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Case Series

Surgery Section

Tubeless Supine Percutaneous Nephrolithotomy in Calyceal Diverticular Stone

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ABSTRACT

Percutaneous Nephrolithotomy (PCNL) has routinely been performed in prone position as a treatment for calyceal diverticular stone. PCNL is performed supine as an alternate modality for calyceal diverticular stones. The objective of the procedure is to reduce operative time and anaesthetic morbidity during supine tubeless PCNL in calyceal diverticular stone. The series is about three patients with calyceal diverticular stones. These patients underwent supine tubeless PCNL in Galdakao modified supine Valdivia position. There was no intraoperative, postoperative or on follow-up complications in any of the the patients. In all the patients stones were cleared completely in single sitting. Supine PCNL in calyceal diverticular stone could be an alternative with similar outcomes to the standard prone PCNL. It provides an additional benefit of performing the procedure in a single position, which is known to reduce total operating time and also reduces anaesthesia complications.

Keywords: Anaesthesia, Complications, Galdakao modified supine valdivia position, Operative time, Urolithiasis

INTRODUCTION

Calyceal diverticula are usually congenital, non secreting cavities. They are lined by urothelium and are located within the renal parenchyma which communicates with the calyceal fornix through a diverticular neck [1]. Calyceal calculi usually occurs in 9.5-50% of cases and most of them are asymptomatic, but few can cause flank pain, urinary tract infections, haematuria or can even lead to damage of renal parenchyma that is surrounded locally [2].

In present era, minimally invasive treatments are usually preferred over traditional open techniques which include Shock Wave Lithotripsy (SWL) [3], flexible Ureteroscopy (URS) [4], laparoscopy [5] and PCNL [6]. There are different treatment modalities for managing calyceal diverticuli and have their pros and cons for example SWL can provide symptomatic pain relief but have low stone free rates [7]. On the other hand, percutaneous approach yields high stone-free rates and also leads to resolution of the diverticulum [8]. Traditionally, prone position had been the dominant position for PCNL but use of supine PCNL is increasing over time globally [9].

This series reports three cases of Calyceal diverticular stone disease who were treated by supine PCNL and were found to have excellent results.

CASE SERIES

All the patients were evaluated for the size of calyceal diverticulum, its location, puncture site, operative time, stone clearance rate and its complications. All patients had undergone basic biochemical tests and urine routine and microscopic examination and culture. Preoperative Contrast Enhanced Computerized Tomography (CECT) Kidneys Ureter Bladder (KUB) was performed in all cases to evaluate the diverticulum and stone. Informed consent was obtained from all patients before procedure.

Galdakao modified supine valdivia position [Table/Fig-1] was used in all the cases [10]. The ipsilateral arm was brought across the chest; the contralateral arm was abducted. A gentle break was placed in the table at the level of the flank. The patient was then tilted and, to raise the side to be operated on, an air filled 3l bag was placed under the ipsilateral flank. The airbag enhances the natural lordosis of the lumbar spine and increases the surface area available for access. Upper pole punctures, which are often tricky in the prone position, are made much more achievable in the supine position.

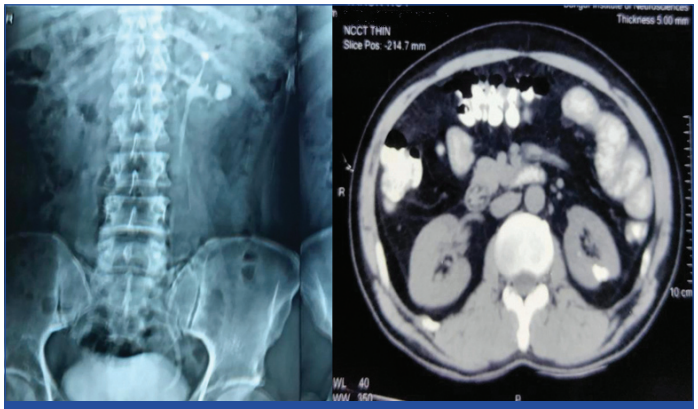
[Table/Fig-1]: Galdakao modified supine valdivia position.

As shown in [Table/Fig-2], two patients were male and one was female. Average age was 41.3 years with the youngest being 36 years and eldest being 48 years of age. Average stone size was 18.3 mm with the largest being 20 mm and smallest being of 17 mm size. Average BMI was 28.8 kg/m^2 with lowest being 26.4 and highest being 31.0. The cases were analysed for Guy's Stone Score (GSS) which is a scoring system to grade the complexity of PCNL and is used to predict the stone-free rate after PCNL [11]. All three patients had GSS three.

