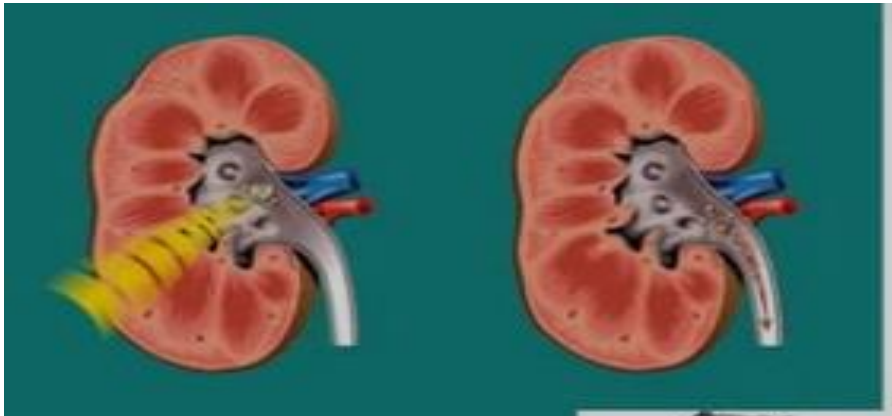
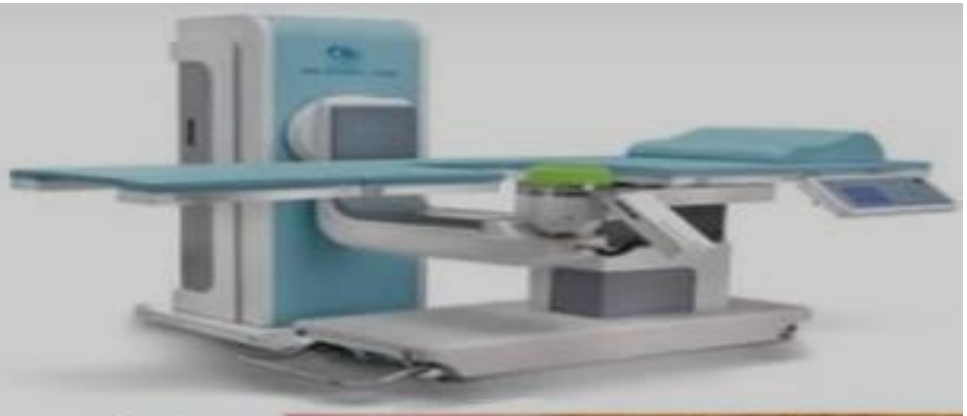
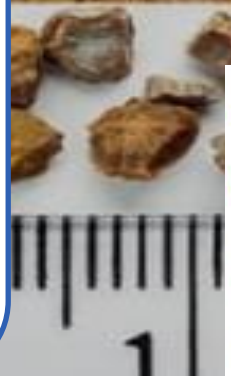






Extracorporeal shock wave lithotripsy

Lecturer: Dr Salma Al Qazzaz

Medical instrumentation

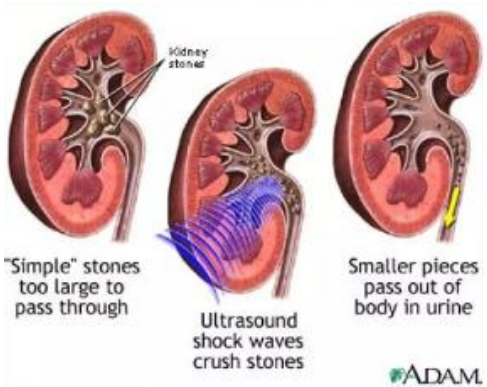
4th stage Medical physics students

2024

Introduction to Lithotripsy

Definition and Uses

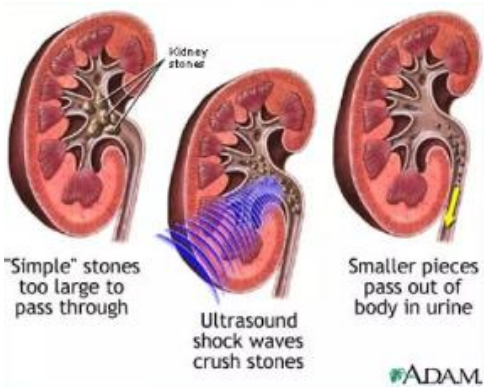
- Lithotripsy is a noninvasive (the skin is not pierced) procedure used to treat kidney stones that are too large to pass through the urinary tract.
- Lithotripsy treats kidney stones by sending focused ultrasonic energy or shock waves directly to the stone first located with fluoroscopy (a type of X-ray “movie”) or ultrasound (high-frequency sound waves).
- The shock waves break a large stone into smaller stones that will pass through the urinary system. Lithotripsy allows persons with certain types of stones in the urinary system to avoid an invasive surgical procedure for stone removal



Introduction to Lithotripsy

What The words mean

- extracorporeal: from outside the body
- shock waves: pressure waves
- lithotripsy (the Greek roots of this word are "litho" meaning stone, and "tripsy" meaning crushed)
- Extracorporeal Shock Wave Lithotripsy (ESWL)



When can SWL be used?

