

# *Splenic rupture following shock wave lithotripsy*

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*We present the case of a 61-year-old female who underwent extracorporeal shock wave lithotripsy (ESWL) treatment of a 12 mm left ureteropelvic junction stone. Following an uneventful and successful treatment, the patient was discharged. The patient re-presented to the emergency room 24 hours later with abdominal pain and hypotension. CT of the abdomen revealed a*

*shattered spleen necessitating emergent removal. The patient recovered without difficulty. Although splenic rupture following shock wave lithotripsy (SWL) has been reported previously, this case represents the only published report of splenic rupture with use of a third generation electromagnetic lithotripter. Our report will highlight the details of the case and comment on the salient literature concerning visceral injury following lithotripsy.*

**Key Words:** lithotripsy/adverse effects, splenic rupture/etiology, tomography, x-ray, computed, kidney calculi/therapy

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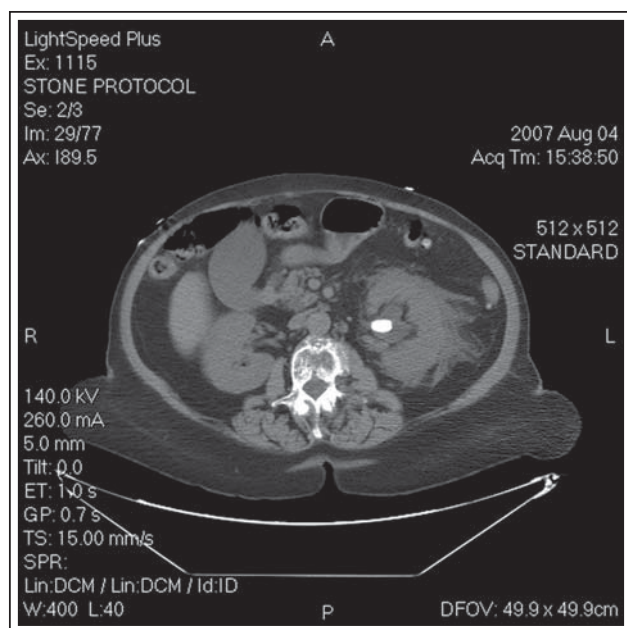
## Introduction

Adverse outcomes following shock wave lithotripsy are relatively uncommon with a cited complication rate in the literature of between 3%-7%.<sup>1,2</sup> While

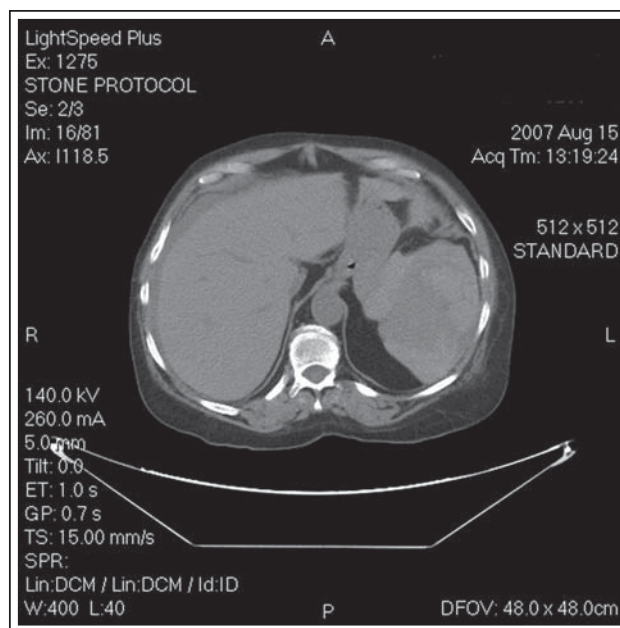
the majority of these are limited to urinary tract infections, perirenal hematomas, and persistent pain requiring hospital admission, the literature lacks uniformity in reporting and, as such, the true rate and nature of post-ESWL complications is speculative. Vascular and visceral injuries following ESWL have been previously published but are exceedingly rare and reportable.<sup>3-5</sup> The specific complication of splenic rupture following ESWL has been reported five times previously, but never with use of a third generation lithotripter.<sup>6-10</sup> We present a case of splenic rupture in a 61-year-old female following treatment with a third-generation lithotripter.

### Case presentation and management

A 61-year-old female with a past medical history including diabetes mellitus, hypertension, and an unidentified connective tissue disorder presented to an outside emergency department with acute left flank pain, nausea, and vomiting. A noncontrast CT of the abdomen was obtained demonstrating a 12 mm left renal pelvic stone with mild hydronephrosis and perinephric stranding, Figure 1. The patient's pain was controlled with oral narcotics and outpatient follow-up was arranged the following week. An



**Figure 1.** Axial computed tomography of the abdomen demonstrating the 12 mm left ureteropelvic junction stone with associated mild hydronephrosis and perinephric stranding.



