

Multiperc Versus Single Perc with Flexible Instrumentation for Staghorn Calculi*

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Abstract

Several techniques have been described for percutaneous access and stone removal. The method of choice depends on the available instrumentation, stone burden in given caliceal anatomy, and the surgeon's preference, depending on his or her level of training. The argument for multiple strategic tracts *vs* single-tract percutaneous nephrolithotomy (PCNL) with or without flexible instrumentation for complete clearance of the stones is ongoing. The "multiperc" or multiple tract approach offers clearance of stones without the added cost of sophisticated instrumentation; further, a surgeon who can achieve a primary tract can easily create secondary tracts. This does not require a learning curve to be overcome. The argument against the multiperc approach is a potential for increased bleeding, which has not been substantiated in any published series. The single-tract approach without need for flexible instrumentation, currently published, is for small burden and partial staghorn stone where multiple tracts are not really necessary. Use of single-tract PCNL with flexible instrumentation, such as ureteroscopy and nephroscopy, ideally needs a supracostal approach with its attendant morbidity. The success of this procedure depends on the collecting system anatomy. Few studies published to date report suboptimal stone clearance rates with the advantages of shorter hospital stay and less blood loss. The currently available literature is not sufficient because of mostly retrospective studies, fewer patient accrual, and paucity of staghorn cases. Proper prospective studies with head-on comparisons are needed to prove or disprove the advantages and disadvantages of either approach.

Introduction

THE PRIMARY AIM in the management of staghorn calculus is complete clearance of the stone. This is important with respect to relieving obstruction, eradicating causative organisms, and preventing further stone growth and possibly stone recurrence. Percutaneous nephrolithotomy (PCNL) remains the cornerstone of the management of these calculi. The debate to clear the stone with multiple tracts as opposed to a single tract with or without flexible instrumentation is ongoing. To come to a conclusion as to which modality is ideal requires critical evaluation of each modality *vis-à-vis* stone-free rates, ancillary procedures, morbidity, and hospital stay.

"Multiperc" or Multiple Tract Approach

The American Urological Association (AUA) Guideline Panel has suggested that two or more accesses may be necessary at times to clear the stone.¹ PCNL according to the AUA guidelines is associated with a stone clearance rate of 79%. The technique has been described.² Renal access is predetermined after studying the stone configuration with respect to intrarenal

collecting system anatomy. The main tract is the one through which maximum stone burden can be cleared. Remaining ones are secondary access punctures to be used for residual caliceal stones (Fig. 1). All initial ultrasonography-guided punctures are made to the potential calix, and each is stabilized by passing a guidewire. The main tract dilatation is performed to facilitate Amplatz sheath placement of adequate size (usually 26–28F), while secondary tracts, if necessary, are dilated later during the procedure (usually 20–24F).

Nephrolithotripsy time is limited to 90 minutes. The procedure is staged by placing a nephrostomy tube. If any of the punctures are not used in the first sitting because of restricted nephroscopy time, then the tract is dilated and a 14F malecot catheter is placed to allow tract maturation before the second stage. The second stage is usually performed after 72 hours, and residual stones are removed (Fig. 2). There are numerous articles that have been published to prove the safety and efficacy of multiple tracts for managing staghorn calculus (Table 1).

Interestingly, the stone-free rates in all these studies are above 80%. There is a significant impact of experience in increasing the clearance rates, as shown by Desai and associates.²

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*A video demonstrating this technique is available on the enclosed CD ROM and online at www.liebertonline.com/end.

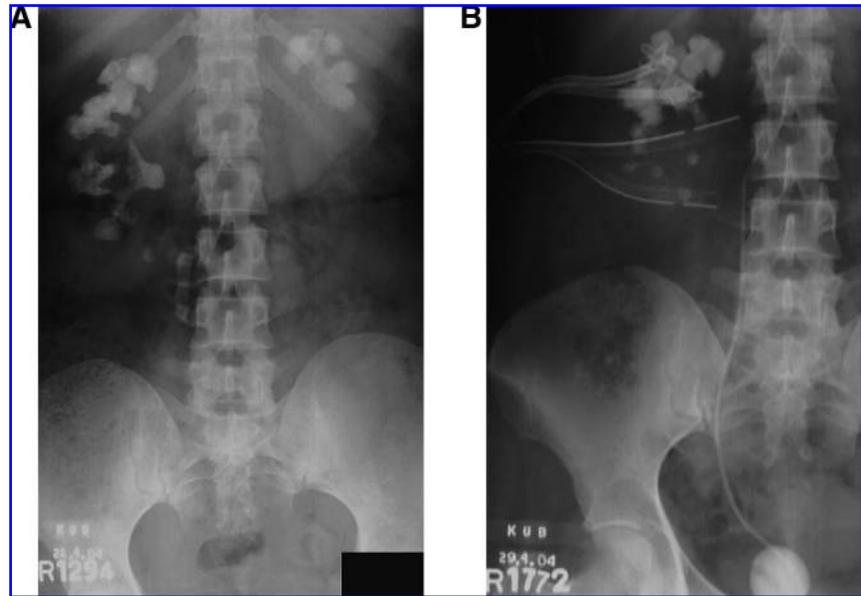


FIG. 1. (A) Radiograph of the kidneys, ureters, and bladder. (B) Initial preplaced tracts and partial clearance in stage 1.

