

# Surgical Treatment of Urolithiasis

د.علي هادي سبهان

The choice of surgical treatment of urolithiasis is related to several factors such as: size, site and shape of the stone at the initial presentation. Therefore, spontaneous stone passage can be expected in up to 80% in patients with stones < 4 mm in diameter while for stones with a diameter > 7 mm, the chance of spontaneous passage is very low.

To date, the available modalities in the management of urolithiasis include: extracorporeal shock wave lithotripsy (ESWL), percutaneous nephrolithotomy (PCNL), ureterorenoscopy (URS) and open or laproscopic surgery.

## **ESWL**

- ESWL is abbreviation for: **Extracorporeal Shock Wave Lithotripsy**.
- It exposes patients to less anesthesia, and yields equivalent stone-free rates in appropriately selected patients.

### Components of ESWL Unit:

lithotripsy unit consist from 4 basic components:

- (1) **Shockwave generator** ; which either Electrohydraulic or Electromagnetic or Piezoelectric.
- (2) **Focusing system**, The focusing system is used to direct and concentrate the shockwaves.
- (3) **Coupling mechanism** ; a coupling system is needed to minimize the dissipation of energy of a shockwave as it traverses the skin surface. The medium used usually are water or a coupling gel like those used with ultrasonography provides an excellent interface with skin.
- (4) **Imaging / localization unit**. Three methods commonly used to localize stones include fluoroscopy , ultrasonography or both .

### Mechanism of Action

A stone fragmentation is thought to occur through a combination of methods, including **compressive** and **tensile** forces, **erosion**, **shearing**, **spalling**, and **cavitation**.

## Factors affect the outcome of ESWL:

### 1-Stone-related factors: including:

- **Stone burden (size and number)** As stone size approaches 2 cm, the likelihood of success with ESWL decrease.

- **Stone composition**

The density and ability of a stone to resist ESWL is based in part on the composition of the stone. Stones composed of calcium oxalate dihydrate, magnesium ammonium phosphate, or uric acid tend to be softer and to fragment more easily with ESWL. Stones composed of calcium oxalate monohydrate or cystine, are harder and are less susceptible to ESWL.

- **Stone location**

Lower-pole renal calculi : Although ESWL can fragment stones in the lower pole of the kidney, the resulting stone-free rate is decreased because of the difficulty in passing stones from this location.

Ureteral calculi : Fragmentation of proximal stones is more effective than mid or distal stones.

**2-Clinical factors** :the patient's tolerance of symptomatic events, associated urinary tract infection, solitary kidney, and abnormal ureteral anatomy.

**3-Technical factors** : equipment availability for treatment and costs.

## Indications

*ESWL is the "Treatment of Choice" for:*

1. Small renal stones(Less than 2 cm.), proximal and distal ureteric stone.
2. Patients unfit for surgery or anesthesia
3. Previously operated patients

## Contraindications

<b>Absolute contraindications</b>	<b>Relative contraindications</b>
<ol style="list-style-type: none"><li>1. Acute urinary tract infection or urosepsis</li><li>2. Uncorrected bleeding disorders or coagulopathies</li><li>3. Pregnancy</li><li>4. Uncorrected obstruction distal to the stone</li></ol>	<ol style="list-style-type: none"><li>1. Body habitus like morbid obesity and orthopedic or spinal deformities which may complicate or prevent proper positioning.</li><li>2. Renal ectopy or malformations (eg, horseshoe kidneys and pelvic kidneys)</li><li>3. Poorly controlled hypertension (due to increased bleeding risk).</li><li>4. aortic or renal artery aneurism.</li></ol>

## **Complications:**

### **I- Renal complications**

1. Post-ESWL hematuria is usually mild and transient.
2. Perinephric hematoma or subcapsular hematoma
3. Stone fragments may pass with a minimal amount of discomfort. In some patients, the comminuted stone fragments pile up in the ureter, creating a virtual column of stone called steinstrasse.
4. Bacteriuria or bacteremia is less common.
5. Renal atrophy, although uncommon, can result from renal vascular or severe atherosclerotic disease.

### **II- Other (non-renal) complications:**

Less-common complications may include :

- (1) pulmonary contusion, (2) pancreatitis, (3) splenic hematoma, (4) impaired liver functions (transient), and (5) biliary colic with inadvertent fragmentation of adjacent biliary stones.