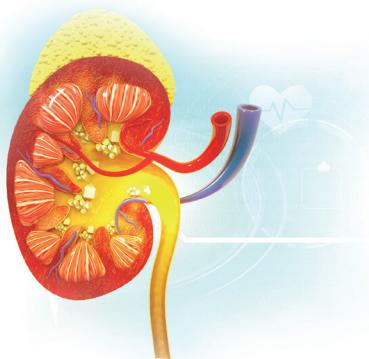


# BÖLÜM 3



## ÜRİNER SİSTEM TAŞ HASTALIĞINDA METABOLİK DEĞERLENDİRME, DİYET VE MEDİKAL TEDAVİ

Sait BİÇER<sup>1</sup>

### GİRİŞ

Üriner sistem taş hastalığı; gelişmiş toplumlarda yaşam boyu %10-15 oranında görülen, sık karşılaştığımız bir hastaliktır (1). Altı büyük retrospektif çalışmadan yapılan bir derlemede, böbrek taşlarının doğal kümülatif nüks oranının ilk bir yılda %14,5, beş yılda %35, on yılda %52 olduğu gösterilmiştir (2). Yine Avrupa Üroloji Birliği (EAU) 2022 kılavuzunda taş formasyonları için risk faktörlerinden bahsederken yakın zamanda yapılan bir derlemede, ilk defa taş oluşturan hastalarda %26 oranında tekrarlama sıklığı gözleendiği belirtilmiştir (3). İlk defa taş oluşturan hastaların tekrar taş oluşturma riskinin zamanla artmakta olduğu gözlenmiştir. Bu da bu hastalarda genel popülasyona göre metabolik bir değerlendirme gerekliliğini ortaya koymuştur. Taşın bileşimi ileri tetkik ve tedavi aşamasında yol gösterici olmaktadır. Sıklıkla gözlenen taş bileşenleri aşağıdaki Tablo 1'de EAU kılavuzları doğrultusunda ele alınmıştır (4).

### TAŞ ANALİZİ KİME VE NE ZAMAN YAPILMALI

Hastanın öyküsü, fizik muayenesi ve tetkikleri sonucu hastanın düşük ya da yüksek risk gruplarından hangisine girdiğine karar verilmelidir. Düşük veya yüksek risk grubu fark etmeksızın tüm taş hastalarına temel inceleme için idrar

<sup>1</sup> Uzm. Dr., Çankırı Devlet Hastanesi Üroloji Kliniği, saitbicer@hotmail.com

**Bilinmeyen yapıda taşı olan hastaların değerlendirmesinde yapılacak araştırmalar için öneriler (EAU 2022 Kılavuzu) (4)**

Öneri	Araştırma endikasyonu	Öneri Düzeyi
<b>Araştırma</b>		
<b>Tıbbi öykü alınmalıdır.</b>	<ul style="list-style-type: none"> <li>Taş öyküsü (eski taşlar, aile öyküsü)</li> <li>Diyet alışkanlıklar</li> <li>İlaç kullanımı</li> </ul>	Güçlü
<b>Tanısal görüntüleme yapılmalıdır.</b>	<ul style="list-style-type: none"> <li>Taş şüphesinde USG</li> <li>Kontrastsız spiral BT</li> <li>Hounsfield skaları kullanılarak olası taşın kompozisyonu hakkında bilgi edinilebilir</li> </ul>	Güçlü
<b>Kan analizi yapılmalıdır.</b>	<ul style="list-style-type: none"> <li>Kreatinin</li> <li>Kalsiyum (iyonize kalsiyum veya total kalsiyum + albümín)</li> <li>Ürik asit</li> </ul>	Güçlü
<b>İdrar analizi yapılmalıdır</b>	<ul style="list-style-type: none"> <li>İdrar pH profili (her işemeden sonra, günde en az dört ölçüm)</li> <li>Dipstick testi: lökosit, nitrit, protein, idrar pH'sı, özgül ağırlık</li> <li>İdrar kültürü</li> <li>İdrar sedimentinin mikroskopik incelemesi (sabah idrarı)</li> <li>Siyanid nitroprussid testi (sistin taşının dışlanması)</li> </ul> <p>İleri araştırmalara ihtiyaç olup olmadığı yukarıda sıralanan sonuçlara bağlıdır.</p>	Güçlü

