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| Gary C. Curhan | |
| <p>Epidemiology has improved our understanding and management of stone disease. Epidemiologic studies, by quantifying patterns and burden of disease, have helped identify risk factors, leading to changes in clinical practice and providing insights into pathophysiologic processes related to stone formation. Because nephrolithiasis is a complex disease, an understanding of the epidemiology, particularly the interactions among different factors, may help lead to approaches that reduce the risk of stone formation.</p> | |
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| Nicole L. Miller, Andrew P. Evan, and James E. Lingeman | |
| <p>Recent reports suggest that kidney stone disease prevalence is increasing. Despite significant treatment advances, the inciting factor and sequence of events leading to kidney stone formation remain elusive; however, recent efforts to understand the pathogenesis of nephrolithiasis have led to a delineation of the human surgical anatomy, histopathology, and metabolic factors in a variety of kidney stone formers. This article reviews the fundamental concepts of calculus formation, and the leading theories of stone pathogenesis, focusing on recent data from human papillary and renal cortical biopsies in stone formers that provide evidence for the role of Randall's plaque in kidney stone disease pathogenesis. These data suggest there are individual stone-forming phenotypes with unique surgical anatomy, histology, and metabolic profiles.</p> | |
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urologist, rather than members of other medical specialties, seems to have the primary responsibility of the medical management of stone disease. Thus, it is essential for the urologist to have a good working knowledge of the principles of metabolic evaluation and kidney stone prevention. This article provides guidelines related to metabolic evaluation and the prevention of kidney stones.

Pathophysiology and Management of Calcium Stones

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Sangtae Park and Margaret S. Pearle

Nephrolithiasis is a common disorder that accounts for significant cost, morbidity, and loss of work. There is a one in eight lifetime chance of being diagnosed with urinary stones. Calcium is the most common component of renal stones in individuals in industrialized nations. Calcium stones form as a result of a variety of environmental and metabolic abnormalities that change the urinary environment and increase supersaturation of stone-forming salts. Understanding the pathophysiology of stone disease can help direct treatment toward correction of the underlying abnormalities. Current medical and dietary therapeutic regimens have been shown to significantly reduce the risk of recurrent stone formation.

Uric Acid Nephrolithiasis

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Mary Ann Cameron and Khashayar Sakhaee

Uric acid nephrolithiasis may be the final manifestation of various pathophysiological processes. Recent advances in renal urate transport have elucidated mechanisms by which hyperuricosuria occurs. However, in most uric acid stone formers the primary pathophysiologic defect is an excessively acidic urine pH rather than hyperuricosuria. Insulin resistance may contribute to the development of acidic urine by augmenting endogenous acid production and decreasing renal ammonium excretion. Medical management strategies focus primarily on alkali treatment or decreasing hyperuricosuria.

Management of Cystinuria

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Alexandra Rogers, Samer Kalakish, Rahul A. Desai, and Dean G. Assimos

Cystinuria is a monogenic disorder in which there is a transepithelial transport defect of di-basic amino acids, including cystine, ornithine, lysine, and arginine (COLA). This results in diminished reabsorption of these amino acids in both the intestine and renal proximal tubule. This article describes the disorder, reviews the mechanisms of normal COLA renal transport, and summarizes issues related to the disorder, such as the role of mutations, associated diseases, clinical manifestations, therapies, the renal impact, and handling of pediatric patients.

Pathophysiology and Management of Infectious Staghorn Calculi

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Kelly A. Healy and Kenneth Ogan

The American Urological Association Nephrolithiasis Guidelines Panel recently conducted a critical meta-analysis of the existing literature to determine the optimal management for staghorn calculi. This article briefly discusses the pathophysiology of staghorn calculi and, based on the panel's recommendations, examines the alternative medical treatments (eg, chemolysis) and surgical treatments (eg, shock wave lithotripsy, open surgery, ureteroscopy, and percutaneous nephrolithotomy) available for staghorn patients. Considering the various modalities for staghorn disease, percutaneous nephrolithotomy should be the first-line treatment for most patients based on its superior efficacy and low morbidity.

