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“The Era of Shock Wave Lithotripsy is Over” – “NO” response

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Shock wave lithotripsy (SWL) has evolved considerably since introduction of the famous bathtub, the unmodified Dornier HM3 device. This device was highly effective and, further, achieved very reproducible results from one institution to another. However, the HM3 was a large, expensive, and somewhat cumbersome device so efforts were made to simplify the lithotripsy treatment process. Companies moved away from the water bath to dry treatment head lithotriptors. It is widely accepted that these devices do not fragment stones as efficiently and result in higher retreatment rates and lower stone-free outcomes.¹ In contradistinction, during the era of the advent of SWL in the early and mid-1980s, ureteroscopy was limited to large rigid devices that were suitable only for application to the lower ureter in most cases. The technology and technique of ureteroscopy has advanced remarkably over the last 30 years and now, using modern semi-rigid and flexible devices, any stone that heretofore would have been considered for SWL can also be managed via ureteroscopic techniques. Indeed, the application of ureteroscopic procedures for upper urinary tract calculi now exceeds that of SWL all around the world. This raises the question of whether or not the era of shock wave lithotripsy is over. It is my opinion that while the near universal application of shock wave lithotripsy for renal and ureteral calculi is no longer justifiable, SWL continues to have an important role. The key here is proper patient selection for those patients who might be expected to respond well to SWL, as well as attention to the technical aspects of the SWL procedure.

In my view, minimizing the number of procedures required for any given stone event is of paramount importance to patients, so I choose SWL when I believe there is a high likelihood of successful stone clearance with a single session of lithotripsy. Factors to consider in proper patient selection include patient size, which is most effectively indexed by using the skin-to-stone distance (SSD). An SSD of greater than 10cm is associated with poor SWL outcomes.² A second important selection factor, long known to be relevant to SWL outcomes, is stone size or volume. Stone-free outcomes are inversely related to stone burden treated and I would consider any stone with a diameter of over 15mm to be unfavorable for treatment with SWL. In the modern era of the common use of computed tomography (CT) for the evaluation of urolithiasis patients, we are provided with stone volume and also stone density. Numerous reports indicate that there is an inverse correlation between stone density and stone fragmentation with SWL. All three of these factors can be put together into what Tran et al described as a Triple D Score (skin-to-stone *D*istance, stone *D*ensity, and ellipsoidal stone volume *D*iameter).³

Careful attention to the rate of shock wave administration, proper coupling of the treatment head to the patient, and the type of anesthesia selected during SWL also have important influences in the success of lithotripsy. There is powerful clinical evidence to support an inverse relationship between the rate of shock wave administration and outcomes with

SWL.⁴ I perform lithotripsy at 1 HZ which parenthetically is the rate that was typically utilized with the HM3 device. This may have been another factor in its remarkable success. Dry head lithotriptors need to be carefully coupled to the patient's flank as even as little as 5% coverage of the contact area with air pockets can reduce fragmentation significantly.⁵ Finally, the current day electromagnetic lithotriptors characteristically have a very small focal zone with high peak pressures. This means that controlling patient movement and respiration are important to ensure maximum contact of the shock wave to the stone. Using adequate anesthesia has been demonstrated to improve clinical outcomes in several publications.

While there is no longer an equal sign between kidney stone and SWL, many patients can expect successful stone clearance with a minimum number of procedures using this non-invasive technology so long as the above considerations are properly attended to.

References

1. Bhojani N, Mandeville JA, Hameed TA, et al. Lithotripter outcomes in a community practice setting: comparison of the LithoGold LG-380 and Storz Modulith SLX. *J Urol.* 2015; 193:875–879. [PubMed: 25305356]
2. Pareek G, Hedican SP, Lee FT Jr, et al. Shock wave lithotripsy success determined by skin-to-stone distance on computed tomography. *Urology.* 2005; 66(5):941–944. [PubMed: 16286099]
3. Tran TY, McGillen K, Blanchard Cone E, et al. Triple D score is a reportable predictor of shockwave lithotripsy stone-free rates. *J Endourol.* 2015; 29(2):226–230. [PubMed: 25046472]
4. Li K, Lin T, Zhang C, et al. Optimal frequency of shock wave lithotripsy in urolithiasis treatment: a systematic review and meta-analysis of randomized controlled trials. *J Urol.* 2013; 190:1260–1267. [PubMed: 23538240]
5. Bohris C, Roosen A, Dickmann M, et al. Monitoring the coupling of the lithotripter therapy head with skin during routine shock wave lithotripsy with a surveillance camera. *J Urol.* 2012; 187:157–163. [PubMed: 22100005]