## KAYNAKLAR

- Umbehr MH, Müntener M. Urinary stone disease - size isn't all that matter. Ther Umsch. 2021 Jun; 78(5):215-221. doi: 10.1024/0040-5930/a001263.
- Uribarri J, Oh MS, Carroll HJ. The first kidney stone . Ann Intern Med 1989 Dec 15;111(12):1006-9. doi: 10.7326/0003-4819-111-12-1006
- Ferraro, P.M., et al. Risk of recurrence of idiopathic calcium kidney stones: analysis of data from the literature. J Nephrol, 2017. 30: 227
- A. Skolarikos (Chair), A. Neisius, A. Petřík et al. EAU guidelines on urolithiasis. European Association of Urology. <http://uroweb.org/guidelines/urolithiasis/chapter/guidelines> [Accessed 15th March 2022]
- A Trinchieri<sup>1</sup>, F Ostini, et. al. A prospective study of recurrence rate and risk factors for recurrence after a first renal stone. J Urol 1999;162:27-30

6. Norman, R.W., et al. When should patients with symptomatic urinary stone disease be evaluated metabolically? *J Urol*, 1984. 132: 1137
7. Urine evaluation (in: Evaluation of the stone former), In: 2ND International Consultation on Stone Disease, H.M. Assimos D. Chew B, Hautmann R, Holmes R, Williams J, Wolf JS, Editor. 2007, Health Publications
8. Tiselius, H.G. Standardized estimate of the ion activity product of calcium oxalate in urine from renal stone formers. *Eur Urol*, 1989. 16: 48
9. Ackermann, D., et al. Use of the computer program EQUIL to estimate pH in model solutions and human urine. *Urol Res*, 1989. 17: 157.
10. Kavanagh, J.P., et al. Why does the Bonn Risk Index discriminate between calcium oxalate stone formers and healthy controls? *J Urol*, 2006. 175: 766.
11. Rodgers A.L., et al. JESS: What can it teach us?, In: Proceedings of Renal Stone Disease 1st Annual International Urolithiasis Research Symposium, 2-3 November 2006., A.P. Evan, Jr, Editor. 2007, American Institute of Physics: Melville, New York <https://ui.adsabs.harvard.edu/abs/2007AIPC..900..183R/abstract>
12. Sarica, K., et al. The effect of calcium channel blockers on stone regrowth and recurrence after shock wave lithotripsy. *Urol Res*, 2006. 34: 184. <https://pubmed.ncbi.nlm.nih.gov/16463053/>
13. Fink, H.A., et al. Medical management to prevent recurrent nephrolithiasis in adults: a systematic review for an American College of Physicians Clinical Guideline. *Ann Intern Med*, 2013. 158: 535. <https://pubmed.ncbi.nlm.nih.gov/23546565/>
14. Borghi, L., et al. Urinary volume, water and recurrences in idiopathic calcium nephrolithiasis: a 5-year randomized prospective study. *J Urol*, 1996. 155: 839. <https://pubmed.ncbi.nlm.nih.gov/8583588/>
15. Bao, Y., et al. Water for preventing urinary stones. *Cochrane Database Syst Rev*, 2012: Cd004292. <https://pubmed.ncbi.nlm.nih.gov/22696340/>
16. Siener, R., et al. Dietary risk factors for hyperoxaluria in calcium oxalate stone formers. *Kidney Int*, 2003. 63: 1037.
17. Wabner, C.L., et al. Effect of orange juice consumption on urinary stone risk factors. *J Urol*, 1993. 149: 1405. <https://pubmed.ncbi.nlm.nih.gov/8501777/>
18. Gettman, M.T., et al. Effect of cranberry juice consumption on urinary stone risk factors. *J Urol*, 2005. 174: 590.
19. Shuster, J., et al. Soft drink consumption and urinary stone recurrence: a randomized prevention trial. *J Clin Epidemiol*, 1992. 45: 911. <https://pubmed.ncbi.nlm.nih.gov/1624973/>
20. Ferraro, P.M., et al. Soda and other beverages and the risk of kidney stones. *Clin J Am Soc Nephrol*, 2013. 8: 1389 <https://pubmed.ncbi.nlm.nih.gov/23676355/>
21. Kocvara, R., et al. A prospective study of nonmedical prophylaxis after a first kidney stone. *BJU Int*, 1999. 84: 393. <https://pubmed.ncbi.nlm.nih.gov/10468751/>
22. Hess, B., et al. Effects of a 'common sense diet' on urinary composition and supersaturation in patients with idiopathic calcium urolithiasis. *Eur Urol*, 1999. 36: 136.
23. Ebisuno, S., et al. Results of long-term rice bran treatment on stone recurrence in hypercalciuric patients. *Br J Urol*, 1991. 67: 237. <https://pubmed.ncbi.nlm.nih.gov/1902388/>

