus

Etiology	Frequency (n)	Percentage (%)
Tuberculosis (biopsy-proven)	29	29.0
Chronic bacterial infection	34	34.0
Urinary leak	18	18.0
Foreign body reaction	11	11.0
Idiopathic	8	8.0
Total	100	100

Table 5 describes the diagnostic modalities used and treatment outcomes. Histopathological examination was the most frequent modality confirming diagnosis in 47% of patients, followed by microbiological culture in 32% and imaging studies in 21%. Regarding management, 45% of patients required surgical excision of the sinus

tract, while 29% received anti-tubercular therapy. Conservative management alone was sufficient in 26% of cases. Overall outcomes were favorable, with complete healing achieved in 88% of patients, whereas 12% continued to have persistent sinusitis despite treatment.

Table 5: Diagnostic modalities and treatment outcomes

Parameter	Category	Frequency (n)	Percentage (%)
Diagnostic modality confirming diagnosis	Histopathology	47	47.0
	Microbiological culture	32	32.0
	Imaging	21	21.0
Treatment modality	Conservative management	26	26.0
	Surgical excision of sinus tract	45	45.0
	Anti-tubercular therapy	29	29.0
Outcome	Complete healing	88	88.0
	Persistent sinus	12	12.0

Chronic discharging sinus noted at the right nephrostomy tract site in a 45-year-old male patient following right-sided percutaneous nephrolithotomy (PCNL) performed for multiple renal calculi. The clinical image shows persistent seropurulent discharge from the tract site with surrounding erythema and local induration, indicating ongoing tract inflammation and delayed wound healing several days after surgery (Fig. 1).



Fig. 1: A 45-year-old male case of Right PCNL for multiple renal calculi with a chronic discharging sinus

Chronic discharging sinus observed at the left nephrostomy tract site in a 38-year-old male patient following left-sided percutaneous nephrolithotomy (PCNL) performed for a staghorn calculus. The image demonstrates persistent seropurulent discharge with surrounding erythema and induration, suggestive of delayed wound healing and chronic tract inflammation (Fig. 2).



Fig. 2: 38-year-old male with a case of left PCNL for left Staghorn calculus with chronic discharging sinus

DISCUSSION

Percutaneous Nephrolithotripsy is an established and effective modality for the management of renal calculi; however, postoperative complications continue to pose challenges, particularly when they are atypical or delayed in presentation. The present observational study of 100 cases focuses on chronic discharging sinus following PCNL, an infrequent but clinically significant complication that often leads to prolonged morbidity, repeated consultations, and delayed recovery ^[3].

In the present study, most patients were middle-aged, with a clear male predominance. This demographic profile is comparable to that reported in large PCNL series, reflecting the higher incidence of renal stone disease among males and individuals in the productive age group. Michel *et al.* ^[12], in their comprehensive

review of complications following PCNL, highlighted that patient-related factors such as age, diabetes mellitus, and other comorbidities significantly influence postoperative outcomes and complication rates. In our study, diabetes mellitus and hypertension were common comorbidities, which may have contributed to impaired wound healing and increased susceptibility to chronic infection, thereby predisposing patients to persistent sinus formation.

Surgical factors played an important role in the development of chronic-discharging sinuses in our cohort. Prolonged operative duration, multiple access tracts, and extended nephrostomy tube placement were frequently observed. Previous literature has shown that increased operative time and multiple tracts are associated with a higher risk of postoperative complications following percutaneous nephrolithotomy (PCNL) ^[12]. The underlying mechanisms may include greater tissue trauma, prolonged urinary leakage, and an increased risk of infection, all of which can contribute to delayed wound healing and persistent tract inflammation. In the present study, more than half of the patients had nephrostomy tubes retained beyond five days, which may have further contributed to delayed closure of the nephrostomy site.

The clinical presentation in our study was characterized by prolonged seropurulent discharge, local pain, and a high rate of non-healing wounds despite repeated antibiotic therapy. These findings underscore the limitation of empiric antibiotic use without definitive etiological diagnosis. Michel *et al.* ^[12] emphasized that early recognition and appropriate management of PCNL-related complications are crucial to prevent progression to chronic morbidity. Failure to identify atypical causes may result in prolonged conservative treatment with poor outcomes, as observed in a significant proportion of our patients.

