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Lower Pole Caliceal Stone Clearance After Extracorporeal Shock Wave Lithotripsy: The Effect of Infundibulopelvic Angle

Bannakij Lojanapiwat, MD
Surithorn Soonthornpun, MD
Supot Wudhikarn, MD

Department of Surgery, Faculty of Medichne, Chiangmai University, Changmai, Thailand.

Abstract **Extracorporeal Shock Wave Lithotripsy (ESWL) represents the first choice therapy for renoureteral stone disease. Clinical controversy exists concerning the efficacy of ESWL for lower pole kidney stones. Nowadays, the factors that hindering the spontaneous passage of stone debris resulting from ESWL of lower caliceal stone are the gravity - dependent position of the lower pole calices and particular features of the inferior - pole collecting system anatomy.**

We studied the influence of the lower infundibulo-pelvic anatomy in the success of ESWL of lower caliceal stone size 10-20 millimeter in 50 patients with Storz Modulith SL-20 machine. At the mean follow-up of 6 months, 44 per cent of the patients presenting an infundibulo-pelvic angle of lesser than 90° became stone free. On the other hand, 86% of the patients presenting an infundibuo-pelvic angle of greater than 90° became stone free. Our data suggested that acute infundibulo-pelvic angle of lower pole hindered the spontaneous passage of stone fragments after ESWL.

Extracorporeal shock wave lithotripsy (ESWL) is the preferred management for the majority of patients who require the intervention of kidney stones including those in calices due to its noninvasive nature, low complication rate and high patient acceptance.[1-4] The success of ESWL depends on the size, composition and the location of the stone within the kidney. Nowadays, there is a consensus that the poor success rate of ESWL is in the treatment of lower caliceal stones particularly when the stone size is greater than one centimeter or in cases of multiple stones.[3] The main factor that hinders the spontaneous passage of stone debris resulting from ESWL of lower caliceal stone is the gravity - dependent position of the lower-pole calices. The

other important factor is the particular features of the inferior - pole collecting system anatomy that could be important in fragment retention.[1,5,6]

For this work, we studied the influence of the lower infundibulo-pelvic angle in the success of ESWL of lower caliceal stone clearance.

Materials and Methods

Patients

We prospectively analyzed 50 patients submitted to ESWL for treatment of single lower pole caliceal stone with Storz Modulith SL-20 machine. All of stone sizes are between 10-20 millimeter. The patients were divided into two groups according to the lower infundibulo-pelvic angle. The angle was measured concerning the calyx where the stone was located. The mean number of shockwaves per treatment was 5,000.

Infundibulo - Pelvic Angle Measurement

For measurement of the angle, two lines must be drawn.

The first line (Line A) is the line between the central axis of the upper ureter and the central axis of the ureteropelvic region (Figures 1, 2)

The second line (Line B) is the line drawn through the central axis of the main infundibulum if the stone is located in a calyx whose neck follows the axis of the main inferior-infundibulum (Figure 1). If the stone is in the minor calyx, the line is drawn through the central axis of the neck of the calyx where the stone is located (Figure 2).

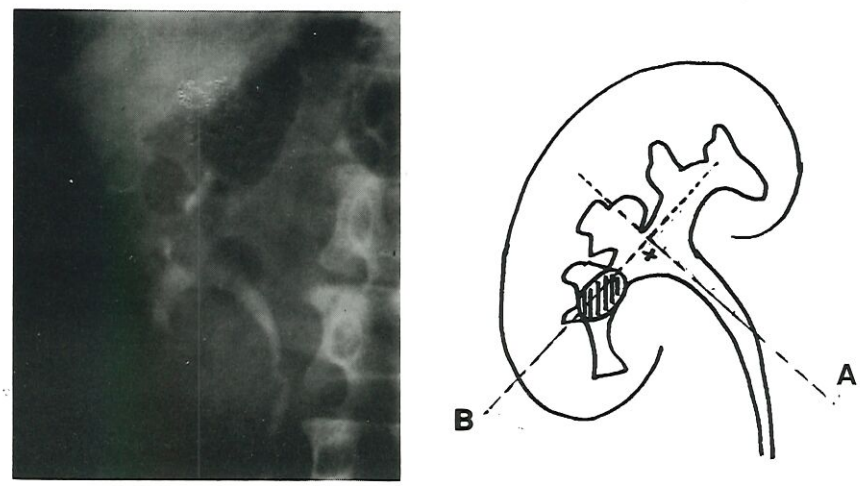

Fig. 1 Anterior view of right pelviocaliceal system, I-P angle measures 100° (Obtuse Angle)