24. Turney, B.W., et al. Diet and risk of kidney stones in the Oxford cohort of the European Prospective Investigation into Cancer and Nutrition (EPIC). *Eur J Epidemiol*, 2014. 29: 363. <https://pubmed.ncbi.nlm.nih.gov/24752465/>
25. Asplin, J.R. The management of patients with enteric hyperoxaluria. *Urolithiasis*, 2016. 44: 33. <https://pubmed.ncbi.nlm.nih.gov/26645872/>
26. Ferraro, P.M., et al. Total, Dietary, and Supplemental Vitamin C Intake and Risk of Incident Kidney Stones. *Am J Kidney Dis*, 2016. 67: 400. <https://pubmed.ncbi.nlm.nih.gov/26463139/>
27. Fink, H.A., et al. Diet, fluid, or supplements for secondary prevention of nephrolithiasis: a systematic review and meta-analysis of randomized trials. *Eur Urol*, 2009. 56: 72. <https://pubmed.ncbi.nlm.nih.gov/19321253/>
28. Borghi, L., et al. Comparison of two diets for the prevention of recurrent stones in idiopathic hypercalciuria. *N Engl J Med*, 2002. 346: 77
29. Curhan, G.C., et al. Comparison of dietary calcium with supplemental calcium and other nutrients as factors affecting the risk for kidney stones in women. *Ann Intern Med*, 1997. 126: 497. <https://pubmed.ncbi.nlm.nih.gov/9092314/>
30. Hiatt, R.A., et al. Randomized controlled trial of a low animal protein, high fiber diet in the prevention of recurrent calcium oxalate kidney stones. *Am J Epidemiol*, 1996. 144: 25. <https://pubmed.ncbi.nlm.nih.gov/8659482/>
31. Hesse, A.T., et al. (Eds.), *Urinary Stones, Diagnosis, Treatment and Prevention of Recurrence*. 3rd edition. 2009, Basel.
32. von Unruh, G.E., et al. Dependence of oxalate absorption on the daily calcium intake. *J Am Soc Nephrol*, 2004. 15: 1567. <https://pubmed.ncbi.nlm.nih.gov/15153567/>
33. Harris, S.S., et al. Effects of Hydration and Calcium Supplementation on Urine Calcium Concentration in Healthy Postmenopausal Women. *J Am Coll Nutr*, 2015. 34: 340. <https://pubmed.ncbi.nlm.nih.gov/25856469/>
34. Coe F.M., et al. Hyperuricosuric calcium stone disease, In: *Kidney Stones: Medical and Surgical Management*, F.M. Coe FL, Pak CYC, Parks JH, Preminger GM, Editor. 1996, Lippincott-Raven: Philadelphia. <https://www.geneeskundeboek.nl/kidney-stones-9789351529422>
35. Coe, F.L. Hyperuricosuric calcium oxalate nephrolithiasis. *Adv Exp Med Biol*, 1980. 128: 439. <https://pubmed.ncbi.nlm.nih.gov/7424690/>
36. Siener, R., et al. The role of overweight and obesity in calcium oxalate stone formation. *Obes Res*, 2004. 12: 106. <https://pubmed.ncbi.nlm.nih.gov/14742848/>
37. Madore, F., et al. Nephrolithiasis and risk of hypertension. *Am J Hypertens*, 1998. 11: 46. <https://pubmed.ncbi.nlm.nih.gov/9504449/>
38. Madore, F., et al. Nephrolithiasis and risk of hypertension in women. *Am J Kidney Dis*, 1998. 32: 802. <https://pubmed.ncbi.nlm.nih.gov/9820450/>
39. Worcester, E.M., et al. New insights into the pathogenesis of idiopathic hypercalciuria. *Semin Nephrol*, 2008. 28: 120
40. Pearle, M.S., et al., Medical management of urolithiasis. In: *2ND International Consultation on Stone Disease*, ed. K.S. Denstedt J. 2008. <https://www.researchgate.net/publication/260000334>

