

Percutaneous Nephrolithotomy in Patients on Chronic Anticoagulant/Antiplatelet Therapy

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Percutaneous nephrolithotomy (PCNL) is an integral component in the management of large volume renal stone disease either as monotherapy or in combination with shock wave lithotripsy. Stone disease in patients on chronic anticoagulation/antiplatelet therapy, however, poses a difficult scenario. Bleeding is a major concern for any patient undergoing PCNL. We retrospectively analyzed our series of patients with renal calculi who were on chronic anticoagulant therapy and who underwent PCNL. We reviewed the case records of patients undergoing PCNL during the period from January 2005 to December 2011. We analyzed the changes in preoperative and postoperative hemoglobin, serum creatinine, and clotting parameters, as well as intraoperative and postoperative bleeding and thromboembolic complications. During the 5-year study period, a total of 36 patients (30 males and 6 females) with a mean age of 46.33 ± 9.96 years (range, 29-61 years) who were on chronic anticoagulant/antiplatelet therapy underwent PCNL for urolithiasis. The mean size of the stone was 6.40 ± 1.98 cm² (range, 2.8-9 cm²). The mean operating time was 62.08 ± 10.10 min. The bleeding was successfully managed in all patients and the anticoagulant/antiplatelet agents were restarted after an appropriate duration. The mean rise in serum creatinine at discharge was 0.05 ± 0.03 mg/dl and the mean fall in serum hemoglobin was 1.63 ± 0.77 g/dl. At 3 months after surgery, the stone-free rate was 100%. With careful preoperative care and regulation of anticoagulation/antiplatelet therapy and appropriate intraoperative management, PCNL can be performed safely and successfully in properly selected patients with renal calculi who are on chronic anticoagulant/antiplatelet therapy.

Key Words: *Urolithiasis; Percutaneous nephrolithotomy; Anticoagulants; Antiplatelet agents; Kidney calculi*

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INTRODUCTION

In patients with a large stone burden, percutaneous nephrolithotomy (PCNL) monotherapy shows superior results in terms of stone clearance, cost-effectiveness, and also early postoperative convalescence when compared with shockwave lithotripsy (SWL) or open stone surgery.¹⁻³ The American Urological Association Clinical Nephrolithiasis Guidelines Committee on staghorn calculi has recommended PCNL monotherapy as the most effective approach to large volume renal stone disease with a superior overall stone-free rate of 78%.¹ The greatest advantage of PCNL is the high stone-free rate following the procedure,

irrespective of the size of the stone, in a single session. Reported stone-free rates range between 78% and 100%.⁴ On the other hand, PCNL is also associated with significant morbidity. Complication rates as high as 83% have been reported.⁵⁻⁷ Intraoperative and postoperative hemorrhage is one of the most frequent complications associated with PCNL. Transfusion rates of up to 34% have been reported.⁸ About 1% of all PCNL patients complain of delayed postoperative bleeding,⁹ with the development of arteriovenous fistula or pseudoaneurysm being the most frequent cause.¹⁰ Therefore, patients needing anticoagulation/antiplatelet therapy present a complex clinical problem. In this selected group of patients, the risk of bleeding during the

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reinitiation of anticoagulation must be balanced against the risk of thromboembolic events during the withdrawal of anticoagulation/antiplatelet therapy, especially in a procedure such as PCNL, which is known to have a relatively higher risk of bleeding both during and after surgery. We retrospectively analyzed our series of patients with renal calculi who were on chronic anticoagulant/antiplatelet therapy for comorbid diseases and who underwent PCNL.

MATERIALS AND METHODS

We retrospectively reviewed the case records of all patients undergoing PCNL for renal calculi during the period of January 2005 to December 2011. Of these patients, those who were on anticoagulant/antiplatelet therapy at the time of surgery were identified. Indications for chronic anticoagulant/antiplatelet therapy, the prescribed drugs, and the duration of therapy before surgery in these patients were noted.

Preoperative imaging records were reviewed and the stone burden was calculated as follows as described by Lee et al.: (length×breadth)=cm².¹¹ Preoperative clotting parameters were noted in all patients. The technique of PCNL, retrograde access, method of tract dilatation, the extent of dilatation, source of stone fragmentation, operative time, number of tracts, and clearance rate were noted. Postoperative radiological evaluation for residual fragments, restart of anticoagulation/antiplatelet agents, and postoperative outcome were similarly noted.