- SWL works better with some stones than others. Very large stones cannot be treated this way. The size and shape of the stone, where it is lodged in your urinary tract, your health, and your kidneys' health will be part of the decision to use it. Stones that are smaller than 2 cm in diameter are the best size for SWL. The treatment might not be effective in very large ones.

- SWL is more appropriate for some people than others. Because x-rays and shock waves are needed in SWL, pregnant women with stones are not treated this way. People with bleeding disorders, infections, severe skeletal abnormalities, or who are morbidly obese are also not usually good candidates for SWL. If your kidneys have other abnormalities; your doctor may decide you should have a different treatment. If you have a cardiac pacemaker, a cardiologist will decide if you can have SWL.

Principles and Components of ESWL?

1- Shock Wave Generation: The shock waves are generated outside the body using an electromagnetic or piezoelectric device. These shock waves are focused on the location of the kidney or gallstones.

2- Shock Wave Focusing: The shock waves are focused using a reflector system to ensure they converge precisely at the stone location, maximizing their impact.

3- Patient Positioning: The patient is positioned on a specialized treatment table that allows precise targeting of the stones using imaging techniques such as ultrasound or fluoroscopy.

Principles and Components of ESWL?

4- Monitoring and Adjustments: During the procedure, the physician monitors the progress using imaging to ensure the shock waves are effectively breaking down the stones. The intensity and frequency of the shock waves may be adjusted as needed.

5- Stone Fragmentation: The shock waves create high-pressure waves that shatter the stones into smaller pieces, reducing their size for easier passage through the urinary or biliary system.

6- Post-Procedure Monitoring: After the lithotripsy session, patients are monitored for any complications and may be given medications or instructions to help with stone passage and pain management.

ESWL Components:

[1] Image intensifier
[2] Monitor support arm with (one or) two monitors
[3] Therapy C-arm
[4] Patient table with attached foot section
[5] One of the control panels
[6] Therapy head with EMSE and coupling cushion
[7] Therapy head support
[8] X-ray tube
[9] Basic unit
[10] Cover of the left connection b
[11] Rack for endourological units
[12] X-ray C-arm
[13] Flat Panel Detector (FPD)

What does the treatment involve?

- The patient will be positioned on an operating table. A soft, water-filled cushion may be placed on the patient's abdomen or behind his kidney. The body is positioned so that the stone can be targeted precisely with the shock wave. In an older method, the patient is placed in a tub of lukewarm water. About 1-2 thousand shock waves are needed to crush the stones. The complete treatment takes about 45 to 60 minutes.

- After the procedure, the patient will usually stay for about an hour and then be allowed to return home if all goes well. The patient will be asked to drink plenty of liquid, strain their urine through a filter to capture the stone pieces for testing, and may need to take antibiotics and painkillers. Some studies have reported stones may come out better if certain drugs (calcium antagonists or alpha-blockers) are used after SWL.

What can the patient expect after treatment?

- The recovery time is usually short. After treatment, the patient can get up to walk almost at once.
- Many people can fully resume daily activities within one to two days.
- Special diets are not required, but drinking plenty of water helps the stone fragments pass.
  For several weeks, you may pass stone fragments.

What are the advantages and disadvantages of this treatment?

Advantages

1- Non-Invasive: ESWL is a non-invasive procedure, meaning it does not require surgical incisions. This reduces the risks associated with surgery and typically results in shorter recovery times.

2- High Success Rates: ESWL has high success rates for treating kidney stones, particularly smaller stones in the kidney or upper ureter.

3- Minimal Pain: Patients undergoing ESWL generally experience minimal pain during the procedure compared to surgical interventions.

4- Outpatient Procedure: ESWL is often performed as an outpatient procedure, allowing patients to return home the same day.

Disadvantages

1- Limited Stone Size: ESWL is most effective for smaller kidney stones (typically less than 2 centimeters in diameter). Larger stones may require alternative treatments.

2- Multiple Sessions: Some patients may require multiple ESWL sessions to completely break down and eliminate the kidney stones. This can prolong the treatment process.

3- Possible Side Effects: While uncommon, ESWL can lead to potential side effects such as bruising, minor bleeding, or discomfort during urination.

4- Fragmentation Residue: After ESWL, patients may pass stone fragments in their urine. Occasionally, these fragments may cause pain or discomfort.