41. Pearle, M.S., et al. Meta-analysis of randomized trials for medical prevention of calcium oxalate nephrolithiasis. *J Endourol*, 1999. 13: 679. <https://pubmed.ncbi.nlm.nih.gov/10608521/>
42. Borghi, L., et al. Randomized prospective study of a nonthiazide diuretic, indapamide, in preventing calcium stone recurrences. *J Cardiovasc Pharmacol*, 1993. 22 Suppl 6: S78. <https://pubmed.ncbi.nlm.nih.gov/7508066/>
43. Brocks, P., et al. Do thiazides prevent recurrent idiopathic renal calcium stones? *Lancet*, 1981. 2: 124. <https://pubmed.ncbi.nlm.nih.gov/6113485/>
44. Scholz, D., et al. Double-blind study with thiazide in recurrent calcium lithiasis. *J Urol*, 1982. 128: 903. <https://pubmed.ncbi.nlm.nih.gov/7176047/>
45. Hesse, A., et al. Causes of phosphate stone formation and the importance of metaphylaxis by urinary acidification: a review. *World J Urol*, 1999. 17: 308. <https://pubmed.ncbi.nlm.nih.gov/10552150/>
46. Silverberg, S.J., et al. A 10-year prospective study of primary hyperparathyroidism with or without parathyroid surgery. *N Engl J Med*, 1999. 341: 1249. <https://pubmed.ncbi.nlm.nih.gov/10528034/>
47. Evan, A.E., et al. Histopathology and surgical anatomy of patients with primary hyperparathyroidism and calcium phosphate stones. *Kidney Int*, 2008. 74: 223. <https://pubmed.ncbi.nlm.nih.gov/18449170/>
48. Rizzato, G., et al. Nephrolithiasis as a presenting feature of chronic sarcoidosis: a prospective study. *Sarcoidosis Vasc Diffuse Lung Dis*, 1996. 13: 167. <https://pubmed.ncbi.nlm.nih.gov/8893387/>
49. Hoppe, B., et al. The primary hyperoxalurias. *Kidney Int*, 2009. 75: 1264. <https://pubmed.ncbi.nlm.nih.gov/19225556/>
50. Garrelfs, S.F., et al. Lumasiran, an RNAi Therapeutic for Primary Hyperoxaluria Type 1. *N Engl J Med*, 2021. 384: 1216. <https://pubmed.ncbi.nlm.nih.gov/33789010/>
51. Takei, K., et al. Oral calcium supplement decreases urinary oxalate excretion in patients with enteric hyperoxaluria. *Urol Int*, 1998. 61: 192. <https://pubmed.ncbi.nlm.nih.gov/9933846/>
52. Hoppe, B., et al. Diagnostic and therapeutic approaches in patients with secondary hyperoxaluria. *Front Biosci*, 2003. 8: e437. <https://pubmed.ncbi.nlm.nih.gov/12957811/>
53. Prezioso, D., et al. Dietary treatment of urinary risk factors for renal stone formation. A review of CLU Working Group. *Arch Ital Urol Androl*, 2015. 87: 105. <https://pubmed.ncbi.nlm.nih.gov/26150027/>
54. Pearle, M.S., et al. Meta-analysis of randomized trials for medical prevention of calcium oxalate nephrolithiasis. *J Endourol*, 1999. 13: 679. <https://pubmed.ncbi.nlm.nih.gov/10608521/>
55. Domrongkitchaiporn, S., et al. Dosage of potassium citrate in the correction of urinary abnormalities in pediatric distal renal tubular acidosis patients. *Am J Kidney Dis*, 2002. 39: 383. <https://pubmed.ncbi.nlm.nih.gov/11840381/>
56. Maxwell A.P. Genetic renal abnormalities. *Medicine*, 2007. 35: 386. [https://www.medicinejournal.co.uk/article/S1357-3039\(07\)00109-0/fulltext](https://www.medicinejournal.co.uk/article/S1357-3039(07)00109-0/fulltext)