RESULTS

During the 5-year study period, a total of 36 patients (30 males and 6 females) with a mean age of 46.33±9.96 years (range, 29-61 years) who were on chronic anticoagulant/antiplatelet agents underwent PCNL for urolithiasis. The patient demographics are listed in Table 1. The indications for chronic anticoagulant/antiplatelet therapy (Table 2) included prosthetic valves, ischemic heart disease, coronary

stents, and coronary artery bypass grafts. Twenty-one of these patients were on warfarin and the remaining 15 were on clopidogrel. The mean size of the stone was 6.40±1.98 cm² (range, 2.8-9 cm²). The stones were located in the renal pelvis (36), lower calyx (15), and middle calyx (6). The mean preoperative hemoglobin was 13.54±0.79 g/dl. The mean preoperative serum creatinine was 1.18±0.13 mg/dl. Three of the patients had a solitary functioning kidney. The other kidney was hydronephrotic secondary to congenital UPJ obstruction in one patient, and the remaining two patients had a small-sized contralateral kidney (Fig. 1 and Fig. 2).

Preoperatively, warfarin was withheld for at least 5 days before surgery and was resumed after 5 days postoperatively. All patients were given vitamin K daily for 3 days.



FIG. 1. Pre operative coronal CT view of patient with left renal calculus and right gross hydronephrosis due to congenital UPJ obstruction.



FIG. 2. Post operative coronal CT view of same patient as in Fig. 1 with complete stone clearance and DJ stent in situ.

TABLE 1. Patient demographics

Mean age (yrs)	46.33±9.96	
Gender		
Male	30	83.33%
Female	6	16.67%
Mean stone size (cm ²)	6.40±1.98	
No of solitary functioning kidney	1	8.33%
Mean pre-op Sr creatinine (mg%)	1.18±0.13	
Mean pre-op Hb (gm%)	13.54±0.79	

TABLE 2. Indications for chronic anticoagulation therapy

Prosthetic heart valves	15
Arterial fibrillation	9
Coronary artery bypass grafts	9
Intracoronary stent	3

TABLE 3. Intra-operative and post-operative outcomes

Mean blood loss in first 15 cases (ml)	380±57.88
Mean blood loss in latter 21 cases (ml)	252.14±88.68
Mean change in Sr creatinine (mg%)	0.05±0.03
Mean change in Hb (gm%)	1.63±0.77
No of transfusions	6 (50%)
Mean operating time (mins)	62.08±10.10 mins
Additional procedures SWL	3 (25%)

Heparin was used to bridge the interim period so as to achieve an INR (international normalized ratio) of 1.5. Patients on clopidogrel had their medication withheld for 10 days preoperatively and resumed at 5 days postoperatively. These patients were on low-molecular-weight heparin during the interim period.

The mean operating time was 62.08±10.10 min (Table 3). The percutaneous procedure was performed by using a single tract in 24 patients and two tracts in the remaining 12 patients. In the initial 15 patients, Alken telescopic metal dilators were used to dilate the tract up to 30 Fr. In the remaining 21 patients, Cook's Nephromax[®] balloon dilators were used and the tract was dilated up to 26 Fr. The regular 26 Fr sheath nephroscope was used in the first 15 cases and this was replaced by the 22 Fr mini-perc nephroscope in the latter 21 cases. The mean estimated blood loss was 380±57.88 cc in the first 15 cases and 252.14±88.68 cc in the latter 21 cases. There were no intraoperative complications and no patients received intraoperative blood transfusions.

The intraoperative vision was tinged with red in all our patients, and significant bleeding was noted in our first 15 patients, who had undergone tract dilatation with metal dilators. Of these 15 patients, 6 were on warfarin and the remaining 9 patients were on clopidogrel therapy. The urine was highly colored in the postoperative period in all patients, with seven of these patients needing blood transfusions. The urine gradually became clear in all patients within 48 hours. The bleeding was successfully managed in all patients and the anticoagulant/antiplatelet agents were restarted after an appropriate duration. None of the patients developed thromboembolic complications. Similarly, none of the patients were readmitted for secondary bleeding. The overall stone-free rate was 75% (27 of 36 cases), with 9 patients needing additional SWL to achieve stone-free status. The mean rise in serum creatinine at discharge was 0.05±0.03 mg/dl and the mean fall in serum hemoglobin was 1.63±0.77 g/dl. Radiological imaging for residual radiopaque stones was done by KUB and ultrasonography. At 3 months postoperatively, the surgery stone-free rate was 100%.

