



STONES/ENDOUROLOGY

ORIGINAL ARTICLE

# Balloon dilator versus telescopic metal dilators for tract dilatation during percutaneous nephrolithotomy for staghorn stones and calyceal stones



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## KEYWORDS

Percutaneous;  
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Dilators

## ABBREVIATIONS

BD, balloon dilator  
(dilatation);  
TMD, telescopic metal  
dilator (dilatation);  
PCNL, percutaneous  
nephrolithotomy

**Abstract Objective:** To compare the results of balloon dilatation (BD) vs. telescopic metal dilators (TMDs) in establishing the tract for percutaneous nephrolithotomy (PCNL) in patients with calyceal stones or staghorn stones, but with no hydronephrosis.

**Patients and methods:** Data from selected patients over 4 years were recorded retrospectively. Patients with complex staghorn stones, an undilated targeted calyx, or the stone filling the targeted calyx, were included in the study. In all, 97 patients were included, of 235 undergoing PCNL between March 2010 and March 2014, and were divided into two groups according to the technique of primary tract dilatation. Group A included patients who had BD and group B those treated using TMDs.

**Results:** In group A (BD, 55 patients) dilatation was successful in 34 (62%). The dilatation failed or there was a need for re-dilatation using TMD in 21 patients (38%). In one of these 21 patients the dilatation failed due to extravasation. In group B (TMD, 42 patients) dilatation was successful in 38 (90%) patients, with incomplete dilatation and a need for re-dilatation in four (10%) patients, and no failed procedures. Group A had a significantly higher failure rate than group B ( $P < 0.001$ ). Dif-

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ferences in operative duration, blood loss, stone-removal success rate and complication rate were statistically insignificant.

**Conclusion:** BD has a higher failure rate than TMD when establishing access for calyceal stones or staghorn stones that have little space around them.

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## Introduction

The technique of percutaneous nephrolithotomy (PCNL) was first established in 1976 by Fernstrom and Johansson [1]. PCNL rapidly became a routine procedure and with technological advances in endourological instruments over the last three decades it has gradually replaced open surgery for managing large renal calculi [2]. Currently PCNL should be the first option for treating large renal stones of > 2 cm, multiple stones, staghorn stones or large lower calyceal stones [3].

The access tract can be dilated using a balloon dilator (BD), telescopic metal dilator (TMD), an Amplatz semi-rigid dilator or a single-step dilator [4,5]. TMDs, first introduced by Alken in 1985, comprise a series of sequentially enlarging coaxial metal rods that pass over an 8-F guide (central) rod. The rigid metal dilator system is considered the most effective dilator, especially if there are dense perinephric adhesions from previous renal surgery, and it is cheaper than other disposable dilators like the Amplatz and BD. However, it can cause perforation of the pelvicalyceal system if the dilatation is not well controlled [6].

BDs have the disadvantages of higher cost and lower efficacy than rigid TMDs and semirigid Amplatz dilators, especially in cases with perinephric adhesions due to previous surgery. There is evidence from previous reports that BDs are associated with less bleeding and lower blood transfusion rates than are other dilators [7–9].

There are particular cases where the limited space around the stone is a challenge for tract dilatation, with an increased risk of guidewire slippage and subsequent failure to dilate the tract. Such difficulty is mostly encountered in patients with calyceal stones, staghorn stones but no hydronephrosis, and an anteriorly located targeted calyx [10].

The aim of the present study was to compare the results of BD and TMDs in patients with calyceal stones or staghorn stones with a limited space around the stone in the targeted calyx.

## Patients and methods

This was a retrospective study in which patients with complex staghorn stones or calyceal stones underwent PCNL. They were divided into two groups, being treated with BDs in group A and TMDs in group B as a primary

dilatation technique. The records of patients over the 4 years from March 2010 to March 2014 were reviewed; all were operated on by one surgeon (M.E.-S.).

Patients were included if they had calyceal stones with no space around the stone (stone-casting calyx), anterior calyceal stones, or complex staghorn stones with little space around the stone. Patients were excluded if they had hydronephrosis or renal pelvic stones with the targeted calyx free of stones, uncorrected coagulopathies, previous renal surgery, or previous intercostal (supracostal) access, as it was reported previously that BD is inferior to TMD in these cases.

All patients were assessed using multislice noncontrast CT. Urine samples were cultured routinely before surgery and appropriate antibiotics given for 7 days before PCNL in patients with positive urine cultures or when infected stones were suspected.

All patients had a general anaesthetic. A ureteric catheter (5 F, open-tip) was fixed with the patient in the lithotomy position, and then the patient was turned prone. Access was established by a urologist, under fluoroscopic guidance, using a two-plane technique at 0° and 30°. A stiff guidewire was used, and sometimes a Terumo guidewire first, to find the space to pass the wire, and then the stiff guidewire was passed for dilatation. In group A two fascial dilators (6 and 8 F) were used, followed by the BD (30 F, length 55 cm, balloon length 15 cm; Cook, Spencer, Indiana, USA) inflated up to 1.4 MPa. Full inflation of the balloon throughout its length was confirmed in each case by using contrast medium for inflation. After 30 s the sheath (30 F, 17 cm; Cook) was passed over the inflated balloon. The balloon was then evacuated and removed.

In group B the first step in tract dilatation was to pass the 8-F guide (central) rod over a stiff guidewire. Then each successive metal rod was telescopically passed until the desired tract was achieved, mostly up to 26 F. Exposure to fluoroscopy during the sequential dilatation was limited, to decrease the fluoroscopy time.

Bleeding was estimated from the decrease in the haematocrit value. Blood transfusions required during and after surgery were recorded. The dilatation time, total operative duration and success rates were recorded, the last being defined as the patient being rendered stone-free, or with clinically insignificant residual fragments of <4 mm. This was usually assessed using a plain abdominal film and ultrasonography, and in

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