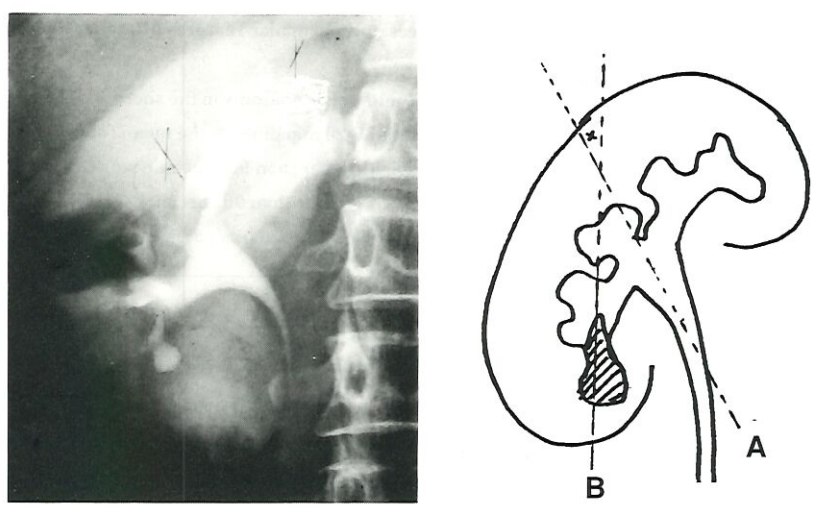

Fig. 2 Anterior view of right pelviocaliceal system, I-P angle measures 35° (Acute Angle)

Table 1 Results of stone clearance 6 months after extra corporeal shockwave treatment of Lower pole caliceal stones.

Group	I-P angle (mean)	Number of patient	Stone free (%)
I	<90° (~25.5°)	36	16 (44%)
II	>90° (~95.25°)	14	12 (86%)

The total stone free is 56%

After the first and second lines have been drawn, the angle (×) is measured at the intersection of the lines (Figures 1,2).

Result

The mean follow-up of the patients was 6 months. The results of stone clearance was show in Table 1.

In 36 patients, an angle of >90° (obtuse angle) was formed between the inferior - pole calyx where the stone was located and the renal pelvis. In the other 14 patients, the angle was < 90° (acute angle).

Discussion

Extracorporeal Shock Wave Lithotripsy (ESWL) is the first choice therapy for renoureteral stone disease because of its noninvasive nature, low complication rate, and high patient acceptance. However, considerable clinical controversies exist concerning the management of lower pole kidney stones. The debate related to the efficacy of shock wave lithotripsy and percutaneous nephrolithotomy entails several factors such as the stone size, composition, type of lithotriptor and lower pole caliceal anatomy.[4,7] Lingeman et al reported that the efficacy of percutaneous nephrolithotomy wass independent of stone size (approximately 90% stone free), but the efficacy of shock wave lithotripsy decreased rapidly as the stone size increased (stone-free rates from 74% for stone less than 1 cm. to 33% for stones greater than 2 cm). They and Chan et al advocated the use of percutaneous nephrolithotomy as primary treatment for lower pole stones, especially if the stone size exceed 1 cm.[2,7]

Residual stone debris in the collecting system might lead to pain, hydronephrosis, urosepsis, nidus for future stone formation and recurrent urinary tract infection.[1] The reasons for delayed, insufficient, or absent discharge of residual lower-pole fragments are the gravity-dependent positiion of the lower calices and some particular features of the inferior pole collecting system anatomy.

Sampaio et al reported that the success rate for ESWL of lower pole caliceal stone depended on the inferior pole collecting system anatomy (Infundibulopelvic angle, angle of infundibulum to the verical plane and infundibular diameter).[1] The stone free rates of solitary lower pole stones with the angle less than 90° and more than 90° were 23-38 per cent and 57-75 per cent, respectively.[1,6]

Determination of the angle between infundibulum-pelvic and the inferior calyx where the stone is located is very important because the angle may differ even in the same kidney depending on the stone location.

Our data observed from 50 patients undergoing ESWL for treatment of single lower pole caliceal stone showed that an acute angle between the calyx where the stone is located and the renal pelvis is a significant negative factor in the rate of stone clearance after ESWL for stone of 10-20 mm size located in the lower pole of the kidney.

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