Original Article

Comparison of Two Treatment Methods "One Shot" and "Sequential" on Reduction the Level of Hemoglobin in Patients with Percutaneous Nephrolithotripsy in Al Zahra Hospital in 2012–2013

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Abstract

Background: Access dilation is the most important part of percutaneous nephrolithotripsy (PCNL) that is done by different methods, especially metal telescoping and one shot. In this study, two different methods of access dilation one shot and telescoping were compared. **Materials and Methods:** In observational cross-sectional study, 240 patients who were a candidate for PCNL were selected and randomly divided into two groups. The first group was undergone one-shot method and the second group was undergone telescoping method. The decrease in hemoglobin (Hb), duration of hospitalization and the time of radiation exposure during access dilation was compared in two groups by SPSS software version 21, (SPSS Inc., Chicago, IL, USA). **Results:** The decrease of Hb level after intervention in one-shot group was 1.08 ± 1.23 g/dl and in telescoping, group was 1.51 ± 1.08 g/dl with no difference statistically (P = 0.37). The mean duration of hospitalization in one shot and telescoping group were 2.36 ± 0.67 and 2.28 ± 0.61 days, respectively. According to t-test, there was no significant difference between the two groups (P = 0.37). Average radiation exposure in one shot group was 7.13 s and in telescoping, group was 35.75 s, and there was a significant difference between the two groups (P < 0.001). **Conclusion:** One-shot method is superior to telescoping method due to less time for radiation exposure and no more blood loss and other complications during PCNL.

Keywords: *Metal telescoping, one shot, percutaneous nephrolithotripsy*

Introduction

Urinary stones are the main problems of the urinary tract system and after urinary tract infection (UTI) and prostate pathology one of the most common diseases in the urinary tract system. This disease affects 2%–3% of the total population. The disease is common in the third and fourth decades of life and men are affected 3–5 times more than women and 50% of the patients relapse within 5 years after treatment.[1]

Staghorn kidney stones are the ones which occupy a big portion of the urinary collective system, and it typically encompasses the pelvis and splits in all or some calyces. Awaiting treatment in these stones results in kidney damage. In addition, the kidney stones more than 2 cm are not suitable for extracorporeal shock wave lithotripsy. Percutaneous nephrolithotripsy (PCNL) is the treatment of choice for these types of stones.[2-7]

First and foremost phase in PCNL is creating an access from skin to the kidney. Access dilation is done by different methods under C-arm guide. The methods which are used for access dilation concluding balloon dilatators, metal telescopic, and one shot.[8,9]

Complications of PCNL are bleeding, infection, stone residue, injury to collecting system, and urinary extravasation.

One of the most important complications of PCNL is bleeding, and the most etiology for this complication is access dilation from skin to collecting system. During this stage, vascular, and parenchymal damage can cause severe bleeding during surgery or after operation. In addition, creating access is done under C-arm and exposure to X-ray is important both for patients and physicians.[10-13] The aim of this study is comparison the two methods for access dilation one shot and sequential method about the time of creating access and thus the time of radiation exposure and the decrease of hemoglobin (Hb) during the operation.

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Materials and Methods

This observational cross-sectional study was conducted from 2012 to 2013 in Isfahan Al Zahra Hospital. The target population was the patients with kidney stones who were scheduled for PCNL.

According to Cochran sample size calculation formula to compare the mean values at the confidence level of 95% and power of 80%, a standard deviation (SD) of Hb as 1.55 and the least significant difference between the two groups considered as 0.4; approximately, 120 patients assigned to the both "one-shot" and "telescopic" groups with simple random sampling method.

Inclusion criteria included age over 18 years, kidney stones larger than 2 cm, and exclusion criteria were uncontrolled coagulation disorders and UTI and morbid obesity. All patients had intravenous urography or spiral abdominal computed tomography scan.

Laboratory tests, including cell blood counts, Hb, and platelet count, coagulation tests, urinalysis, and urine culture and if it was necessary chest X-ray and electrocardiogram were conducted.

Patients were divided randomly into two groups. PCNL in both groups was performed with general anesthesia. In both groups, after insertion a ureteral stent the patients were placed in prone position and with an injection of contrast media under C-arm the system was punctured with appropriate calyces and a guide wire was placed in the system. In the first group, the access was gradually dilated up to 28 Fr using metal telescopic dilators. In the second group, the access was dilated with an Amplatz dilator to 28 Fr in one shot. In both groups, after access dilation, an Amplatz sheath was inserted into the collecting system under the guide of C-arm. Then with a rigid nephroscope and pneumatic probe the stone was crushed and removed by forceps. At the end of the procedure, an 18 Fr nephrostomy tube was put in the system, and nephrostography was done under C-arm to ensure extravasations and collecting system injuries. After 48 h, nephrostomy tube was removed and if there was no problem the patient was discharged.

The Statistical Package for Social Sciences (SPSS) version 21.0 for Windows (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. Data were expressed as mean ± SD and were analyzed by Fisher's exact test, Chi-square, and independent sample *t*-test. So $P < 0.05$ was considered statistically significant.

Results

This study was done on 240 patients went under PCNL that were divided into two groups of 120 patients with one-shot method and 120 patients with telescoping method. The mean age in one shot and telescoping group was 44.6 ± 14.8 years and 44.4 ± 15.3 years, respectively with no significant difference between two groups ($P = 0.88$). The men to women ratio in one-shot group was 76/44 and in telescopic was 74/46 and according to Chi-square, the gender distribution was not significantly different in the two groups ($P = 0.79$).