All the three patients underwent supine tubeless PCNL and calyceal puncture access was done taking into consideration location of stone [Table/Fig-3]. Average time for surgery was 47.6 minutes, maximum being 50 minutes for patient with BMI 31.0 and lowest being 45 minutes for patient with BMI 26.4 kg/m^2 [Table/Fig-4]. Fulguration was done in one patient and in rest it was not done because of thin diverticular wall and sufficiently wide diverticular neck. There was no intraoperative complication in any of the patient. There was no significant difference in pre and postprocedure haemoglobin levels. Postoperative period was uneventful. Mean hospital stay was found to be 3.66 days. As described in [Table/Fig-3], all patients stones were cleared completely in single puncture and single sitting. Nephrostomy tube was not placed in any patient (Tubeless supine PCNL done in all cases). All patients had 21 days of stent in dwelling time, after that stents were removed.

Variables	Case 1	Case 2	Case 3
Age (years)	36	40	48
Gender	Male	Female	Male
BMI (kg/m^2)	31	26.4	29
No. of stones	1	1	1
Size (cm)	1.8	1.7	2
Guy stone score	3	3	3
ASA class	II	II	II
Stone and calyceal diverticulum location	Lower pole	Middle pole	Lower pole
Site of involvement	Left kidney	Right kidney	Right kidney
Contralateral kidney	Normal and stone free	Normal and stone free	Contained cyst and stone free
Preoperative haemoglobin (g/dL)	11.8	13.7	12.5
Preoperative creatinine (mg/dL)	0.9	1.2	0.65

[Table/Fig-2]: Demographic, biochemical and radiologic data of patients.
ASA: American society of anaesthesiologist



[Table/Fig-3]: Intravenous pyelogram (IVP) and computed tomography (CT) scan showing calyceal diverticular stone in left kidney.

Perioperative data	Case 1	Case 2	Case 3
Position	GMSVP	GMSVP	GMSVP
Total operative time including cystoscopy and retrograde pyelography	50 min	45 min	48 min
Percutaneous access	Lower pole diverticulum	Middle diverticulum	Lower pole diverticulum
Fulguration done	No	No	Yes
Ureteral stent placement	26 cm*5Fr Antegrade technique	26 cm*5Fr Antegrade technique	26 cm*5.5Fr Retrograde technique
Intraoperative complications	None	None	None
Postoperative haemoglobin(g/dL) and creatinine (mg/dL)	11/1	12.8/0.9	12/0.76
Postoperative requirement of blood transfusion	No	No	No
Length of stay in hospital	4 days	3 days	4 days
Postoperative complications	None	None	None

[Table/Fig-4]: Perioperative data for the patients.
GMSV: Galdakao modified supine valdivia

DISCUSSION

Percutaneous treatment of calyceal diverticular calculi have excellent stone-free rates 87.5-100% with successful obliteration rate of the diverticular cavity in 76-100% cases. The PCNL for the treatment of diverticular stones has superior results along with long-term symptom relief that justify the use of PCNL over any other minimal invasive approach [12]. It is now considered as the gold standard for treatment of large stones and over the time it has evolved and results in decreased invasiveness and morbidity and also improved ergonomics and outcomes [13]. However, in some cases it may be difficult to negotiate through caliceal neck and in those cases sometimes trans-diverticular approach and creation of neo-infundibulum may be an alternative approach.

Originally, PCNL was performed in the prone position since it was postulated that other positions may lead to increased risk of colon injury during percutaneous puncture of the kidney in supine or other positions. Over the last few years different variations in positioning have been described, lateral [14], complete supine [15] and modified supine positions.

Supine PCNL offers advantages over prone PCNL in terms of anaesthesiological management including improved access to the patient for cardiovascular and pulmonary management, less risk of injury to central and peripheral nervous system [16]. Supine PCNL also shortens the operative time since there is no need to reposition the patient after ureteral catheter placement as is the case for standard prone PCNL [17]. Supine PCNL also facilitate antegrade as well as retrograde transurethral approaches to complex stone disease [18].

In a study, Jones MN et al., also concluded that modified supine PCNL has significantly lower operative time, shorter length of hospital stay, higher stone free rate and more safe when compared with prone PCNL [19]. In another study Paksi S et al., suggested supine PCNL to be promising alternative to conventional prone PCNL due to less blood loss, shorter operative time in patients undergoing supine PCNL [20].

CONCLUSION(S)

The PCNL is considered a safe and effective treatment option in patients with renal stones in a calyceal diverticular stone. Supine position is a viable and safe option for PCNL. It also reduces intraoperative complications and also advantageous over anaesthetic outcomes.

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