DISCUSSION

PCNL is an essential component in the management of large volume renal calculi. PCNL is recommended as the most effective treatment option for patients with staghorn

calculi or large volume stone disease, either as monotherapy or in combination with SWL. Multiple tracts allow for the successful management of nearly every stone burden in a single surgical session. Furthermore, patients with anatomical variations (e.g., horseshoe kidney) can be successfully treated by PCNL. Overall stone-free rates of above 78% have been described.¹

Both intraoperative and postoperative bleeding are a matter of concern for any patient undergoing PCNL. Kukreja et al.¹² reported an 8% blood transfusion rate in 301 PCNL procedures in patients with normal clotting parameters, and Kessarar et al. reported a 0.8% incidence of post-PCNL bleeding requiring embolization.¹³ In view of this, patients who need anticoagulation/antiplatelet therapy present a difficult and complex situation. The combined risk of bleeding during the reinitiation of anticoagulation/antiplatelet therapy, as well as the increased risk of thromboembolism during the withdrawal of anticoagulation/antiplatelet agents, makes a procedure such as PCNL a very risky proposition. The risk of thrombosis after stopping anticoagulation/antiplatelet therapy cannot be assessed easily for all patients. Depending on the underlying disease, primarily leading to anticoagulation, the risk of thromboembolic complications differs. In patients having mechanical heart valves, the design and location of the valves influence the risk of thrombotic complications. The complication rate can range from 0.7% to 7.6% nonfatal thromboembolic events per year and up to 1.1% fatal events per year, with the highest risk in patients with "caged ball mitral valves" and the lowest risk for patients with "bileaflet" aortic valves. Without any anticoagulation/antiplatelet therapy, the risk of major thromboembolism, including stroke and myocardial infarction, is 8%, and anticoagulation therapy reduces this risk by 75%.^{14,15} Patients with atrial fibrillation are considered at relatively low risk for thrombosis. Patients with atrial fibrillation and no coagulation have an average risk of embolism of 4.5% per year.^{14,16} With associated risk factors such as valvular atrial fibrillation, this risk can rise up to 20%.¹⁷ The risk of stent thrombosis in patients with an intracoronary stent with anticoagulation is reported to be as high as 20% within 3 months with bare metal stents, whereas the risk of stent thrombosis without anti-coagulation/antiplatelet therapy is likely to be higher.¹⁸

Alternative treatment options to PCNL must be considered before scheduling the patient for percutaneous surgery. Anticoagulation remains a contraindication for SWL. The only endoscopic treatment option that remains is the ureterorenoscopy (URS) approach. Watterson et al.¹⁹ reported their experience with ureterorenoscopic stone treatment and laser lithotripsy in patients with uncorrected bleeding diathesis. The average stone diameter was 11.9 mm and the overall stone-free rate was 96%, with bleeding complications occurring in only 3% of the treated patients. The authors concluded that URS was safe and effective, even in patients with uncorrected bleeding diathesis. However, PCNL is considered a treatment op-

tion for patients with a large stone burden, and one may definitely question the efficacy of URS in such cases. As a compromise, Ricchiuti et al.²⁰ proposed a staged URS procedure as an alternative to PCNL. The mean stone diameter in their series was 30.9 mm, with 43.5% of patients needing a second procedure; the stone-free rates achieved were 73.9%. Despite URS remaining as a possible alternative, PCNL remains the most valuable option in patients with large renal calculi.

Klinger et al.²¹ retrospectively evaluated treatment protocols and the results of upper tract stone treatment in patients with clotting disorders. Over a 6-year period, 6,827 stone interventions (ESWL or endourologic procedures) were performed in 5,739 patients. Thirty-five (0.61%) patients suffered from a variety of systemic clotting disorders or were anti-coagulated. A total of 76 interventions were performed, consisting of ESWL, URS, PCNL, ureteric stenting, or percutaneous nephrostomy. URS and PCNL were successful in all cases, and complications occurred in 0% (0/7) and 33% (1/3) of patients, respectively. One patient undergoing PCNL developed significant bleeding after reversal of warfarin therapy.