57. Dhayat, N.A., et al. Furosemide/Fludrocortisone Test and Clinical Parameters to Diagnose Incomplete Distal Renal Tubular Acidosis in Kidney Stone Formers. *Clin J Am Soc Nephrol*, 2017. 12: 1507. <https://pubmed.ncbi.nlm.nih.gov/28775126/>
58. Pedersen, S.A., et al. Hydrochlorothiazide use and risk of nonmelanoma skin cancer: A nationwide case-control study from Denmark. *J Am Acad Dermatol*, 2018. 78: 673. <https://pubmed.ncbi.nlm.nih.gov/29217346/>
59. Pottegård, A., et al. Hydrochlorothiazide use is strongly associated with risk of lip cancer. *J Intern Med*, 2017. 282: 322.
60. Oliveira, B., et al. Genetic, pathophysiological, and clinical aspects of nephrocalcinosis. *Am J Physiol Renal Physiol*, 2016. 311: F1243. <https://pubmed.ncbi.nlm.nih.gov/27605580/>
61. Gambro, G., et al. Metabolic diagnosis and medical prevention of calcium nephrolithiasis and its systemic manifestations: a consensus statement. *J Nephrol*, 2016. 29: 715. <https://pubmed.ncbi.nlm.nih.gov/27456839/>
62. Mandel, N.S., et al. Urinary tract stone disease in the United States veteran population. II. Geographical analysis of variations in composition. *J Urol*, 1989. 142: 1516. <https://pubmed.ncbi.nlm.nih.gov/2585627/62>
63. Cameron, M.A., et al. Uric acid nephrolithiasis. *Urol Clin North Am*, 2007. 34: 335. <https://pubmed.ncbi.nlm.nih.gov/17678984/>
64. Kim, S., et al. Development of Nephrolithiasis in Asymptomatic Hyperuricemia: A Cohort Study. *Am J Kidney Dis*, 2017. 70: 173. <https://pubmed.ncbi.nlm.nih.gov/28410765/> 64
65. . Millman, S., et al. Pathogenesis and clinical course of mixed calcium oxalate and uric acid nephrolithiasis. *Kidney Int*, 1982. 22: 366. <https://pubmed.ncbi.nlm.nih.gov/7176335/> 106 UROLITHIASIS - LIMITED UPDATE MARCH 2022
66. . Pak, C.Y., et al. Biochemical distinction between hyperuricosuric calcium urolithiasis and gouty diathesis. *Urology*, 2002. 60: 789. <https://pubmed.ncbi.nlm.nih.gov/12429297/>
67. Chou, Y.H., et al. Clinical study of ammonium acid urate urolithiasis. *Kaohsiung J Med Sci*, 2012. 28: 259. <https://pubmed.ncbi.nlm.nih.gov/22531304/>
68. Wagner, C.A., et al. Urinary pH and stone formation. *J Nephrol*, 2010. 23 Suppl 16: S165. <https://pubmed.ncbi.nlm.nih.gov/21170875/>
69. Miano, R., et al. Stones and urinary tract infections. *Urol Int*, 2007. 79 Suppl 1: 32. <https://pubmed.ncbi.nlm.nih.gov/17726350/>
70. Rodman J.S., et al. Diagnosis and treatment of uric acid calculi., In: *Kidney Stones. Medical and Surgical Management*, F.M. Coe FL, Pak CYC, Parks JH, Preminger GM., Editor. 1996, LippincottRaven: Philadelphia. <https://www.geneeskundeboek.nl/kidney-stones-9789351529422>
71. Low, R.K., et al. Uric acid-related nephrolithiasis. *Urol Clin North Am*, 1997. 24: 135. <https://pubmed.ncbi.nlm.nih.gov/9048857/>
72. Shekarriz, B., et al. Uric acid nephrolithiasis: current concepts and controversies. *J Urol*, 2002. 168: 1307. <https://pubmed.ncbi.nlm.nih.gov/12352383/>
73. Wilcox, W.R., et al. Solubility of uric acid and monosodium urate. *Med Biol Eng*, 1972. 10: 522. <https://pubmed.ncbi.nlm.nih.gov/5074854/>