The mean Hb level before surgery in both groups is not significantly different ($P = 0.15$). Furthermore, after surgery, the mean level of Hb in the two groups was not different ($P = 0.50$) [Table 1 and Figure 1].

Although 10 patients in one shot and 12 patients in telescoping method needed blood transfusion, changes in Hb level in two groups had no significant difference ($P = 0.21$). The average duration of getting radiation in one shot group was 7.13 s and in telescoping, group was 35.78 s, and there was a significant difference between the two groups ($P < 0.001$). The mean of hospitalization in one shot group was were 2.36 ± 0.67 days and in the sequential group was 2.28 ± 0.61 days with no significant difference ($P = 0.32$) [Table 1].

Finally, in the nephrostography done at the end of operation, three patients (2.5%) in one-shot group and four patients (3.3%) in telescopic group had extravasation because of collecting system injury during PCNL. In the next five day later with preservation of nephrostomy tube extravasation were healed in all of these patients. Fisher's exact test showed no significant difference between the two groups ($P = 0.99$).

The mean duration of urinary leak from nephrostomy site after tube removal in one shot group was 10.5 ± 9.4 h and

Table 1: Comparison of hemoglobin levels in the two groups in patients before and after percutaneous nephrolithotripsy

Variables	One shot (*n*=120)	Telescopic (*n*=120)	*P*
Hb before treatment (mg/dl)	13.45±1.73	13.79±1.86	0.15
Hb after treatment (mg/dl)	12.39±1.68	12.2±1.86	0.50
Hb change (mg/dl)	1.08±1.23	1.51±1.08	0.21
Mean time of exposed (s)	7.13±1.36	35.75±6.71	*<0.001
Hospitalization (days)	2.36±0.67	2.28±0.61	0.32

Data shown mean±SD. *Level significant was <0.05. Hb: Hemoglobin, SD: Standard deviation

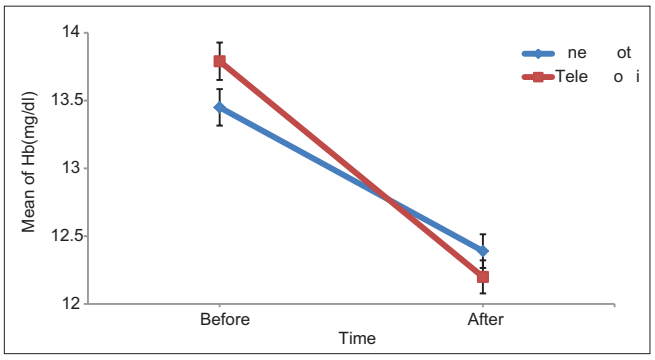

Figure 1: The mean of hemoglobin level before and after percutaneous nephrolithotripsy in the two groups (g/dl)

in telescoping, group was 10.3 ± 9.5 h and according to *t*-test, no significant difference was observed between the two groups ($P = 0.9$).

Discussion

PCNL is the procedure of choice for Staghorn stone and kidney stone larger than 2 cm. The aim of this study was to compare the complication and efficacy of two methods which are used for access dilation in PCNL. Blood loss is one the most important and most prevalent complication in this surgery. The main etiology for hemorrhage is access dilation which can be done with different methods. In Faas *et al*. 4% of the patients whom underwent PCNL, required blood transfusion and blood transfusion during the operation were reported as almost 5%–12%.[14] In Davis *et al*. blood transfusion has been almost 14% without complications. The decrease in Hb level was in average 2.8 g/dl in patients treated with one-shot method.[15] In Salonia *et al*. blood transfusion has been reduced up to 7% after PCNL.[16] According to national and international surveys, the required amount of blood transfusion in PCNL has been reported 5%–12%. Abbou *et al*. used metal telescopic dilatator and they reported no more blood loss with this technique in comparison to one shot.[17] In other study by Corbel *et al*., 9% of the patients required transfusion.[18] Also in Amjadi *et al*. the decrease in Hb concentration in two methods of one shot and telescoping had not significant difference.[19] In this study, the decrease in Hb level was similar in two groups, and therefore both methods for access dilation were safe, and there was not a difference in blood loss during PCNL in two groups. In addition, the other complications such as urinary extravasations because of collecting system injury, leak of urine after nephrostomy tube removal from the nephrostomy site were identical. One of the major concerns is radiation exposure during PCNL under fluoroscopic guide and fluoroscopy time should be as low as possible. Fluoroscopic screening time (FST) in PCNL is a critical factor in radiation exposure.[20-23] In this study, the amount of radiation received in telescoping method was significantly more than one-shot method. Thus, one-shot method is safer than telescoping method because of less exposure to X-ray for patient and surgeon. Features that can effect on FST are having a large stone and several accesses. The amount of radiation exposure will reduce with the use of protective such as lead drapes (lead coating), protective goggles, protective collars, thick lead gown (5 mm), and lead gloves.

According to the results of this study and comparison with other studies, PCNL with one-shot method is superior to metal telescoping method due to less time need for access dilation and less exposure to radiation, while this approach was not associated with more decrease in Hb level and other complication.

In this study, we focused on radiation exposure in one shot and telescoping dilation. It is a good idea to compare these methods in more details in future, but the limitations of our study can be possible laboratory errors or the differences between the patients' body mass index, anatomy and the stone size that may effect on bleeding or radiation exposure. Although the mentioned factors may have not very important impacts, we have tried to eliminate their effects by the large sample size.

Conclusion

Both one shot and telescoping methods for access dilation in PCNL are eligible. However, we prefer one-shot method, when possible, because of less radiation.

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Conflicts of interest

There are no conflicts of interest.

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