Multiple-tract access is thus able to address the primary objective of establishing the highest probability of stone-free rates. In addition to knowledge of its efficacy, it is worthwhile to know some of the concerns regarding this approach.

Table 2 shows the authors' experience with both approaches for staghorn calculi.³ The Table shows that increasing the number of tracts does not increase the complication rates. The stone selection criteria for single tract were smaller stone burden or partial staghorn stone, where multiple tract was not really necessary.

Concerns and issues

Bleeding. Desai and colleagues^{2,3} have shown the importance of the learning curve and use of ultrasonography guidance for reducing bleeding. It has been reported that use of large-size Amplatz sheath results in more blood loss and subsequent increased transfusion rates.⁴ Guohua and coworkers⁴ restricted the multiple tracts to 14 to 18F and were able to achieve clearance of 93% in 100 renal units with the

multiple-tract approach with a blood transfusion rate of only 3%. In the studies by Desai and associates,^{2,3} the Amplatz size is also restricted to 26 or 28F. Also, the other punctures are parked with guidewires only. Once the main tract is used, then only the remaining tracts are dilated. This results in overall less bleeding and blood transfusion.

The safety and efficacy of multiple tracts for staghorn calculi are reported even for pediatric cases.⁵ Manohar and colleagues⁵ and Guohua⁴ and coworkers have illustrated the use of tracts as small as 14F. Manohar and colleagues⁵ have demonstrated the use of the multi-miniperc technique in children using small tracts for the purpose of reducing blood loss and achieving comparable clearance rates.

The studies of Desai and associates^{2,3} and Singla and coworkers⁶ reflect the importance of the population studied. Most of the patients with these stones are anemic and need blood transfusions to build them up for the surgery. If the anemia of chronic disease or baseline renal insufficiency is excluded, then 18.7% of the patients in the series by Singla and

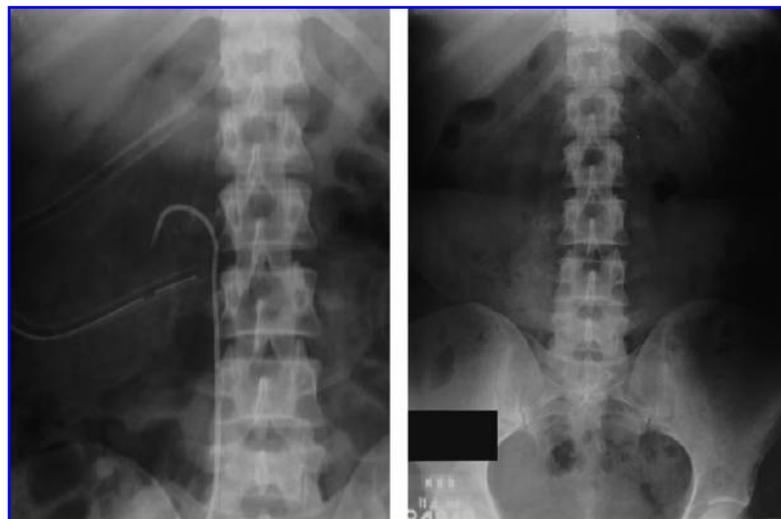


FIG. 2. Complete clearance in second stage.

TABLE 1. STUDIES OF USE OF MULTIPLE TRACTS FOR STAGHORN CALCULUS MANAGEMENT

Parameters	Aron ¹³	Liatsikos ¹⁴	Guohua ⁴	Hegarty ⁷	Singla ⁶
No of renal units	121	100	100	20	149
Stone-free rate	84%	87%	93%	95%	88.9%
Blood transfusion	14.8%	45%	3%	20%	46%
Complications (major)	4.1%	10%	4%	10%	14%
Hospital stay (mean-days)	Not mentioned	4.6 (3–14)	9.4 (6–13)	4.25 ± 1.74	6.8 (3–28)

associates⁶ still needed transfusion. The hospital stay and the blood transfusion rates in a study from Desai and associates² have decreased to 7.1 ± 3.6 days and 11.9%, respectively, as the operators gained experience.

Bowel injury. A concern with multiperc is associated bowel injury. Desai and associates² have shown an incidence of just 0.35% with use of ultrasonography when gaining access; this may again suggest that ultrasonography-guided puncture may have a role in decreasing the incidence of such injury.

Hospital stay. A concern with the multiple-tract approach is long hospital stay. Desai and associates² stress the factors inherent to the local population that resulted in a longer hospital stay. Most of the patients in this series came from far off places and/or from places that had poor healthcare facilities. Among the other studies, Guohua and coworkers⁴ also show a longer hospital stay, reflecting the same phenomenon. The hospital stay in the rest of the series is fewer than 4 days.

In taking a critical look at single tracts for staghorn calculi, the studies thus far are lacking in terms of patient selection and are all retrospective studies. There is only one series by Hegarty and Desai⁷ that is comparative; however, the shortcoming of this study is the small number of patients.