74. Mattle, D., et al. Preventive treatment of nephrolithiasis with alkali citrate--a critical review. *Urol Res*, 2005. 33: 73. <https://pubmed.ncbi.nlm.nih.gov/15875173/>
75. Coe, F.L., et al. Kidney stone disease. *J Clin Invest*, 2005. 115: 2598. <https://pubmed.ncbi.nlm.nih.gov/16200192/>
76. Marchini, G.S., et al. Gout, stone composition and urinary stone risk: a matched case comparative study. *J Urol*, 2013. 189: 1334. <https://pubmed.ncbi.nlm.nih.gov/23022002/>
77. Kramer, G., et al. Role of bacteria in the development of kidney stones. *Curr Opin Urol*, 2000. 10: 35. <https://pubmed.ncbi.nlm.nih.gov/10650513/>
78. Gettman, M.T., et al. Struvite stones: diagnosis and current treatment concepts. *J Endourol*, 1999. 13: 653. <https://pubmed.ncbi.nlm.nih.gov/10608517/>
79. Bichler, K.H., et al. Urinary infection stones. *Int J Antimicrob Agents*, 2002. 19: 488. <https://pubmed.ncbi.nlm.nih.gov/12135839/>
80. Carpentier, X., et al. Relationships between carbonation rate of carbapatite and morphologic characteristics of calcium phosphate stones and etiology. *Urology*, 2009. 73: 968. <https://pubmed.ncbi.nlm.nih.gov/19394492/>
81. Thompson, R.B., et al. Bacteriology of infected stones. *Urology*, 1973. 2: 627. <https://pubmed.ncbi.nlm.nih.gov/4587909/>
82. McLean, R.J., et al. The ecology and pathogenicity of urease-producing bacteria in the urinary tract. *Crit Rev Microbiol*, 1988. 16: 37. <https://pubmed.ncbi.nlm.nih.gov/3053050/>
83. Wong H.Y., et al. Medical management and prevention of struvite stones, in *Kidney Stones: Medical and Surgical Management*, Coe F.M., Pak C.Y.C., Parks J.H., Preminger G.M., Editors. 1996, Lippincott-Raven: Philadelphia. <https://www.geneskundeboek.nl/kidney-stones-9789351529422>
84. Jarrar, K., Boedeker, R. H. and Weidner, W. Struvite stones: long term follow up under metaphylaxis. *Ann Urol (Paris)*, 1996. 30: 112. <https://pubmed.ncbi.nlm.nih.gov/8766146/>
85. Wall, I., et al. Long-term acidification of urine in patients treated for infected renal stones. *Urol Int*, 1990. 45: 336.
86. Griffith, D.P., et al. Randomized, double-blind trial of Lithostat (acetohydroxamic acid) in the palliative treatment of infection-induced urinary calculi. *Eur Urol*, 1991. 20: 243. <https://pubmed.ncbi.nlm.nih.gov/1726639/>
87. Williams, J.J., et al. A randomized double-blind study of acetohydroxamic acid in struvite nephrolithiasis. *N Engl J Med*, 1984. 311: 760. <https://pubmed.ncbi.nlm.nih.gov/6472365/>
88. Leusmann, D.B., et al. Results of 5,035 stone analyses: a contribution to epidemiology of urinary stone disease. *Scand J Urol Nephrol*, 1990
89. Milliner, D.S., et al. Urolithiasis in pediatric patients. *Mayo Clin Proc*, 1993. 68: 241. <https://pubmed.ncbi.nlm.nih.gov/8474265/>
90. Prot-Bertoye, C., et al. CKD and Its Risk Factors among Patients with Cystinuria. *Clin J Am Soc Nephrol : CJASN*, 2015. 10: 842. <https://pubmed.ncbi.nlm.nih.gov/25717071/> UROLITHIASIS - LIMITED UPDATE MARCH 2022 107