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| New Concepts in Shock Wave Lithotripsy | 375 |
| Alon Z. Weizer, Pei Zhong, and Glenn M. Preminger | |
| <p>This monograph reviews the basic principles of shock wave lithotripsy. The focus is on new research on stone fragmentation and tissue injury and how this improved understanding of shock-wave technology is leading to modifications in lithotripsy that will allow this therapy to be a safer, more effective treatment for nephrolithiasis.</p> | |
| Advances in Percutaneous Nephrostolithotomy | 383 |
| Leslie A. Deane and Ralph V. Clayman | |
| <p>Percutaneous nephrolithotomy was first performed in 1976. In the past 30 years, many refinements to the procedure have been made and it has become the gold standard for the management of large and complex renal calculi. This article reviews advances made in the field and highlights the nuances of the technique. The large published series are reviewed and their results discussed.</p> | |
| Advances in Ureterorenoscopy | 397 |
| Darren T. Beiko and John D. Denstedt | |
| <p>There has been a shift toward minimally invasive surgery in all surgical subspecialties in recent decades. Ureterorenoscopy represents an area in which there have been numerous advances that have resulted in excellent patient outcomes with low morbidity. Technologic advances such as miniaturization of ureteroscopes and improved video imaging have expanded the indications for ureteroscopy. The entire upper urinary tract can now be accessed for diagnosis and treatment of many common urologic conditions. Technologic research and development will continue to drive future improvements in the technique and applications for ureteroscopy.</p> | |
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| C. Charles Wen and Stephen Y. Nakada | |
| <p>This article summarizes the history of how renal stones have been treated over the centuries and reviews current treatments and outcomes for renal stones. The authors provide an algorithm based on available outcome data for shock wave lithotripsy, ureteroscopy, and percutaneous nephrolithotomy.</p> | |
| Treatment Selection and Outcomes: Ureteral Calculi | 421 |
| J. Stuart Wolf Jr. | |
| <p>The most important recent advances in the management of ureteral calculi have been the development of medical expulsive therapy to facilitate passage of ureteral stones, such that many calculi that would previously have required procedural treatment now exit the ureter with only pharmacologic treatment; and the improvements in ureteroscopic technology that have enabled retrograde ureteroscopy to become a first-line option for most ureteral stones. Shock wave lithotripsy still plays an important role for many ureteral calculi, particularly smaller ones, and the addition of percutaneous/antegrade ureteroscopy and laparoscopic ureterolithotomy rounds out the treatment options for large or impacted stones. Selection of treatment based upon factors such as size, location, and others will optimize outcome for patients who have ureteral calculi.</p> | |

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| Treatment of Stones Associated with Complex or Anomalous Renal Anatomy Mantu Gupta and Michael W. Lee | 431 |
| <p>This article reviews the most common renal anomalies and the management of patients with calculus disease in anomalous kidneys. The emphasis is on minimally invasive techniques to achieve a stone-free status with minimal morbidity.</p> | |
| Economics of Stone Management Yair Lotan and Margaret S. Pearle | 443 |
| <p>Cost, in addition to efficacy and morbidity, has become an important factor in determining the best therapeutic modality for a variety of disease states. A comprehensive literature search finds that, in general, for staghorn calculi, percutaneous nephrostolithotomy is more cost-effective than shock wave lithotripsy (SWL) for stones greater than 2 cm in any dimension, while SWL may be cost-effective for smaller stones. For ureteral stones, observation is the least costly treatment strategy. Among surgical options, ureteroscopy is less costly than SWL. For single and recurrent stone formers, medical prophylactic strategies involving drug therapy are more costly than conservative therapy involving dietary measures alone. However, drug strategies yield fewer stone recurrences.</p> | |
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