

Conic sections in lithotripsy



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Conic Section Real-World Application:

Lithotripsy, or ECSL is a non-invasive treatment for urinary calculosis (Kidney stones) and Biliary Calculi (Stones in the Liver and Gallbladder).

This method uses powerful sound waves to crush the stone(s) into very small pieces that can easily travel through the Urethra. How it Works This process requires an ellipsoid device called a lithotripter with an opening for the patient to lie in. For the machine to work correctly the stone has to be placed exactly on the focus that is closer to the opening and is stuck with high-frequency shock/sound waves at a rate of 120 shocks per minute. The sound itself is produced at the focus of the ellipsoid that is on the side opposite of the hole. The shockwaves that are sent then crush the stone. The process as a whole takes about one hour to complete. Use of the Ellipsoid Now, the part where the elliptical shape of the machine is important is in the reflection of the sound wave, since the stone is in an area with many important organs the sound wave needs to have great accuracy.

In order for the lithotripter to work using the reflective property of the ellipse, the patient's stone must be at one focus point of the ellipsoid and the shockwave generator at the other focus, because the angles of the beam are equal to the line tangent to the ellipse, as shown in the picture below. Then when the beams are sent, they land exactly on the stone and make it into small pieces. Conclusion Conic sections, complicated as they can be, have many great uses in the real world such as Lithotripsy, LORAN (a hyperbolic tracking system), GPS (uses satellites that transmit circular

signals), and a solar panel (uses parabola to concentrate light at its focus) and should definitely be used for further technological development.