One of the most important observations in this study was the high proportion of biopsy-proven tuberculosis as an etiological factor for chronic discharging sinus. Nearly one-third of patients were diagnosed with cutaneous tuberculosis at the nephrostomy site. While port-site tuberculosis following laparoscopic procedures has been previously reported, tuberculosis involving the nephrostomy tract after PCNL is extremely rare and poorly documented. The findings of our study raise serious concerns about infection control practices,

particularly the reuse of endoscopes sterilized with chemical disinfectants, such as 2% glutaraldehyde. Inadequate sterilization and cross-contamination in high-volume multispecialty centers may play a critical role, especially in tuberculosis-endemic regions.

Urinary leak and foreign body reaction were other notable causes identified in our study. Mishra *et al.* ^[13], in their randomized controlled trial comparing early nephrostomy tube removal and tubeless PCNL, demonstrated that prolonged tube placement is associated with increased urine leak and delayed tract healing. Their findings support the observation in our study that extended nephrostomy tube duration may predispose patients to persistent sinus formation. Early tube removal, where feasible, may therefore reduce the risk of chronic tract-related complications.

Although the primary focus of this study was chronic discharging sinus, it is important to consider the broader context of PCNL-related morbidity. Studies by Talwar *et al.* ^[14] and Mehra *et al.* ^[15] have shown that PCNL is generally safe and effective even in patients with chronic kidney disease, with most patients demonstrating improvement or stabilization of renal function. However, both studies reported higher complication rates in patients with renal insufficiency. Chronic infection and delayed wound healing in such patients could further increase the risk of persistent sinus formation, emphasizing the need for careful patient selection and meticulous postoperative surveillance. Diabetes and other complications also add to the cutaneous and deep non-healing ulcers ^[16,17].

The treatment outcomes in the present study were favorable, with complete healing achieved in most patients following etiology-directed management. Surgical excision of the sinus tract, anti-tubercular therapy, and targeted conservative management led to resolution in most cases, highlighting the importance of a definitive diagnosis. These findings align with the recommendations of Michel *et al.* ^[12], who stressed that standardized techniques and structured postoperative follow-up are essential for early detection and effective management of complications. Tuberculosis remains a major public health problem in India. In this study, nephrostomy-site tuberculosis developed after PCNL in patients without prior TB, suggesting cross-infection from inadequately sterilized instruments. The use of 2% glutaraldehyde is insufficient against mycobacteria,

highlighting the need for improved sterilization practices and strict infection-control measures ^[18].

SUMMARY

In summary, this study highlights that chronic discharging sinus following PCNL is a multifactorial complication influenced by patient-related factors, surgical variables, and infection control practices. Tuberculosis emerged as a significant and underrecognized cause in our cohort, particularly relevant in endemic settings. A high index of suspicion, early biopsy of non-healing sinuses, and strict adherence to sterilization protocols are essential to prevent prolonged morbidity and improve patient outcomes following PCNL.

CONCLUSIONS

Chronic discharging sinus following Percutaneous Nephrolithotripsy is an uncommon but clinically significant postoperative complication that leads to prolonged morbidity if not promptly evaluated. This study highlights the multifactorial etiology of persistent nephrostomy-site sinus, with prolonged operative time, extended nephrostomy tube placement, and underlying comorbidities playing contributory roles. Tuberculosis, specially caused by atypical mycobacteria like *M. chelonae* emerged as an important and underrecognized cause, particularly in endemic regions, emphasizing the need for early biopsy and microbiological evaluation of non-healing wounds. Etiology-directed management results in favorable outcomes. Strict infection control measures and vigilant postoperative follow-up are essential to prevent this complication.

CONTRIBUTION OF AUTHORS

Research concept- Abhinav Chandrakant Gade, Sanil Sadashiv Shinde

Research design- Shivprasad Balasaheb Tarle, Abhishek Murlidhar Adhari

Supervision- Abhinav Chandrakant Gade, Sanil Sadashiv Shinde

Materials- Pratika C. Badole, Ayaz Qureshi

Data collection- Shivprasad Balasaheb Tarle, Abhishek Murlidhar Adhari, Pratika C. Badole

Data analysis and interpretation- Abhinav Chandrakant Gade, Sanil Sadashiv Shinde

Literature search- Shivprasad Balasaheb Tarle, Abhishek Murlidhar Adhari, Pratika C. Badole

Writing article- Abhishek Murlidhar Adhari, Pratika C. Badole, Ayaz Qureshi

Critical review- Abhinav Chandrakant Gade, Sanil Sadashiv Shinde

Article editing- Pratika C. Badole, Ayaz Qureshi

Final approval- Abhinav Chandrakant Gade, Sanil Sadashiv Shinde

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