**Figure 2.** Axial computed tomography of the abdomen demonstrating the shattered spleen post-SWL with associated hematoma and free fluid.

abdominal radiograph confirmed the radioopaque nature of the stone. The patient was given the option of ureteroscopic stone extraction versus shock wave lithotripsy and elected the latter.

The patient underwent cystoscopy with placement of a 6 French double-J ureteral stent and treatment of her stone with the Dornier Compact Delta Lithotripter under fluoroscopic control. Approximately 1300 shocks were administered to the stone at 14kV and the remaining 1200 shocks were administered at 18kV. The stone demonstrated excellent expansion and fragmentation. The patient was discharged home after recovering uneventfully in the postanesthesia care unit.

The patient returned to the emergency department approximately 24 hours following treatment with unrelenting abdominal pain and syncope. The patient's hematocrit dropped from 39 to 28 in the 24 hours following treatment and abdominal imaging was ordered. CT of the abdomen and pelvis revealed a large splenic hematoma with multiple splenic lacerations and free pelvic fluid, Figure 2. The patient underwent an exploratory laparotomy through a left subcostal incision. Intraoperatively, avulsion of the entire splenic capsule was noted and fractures through the body of the spleen were consistent with a Grade IV laceration. The spleen was not salvageable and it was removed. No appreciable renal trauma

was noted. The patient had an uncomplicated post-operative course and a follow-up KUB at 3 months demonstrated no residual stone burden.

## Discussion

As stated, adverse outcomes following shock wave lithotripsy are rather uncommon with a cited complication rate of approximately 5%.<sup>1,2</sup> Splenic injuries following ESWL are exceedingly rare with only five prior reports.<sup>6-10</sup> Although the true causative factors in these five cases could not be identified, 2 of the 5 patients did demonstrate pre-existing splenic abnormalities. And while stone location, degree of obstruction, and the type of lithotripter employed cannot be reliably acknowledged as contributory factors, 2 of the 5 patients were treated with the Dornier MFL 5000 at 24kV (high energy). One author proposed that splenic position and size may impart some risk, but the extremely uncommon nature of this complication precludes us from making a definitive statement in this regard.<sup>8</sup> Anecdotally, it would seem that many more patients with vagaries of spleen size and location undergo uneventful ESWL as compared to the exceptional cases presented in this report. Although our patient demonstrated no appreciable risk factors, one must question whether the presence of a connective tissue disorder treated by chronic steroid use could have imposed some level of risk. We reserve drawing concrete inferences based on this isolated case but may pursue ureteroscopic treatment in this patient population in the future.

The mechanism of induced renal injury during ESWL has been thoroughly studied experimentally. The preponderance of in vivo and ex vivo studies focused on the traumatic effects of lithotripsy on the kidney have identified several predictive factors for renal damage. Age, obesity, coagulopathies, thrombocytopenia, diabetes mellitus, coronary artery disease, and pre-existing hypertension were all found to be risk factors for acute renal damage following ESWL.<sup>11,12</sup> Notably, hypertension, advanced age, and aspirin use (even with discontinuation 2 weeks prior to treatment) were found to be significant predictors of subcapsular hematoma formation. Although the number of shockwaves and energy administered were not associated with hematoma formation, several other animal experiments have found evidence to the contrary.<sup>12-14</sup> Ultimately, it is difficult to extrapolate the aforementioned studies to the spleen and other extra-renal organs. Future animal and observational studies are needed to determine with greater aptitude the effects and predictors of risk that ESWL imparts on the spleen.

We believe that this case helps to highlight the continuing controversy within endourology regarding the treatment of upper ureteral and renal pelvic stones with either ESWL or ureteroscopy. There is considerable movement within the academic community to pursue more aggressive application of ureteroscopic stone extraction owing to its outstanding efficacy and low complication rates in experienced hands. However, the majority of published data has found equivalence in treating stones with either modality and with patient preference favoring ESWL.<sup>15,16</sup> While we would warn against using this exceptionally rare event as fodder for this debate, it nevertheless reinforces the concept that ESWL is not 'noninvasive' and its use must be discriminatory. Until new and mature data is available that can cite reliable predictors of complications from ESWL and ureteroscopy, a more thorough discussion with patients regarding the risks, benefits and alternatives of treatment may be in order. □

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