The real advantage to the multiperc approach is that flexible instrumentation and the consequent learning curve and maintenance cost are not necessary. Multiperc PCNL does not need an extra-sophisticated instrument, which helps in cost containment.⁵

Single Tract with Flexible Nephroscopy

A large renal stone burden can be successfully managed with a single percutaneous access with its limited blood loss. The development of flexible nephroscopy, holmium laser lithotripsy, and improved basketing technology has made single-access PCNL feasible in selected patients. In this tech-

nique, percutaneous access is achieved with an 18-gauge, diamond-tip needle. A calix is chosen in such a way that it offers maximum clearance of stone bulk. This is usually an upper-pole calix. Flexible nephroscopy is performed after debulking the stone with rigid nephroscopy. A 20F catheter is placed on conclusion. Second-look PCNL is performed after 1 week, if necessary.⁸ Wong and Leveillee⁹ in their study could achieve clearance rates of 95% in 35 patients with a single puncture followed by flexible nephroscopy in a staged manner. Interestingly, stone-free rates after a single sitting were only 51.4%. Patients were discharged with a nephrostomy catheter and were re-treated by ancillary procedures after 1 week. The majority of the patients needed flexible nephroscopy for stone retrieval. The conclusion of the study was that this treatment modality helps in rendering the patient stone free without the need for sandwich therapy.⁹ Perhaps, the same group of patients would have been rendered completely stone free with the addition of multiple tracts even at the cost of extending the hospital stay.

The same concept was proposed by Landman and coworkers¹⁰ who applied a ureteral access sheath for simultaneous ureteroscopy from below along with lower calix single-tract PCNL for single-access ablation of nine staghorn and partial staghorn calculi. Complete stone clearance was achieved in 7 of the 9 (78%) cases using this technique, with a hospital stay of 3.2 days and no major complications. Marguet and associates¹¹ applied the same concept, albeit with the difference that ureterorenoscopy was performed from below first to clear the stones in the peripheral calices, which would have needed a second or third nephrostomy access in the supine position. Once the remote calculi were cleared, then the patient was placed in the prone position and single access PCNL performed.

Undre and colleagues¹² have described the technique of “pass the ball,” wherein large multiple or complex stones were managed by use of flexible instruments through percutaneous and retrograde approaches. Table 3 shows data on published studies of single-access PCNL with flexible instrumentation

TABLE 2. DIFFERENCES IN USE OF SINGLE OR MULTIPLE TRACTS

Parameters	Single tract (%) (n = 225)	Multiple tract (%) (n = 500)	P value
Clearance rates	194 (86.4%)	420 (84.1%)	0.06
Blood transfusion	19 (8.4%)	62 (12.4%)	< 0.01
Hemoglobin drop (g%)	1.4	2.1	0.06
Complications	10 (4.6%)	23 (5%)	0.92
Hospital stay (days-mean)	7.4	11.1	< 0.001

TABLE 3. STUDIES OF SINGLE-ACCESS PERCUTANEOUS NEPHROLITHOTOMY

Parameters	Wong ⁹	Landman ¹⁰	Marguet ¹¹
No. of renal units	35	9	7
Stone-free rate	95%	78%	71.4%
Blood transfusion	2.2%	0%	0%
Complications	2.8%	22.2%	Nil
Hospital stay (mean-days)	2 (1–10)	3.2	Not mentioned
Chest complications	2.8%	11.1%	Nil

for staghorn and complex calculi. The advantage of this approach is decreased hospital stay and blood transfusion rates.

One of the prime concerns of the single-tract approach is the hampered vision because of the bleeding, which makes use of flexible instruments challenging. This aspect of the single-tract approach has not been published in detail thus far. One of the logical conclusions of the staged PCNL after 1 week from a published case report⁸ and series⁹ highlight the issue. Maintaining the nephrostomy for a week may add additional morbidity for the patient. If that is the case, then definitely the multiple-tract approach has an edge.

Conclusion

Multiperc or the multiple-tract approach has the ability to achieve stone clearance without increasing the cost of flexible instruments. The procedure can be made more efficient by measures such as ultrasonography-guided punctures, staging the procedures, and restricting the nephroscopy time. A surgeon who can achieve a primary tract can create secondary tracts; this does not require that a learning curve be overcome. The clearance in the multitract approach is not dependent on the anatomy, such as infundibular stenosis.

Although the clearance rates of single tract with judicious use of flexible instruments are equivalent, the drawback of this approach is the need for a supracostal tract with its potential morbidity, the cost involved in the instrumentation, and the learning curve. In addition, the major limitation of this approach, as of today, is the paucity of adequately powered studies.

Until properly designed prospective studies report a conclusion, as of today, the multiple-tract approach has an edge over the single-tract approach in terms of achieving maximal stone-free rates within a single hospital admission. Prolonged hospital stay and higher transfusion rates are still the issues with the multiperc approach, which needs proper head-to-head comparison.

Disclosure Statement

No competing financial interests exist.

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Abbreviations Used

AUS = American Urological Association
PCNL = percutaneous nephrolithotomy

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