Commentary

How to determine the treatment options for lower-pole renal stones

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As the incidence of renal stones is increasing, a variety of treatment modalities have been developed. Current treatment options for renal stones include extracorporeal shock wave lithotripsy (ESWL), retrograde intra-renal surgery (RIRS), and percutaneous nephrolithotomy (PCNL). Traditionally, the treatment method was determined according to the size of the stone, such as PCNL for larger stones (>2 cm) and ESWL or RIRS for small or intermediate-sized stones. With further development of instrumentation and techniques, high success rates of these modalities have been reported for properly selected stones. However, although PCNL has an excellent stone-free rate, it is associated with a significant risk of morbidity and a higher complication rate compared to ESWL or RIRS. ESWL and RIRS do not always guarantee successful outcomes, especially for lower-pole stones. Thus, the treatment of lower-pole stones, especially intermediate sized (≤2 cm) stones, is still controversial. ESWL has advantages of non-invasiveness and minimal or no anesthesia requirement; it is easier to perform in multiple sessions and requires few assistants. However, a lower stone-free rate is its drawback (1). RIRS can be expected to yield a better stone-free rate compared to ESWL and has less morbidity compared to PCNL, but it requires anesthesia and a laser lithotripter. In addition, its main disadvantage is the requirement for flexible ureteroscopes, which are fragile and provide a smaller area of visualization and significantly smaller stone fragment removal (2). Updated guidelines from the European Association of Urology (EAU) only recommended PCNL for large renal stones (>20 mm), ESWL or RIRS for small renal stones (<10 mm), and RIRS or PCNL for lower calyceal stones sized 10–20 mm with unfavorable factors for ESWL (3). Subsequently, several studies tried to compare the effectiveness and safety of ESWL, RIRS, and PCNL and develop advanced guidelines for management of lower-pole renal stones.

Recently, to compare the clinical effectiveness of ESWL, RIRS, and PCNL, Donaldson *et al.* (4) conducted a systematic review and meta-analysis of the clinical effectiveness of ESWL, RIRS, and PCNL for lower-pole renal stones (≤20 mm). They included 691 patients from 12 articles reporting on seven randomized controlled trials. They reported that stone-free rates were highest after PCNL, although PCNL was the most invasive technique and requires the longest hospital stay. They also confirmed that RIRS can offer higher stone-free rates compared to ESWL, but ESWL is the least invasive procedure, being associated with the shortest convalescence and the highest acceptability to patients, particularly when multiple sessions are not needed. However, limitations of this systematic review include few studies reporting on the comparison of PCNL and RIRS, and the lack of reliable evidence concerning outcomes other than stone-free rate, such as length of stay, analgesic requirements, patients' quality of life, and economic outcomes. Despite these limitations, they concluded that PCNL and RIRS were superior to ESWL in terms of stone-free rate for the management of ≤20 mm lower-pole renal stones.

Choosing the least invasive procedure as an initial therapy for renal stones is optimal only if it has a good chance of clearing the stones with a single treatment session. Thus, ESWL has been tried as the first treatment modality for renal stones in many centers due to its simplicity and noninvasiveness. Meanwhile, failure of a first trial of ESWL requires a further ESWL procedure, or other alternative procedure, both of which increase medical costs (5). Therefore, it is important to select appropriate patients, based on pretreatment factors, who are likely to

benefit from ESWL.

Many studies have been performed to identify favorable or unfavorable factors for ESWL. Several factors, such as stone size, composition of stone, skin-to-stone distance, and Hounsfield Unit values measured by computed tomography have been reported as predictors of ESWL outcome (6-9). In addition, the EAU guideline recommends that lower-pole stones with unfavorable anatomy, such as steep infundibulocalyceal angles, long calyceal necks, and narrow infundibulum should be initially managed with RIRS or PCNL, not ESWL (3). It is still not certain that all of these factors can truly affect and predict the outcomes of ESWL. In addition, some factors, such as stone composition and geometrical features, are difficult to measure in detail prior to treatment with current diagnostic tools.

The success rate of ESWL for lower-pole stones might be higher if the proper patients with favorable conditions are selected after considering these factors. However, most studies comparing outcomes between ESWL and other endoscopic procedures did not enroll patients after considering unfavorable factors for ESWL. In contrast, most of the reported outcomes of RIRS and PCNL may be achieved by only those with expertise and skill. Therefore, further studies comparing the outcomes between ESWL for patients with favorable factors to RIRS or PCNL are needed to confirm the true effectiveness of ESWL for lower-pole stones.

There is no doubt that endoscopic procedures can achieve better stone-free outcomes for lower-pole stones with a diameter exceeding 10 mm as compared to ESWL. Accordingly, the EAU guideline recommends endoscopic procedures as a primary treatment for lower-pole stones with a diameter greater than 10 mm (3). However, choosing RIRS or PCNL for 10–20 mm sized lower-pole renal stones are still controversial. Traditionally, RIRS has superiority in terms of less morbidity and a shorter convalescence, but PCNL has shown better stone-free rates.

Recently, miniaturized PCNL procedures, such as mini-PCNL and micro-PCNL, have been introduced and developed in an attempt to reduce the morbidity associated with the procedure (10,11). A recent systematic review and meta-analysis comparing PCNL and RIRS showed that standard PCNL can achieve better stone-free rates than those of RIRS, but miniaturized PCNL did not have better success rates compared to RIRS although it reduced morbidity to a level comparable to RIRS (12). Unfortunately, most of the studies included in this systematic review did not limit the cases only to those with lower-pole stones. Donaldson *et al.* (4) also included only one study that compared PCNL and RIRS in their systematic review due to a paucity of well-designed analyses comparing PCNL and RIRS for lower-pole renal stones. Therefore, more prospective randomized controlled trials comparing RIRS, PCNL, and mini-PCNL for lower-pole renal stones with a diameter less than 20 mm are needed.

Intermediate (10–20 mm) sized lower-pole renal stones are common and more likely to need management because they are less likely to pass spontaneously. There are several options for management of intermediate-sized lower-pole stones, such as ESWL, RIRS, and PCNL. Although a high stone-free rate is important, morbidity and invasiveness are also important factors to consider because nephrolithiasis is not a fatal disease. Previous studies associated with intermediate-sized lower-pole stones showed that PCNL provides the highest stone-free rates and RIRS also offers higher stone-free rates than ESWL. However, considering ESWL is the least invasive procedure and has the shortest convalescence, we should consider ESWL as an initial therapy if the patient has favorable factors. Therefore, further studies to identify and validate the favorable factors for ESWL are needed. In addition, further efforts to reduce the morbidity and convalescence time of PCNL should be continued.

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Footnote

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