Kefer et al.²² assessed the safety and efficacy of PCNL in patients requiring long-term anticoagulant therapy during the period of from 2000 to 2007. Of the 792 patients undergoing PCNL, 27 were identified to be on anticoagulant/antiplatelet therapy, which included warfarin, clopidogrel, or cilostazol. Warfarin was withheld 5 days preoperatively with enoxaparin bridging and was resumed 5 days postoperatively. Clopidogrel and cilostazol were stopped 10 days preoperatively and were resumed 5 days postoperatively. Overall, the stone-free rate with PCNL was 93% (25 of 27). A second-look procedure was required in 5 patients and a third procedure was required in 1. The mean hemoglobin decrease was 1.5 g% (range, 0-4.1 g%), and the mean change in serum creatinine was 0.03 mg% (range, 0-0.4 mg%). Two patients (7%) had significant

bleeding and 1 (4%) had a thromboembolic complication. All complications were managed conservatively and all patients were stone-free at the 1-month follow-up.

Several recommendations have been made for the perioperative management of anticoagulation in patients at risk for arterial thromboembolism who are undergoing surgery.²³ The approach in high-risk patients on warfarin and with atrial fibrillation (e.g., associated with prior thromboembolism, rheumatic heart disease, left ventricular dysfunction) or those with older-generation mechanical heart valves, in whom there is a fragile balance between the risk of bleeding and the risk of thromboembolism, is to administer intravenous heparin until 6 hours before the procedure and to restart heparin as soon as possible after surgery. The dose is adjusted to achieve an activated PTT that is 2.0 times control. Warfarin is then reinstated before discharge from the hospital; the prothrombin time should be in the therapeutic range for at least 48 hours before heparin is discontinued. Antiplatelet agents should be withheld before PCNL, in which perioperative hemorrhage could be catastrophic. At least 10 days should elapse after stopping clopidogrel and before surgery is undertaken, and clopidogrel should be resumed as early as possible in the postoperative period. We have been following the protocol as shown in Fig. 3. Apart from these recommendations, certain surgical recommendations can be made from our study, which include using balloon dilatation for tracts, using smaller sized operating nephroscopes, preferably using a single tract, and keeping the operating time to a bare minimum.

In conclusions, PCNL can be performed safely and effectively in patients with a large stone burden and who are on chronic anticoagulant/antiplatelet therapy with careful perioperative management of anticoagulation. Our perioperative management protocol of withdrawing and resuming anticoagulation/antiplatelet therapy is effective in our patient population. PCNL should be used as a viable

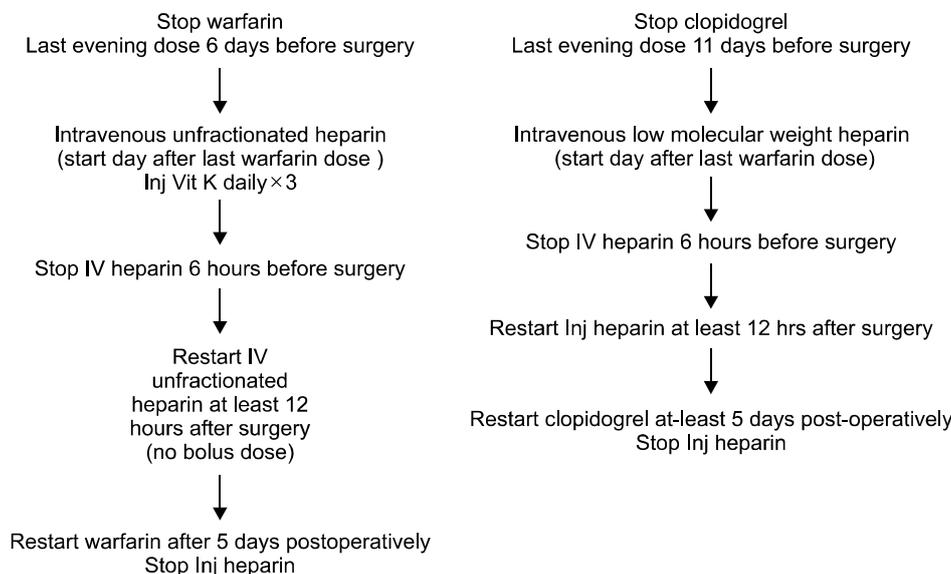


FIG. 3. Guidelines for the perioperative management of anticoagulation.

option in the treatment of a large stone burden following correction of bleeding parameters.

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