STONE DISEASE

Impact of body mass index on cost and clinical outcomes after percutaneous nephrostolithotomy

Bagrodia A, Gupta A, Raman JD, Bensalah K, Pearle MS, Lotan Y
Department of Urology, University of Texas Southwestern Medical Center, Dallas, Texas
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Objectives: To evaluate the impact of body mass index (BMI) on clinical outcomes and costs associated with percutaneous nephrostolithotomy (PCNL).
Methods: We reviewed charts of 200 consecutive patients who underwent PCNL between September 2005 and May 2007. We recorded patient and stone characteristics and perioperative outcomes. BMI was available for 150 patients (75%), who comprised our study group. We obtained direct and subcomponent costs (room and board, laboratory, pharmacy, radiology, operating room, surgical supplies, anesthesia, and recovery room). We divided patients into four BMI categories: normal weight (BMI < 25), overweight (25 </= BMI < 30), obese (30 </= BMI < 40), and morbidly obese (BMI >/= 40). We compared groups with regard to baseline characteristics, intraoperative parameters, stone-free and complication rates, and hospital length of stay.
Results: Mean stone size and proportion of patients with staghorn, multiple, and bilateral calculi were similar among groups. The normal weight cohort had proportionately fewer recurrent stone formers and patients with a history of stone surgery, compared with the other groups (P = .005 and P = .03, respectively). We found no significant differences among groups with regard to stone-free and complication rates, operative time, length of stay, or need for multiple accesses. Median direct cost was marginally, but not significantly, higher in normal weight ($8124) compared with overweight ($6746), obese ($6740), and morbidly obese ($6719) patients (P = .75).
Conclusions: Body mass index had no impact on efficacy or complication rates of PCNL. Despite greater perceived difficulty in performing these procedures in overweight and obese patients, it was not more costly.

Editorial Comment

The authors present a compelling argument that BMI should not impact the decision to consider percutaneous nephrolithotomy as safety, efficacy and cost are not affected. The authors note that these conclusions are based on the experience of a single expert-endourologist at a high-volume tertiary referral center.
The authors noted a higher median length of stay (3 vs. 2 days) and higher cost for room and board for the normal weight patients. This could be a reflection of patient expectations. Patients who are experienced (ex. recurrent stone formers, history of stone disease) would have realistic expectations for post-operative recovery that might help drive them down a clinical treatment pathway to earlier discharge - the normal weight patients in this study were less experienced.

Selection bias may impact the results of retrospective studies. There was a strong trend (p=0.06) to the morbidly obese patients being younger (45 years) than the rest of the study cohort (55 years). It is possibly that older morbidly obese patients are directed to ureteroscopy or other modalities. Similarly, the authors note that the ASA class severity was similar across BMI, suggesting that the normal weight patients may have had higher than expected comorbid conditions that may have lead to referral to their tertiary center. This would inflate the costs and length of stay in the otherwise “healthy control” weight category.

One primary challenge in the morbidly obese is the initial percutaneous access. It would be interesting to evaluate the fluoroscopy time, radiation dose, and time to access for this cohort.

Dr. Manoj Monga
Professor, Department of Urology
University of Minnesota
Edina, Minnesota, USA
E-mail: endourol@yahoo.com

Stone attenuation and skin-to-stone distance on computed tomography predicts for stone fragmentation by shock wave lithotripsy

Perks AE, Schuler TD, Lee J, Ghiculete D, Chung DG, D'A Honey RJ, Pace KT
Division of Urology, Department of Surgery, and the Department of Radiology, St. Michael's Hospital and University of Toronto, Toronto, Ontario, Canada
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Objectives: To determine whether stone attenuation and the skin-to-stone distance (SSD) can predict for stone fragmentation by SWL independently. Identifying the factors predictive of shock wave lithotripsy (SWL) outcome would help streamline the care of patients with stones.
Methods: A retrospective review was performed of 111 patients undergoing initial SWL for a solitary, 5-20 mm, renal calculus. Stone size, location, attenuation value, and SSD were determined on pretreatment noncontrast computed tomography. The outcome was categorized as stone free, complete fragmentation <5 mm, and incomplete fragmentation >/=5 mm or unchanged at 2 weeks on kidney/ureter/bladder radiography.
Results: After SWL, 44 (40%) were stone free, 27 (24%) had complete fragmentation, and 40 (36%) of 111 patients had incomplete fragmentation. The stone attenuation of the successfully treated patients (stone free and complete fragmentation groups) was 837 +/- 277 Hounsfield units (HU) vs 1092 +/- 254 HU for those with treatment failure (incomplete fragmentation; P < .01). The mean SSD also differed: 9.6 cm +/- 2.0 vs 11.1 cm +/- 2.5 for the successful treatment group vs the treatment failure group, respectively (P = .01). On multivariate analysis, the factors that independently predicted the outcome were stone attenuation, SSD, and stone composition. When patients were stratified into 4 risk groups (stone <900 HU and SSD <9.0 cm, stone <900 HU and SSD >/=9.0 cm, stone >/=900 HU and SSD <9.0 cm, and stone >/=900 HU and SSD >/=9.0 cm), the SWL success rate was 91%, 79%, 58%, and 41%, respectively (odds ratio 7.1, 95% confidence interval 1.6-32 for <900 HU and SSD <9.0 cm group vs other 3 risk groups; P = .01).
Conclusions: The results of our study have shown that a stone attenuation of <900 HU, SSD of <9 cm, and stone composition predict for SWL success, independent of stone size, location, and body mass index. These factors will be considered important in the prospective design of a SWL treatment nomogram at our center.

Editorial Comment

This study helps establish parameters to guide the counseling of patients undergoing SWL. It is important to consider that the predictive stone attenuation and skin-to-stone distance will be dependent on the peak pressures at F2 and focal area of the lithotripter respectively. As such, this may require the establishment of criteria for each individual lithotripter.

Outcomes were defined by KUB at two weeks - one would expect that the sensitivity of KUB (at best 70%) would be higher for stones with higher stone attenuation and for thinner patients (smaller skin-to-stone distances). As such, the primary conclusions of the study may be skewed by the outcome measure selected - CT scan imaging would have provided a more critical evaluation for this study.

The authors note that collimation widths > 3 mm can impact stone attenuation measurements, smaller stones will have lower stone attenuation levels due to volume averaging with surrounding soft tissue, and indeed in this study stone size correlated with stone attenuation. However, concerns regarding radiation exposure warrant the continued use of 5-mm collimation widths.

Dr. Manoj Monga
Professor, Department of Urology
University of Minnesota
Edina, Minnesota, USA
E-mail: endourol@yahoo.com