91. Kum, F., et al. Hypertension and renal impairment in patients with cystinuria: findings from a specialist cystinuria centre. *Urolithiasis*, 2019. 47: 357. <https://pubmed.ncbi.nlm.nih.gov/30805669/>
92. Rogers, A., et al. Management of cystinuria. *Urol Clin North Am*, 2007. 34: 347. <https://pubmed.ncbi.nlm.nih.gov/17678985/>
93. Dello Strologo, L., et al. Comparison between SLC3A1 and SLC7A9 cystinuria patients and carriers: a need for a new classification. *J Am Soc Nephrol*, 2002. 13: 2547. <https://pubmed.ncbi.nlm.nih.gov/12239244/>
94. Lee, W.S., et al. Cloning and chromosomal localization of a human kidney cDNA involved in cystine, dibasic, and neutral amino acid transport. *J Clin Invest*, 1993. 91: 1959.
95. Knoll, T., et al. Cystinuria in childhood and adolescence: recommendations for diagnosis, treatment, and follow-up. *Pediatr Nephrol*, 2005. 20: 19. <https://pubmed.ncbi.nlm.nih.gov/15602663/>
96. Finocchiaro, R., et al. Usefulness of cyanide-nitroprusside test in detecting incomplete recessive heterozygotes for cystinuria: a standardized dilution procedure. *Urol Res*, 1998. 26: 401. <https://pubmed.ncbi.nlm.nih.gov/9879820/>
97. Nakagawa, Y., et al. Clinical use of cystine supersaturation measurements. *J Urol*, 2000. 164: 1481. <https://pubmed.ncbi.nlm.nih.gov/11025687/>
98. Fjellstedt, E., et al. Cystine analyses of separate day and night urine as a basis for the management of patients with homozygous cystinuria. *Urol Res*, 2001. 29: 303. <https://pubmed.ncbi.nlm.nih.gov/11762791/>
99. Ng, C.S., et al. Contemporary management of cystinuria. *J Endourol*, 1999. 13: 647. <https://pubmed.ncbi.nlm.nih.gov/10608516/>
100. Biyani, C.S., et al. Cystinuria—diagnosis and management. *EAU-EBU Update Series* 2006. 4: 175. <https://www.sciencedirect.com/science/article/abs/pii/S1871259206000384>
101. Runolfsdottir, H.L., et al. Urinary 2,8-dihydroxyadenine excretion in patients with adenine phosphoribosyltransferase deficiency, carriers and healthy control subjects. *Mol Genet Metab*, 2019. 128: 144. <https://pubmed.ncbi.nlm.nih.gov/31378568/>
102. Edvardsson, V.O., et al. Comparison of the effect of allopurinol and febuxostat on urinary 2,8-dihydroxyadenine excretion in patients with Adenine phosphoribosyltransferase deficiency (APRTd): A clinical trial. *Eur J Intern Med*, 2018. 48: 75. <https://pubmed.ncbi.nlm.nih.gov/29241594/>
103. Matlaga, B.R., et al. Drug-induced urinary calculi. *Rev Urol*, 2003. 5: 227. <https://pubmed.ncbi.nlm.nih.gov/16985842/>
104. Beltrami, P., et al. The endourological treatment of renal matrix stones. *Urol Int*, 2014. 93: 394. <https://pubmed.ncbi.nlm.nih.gov/24969358/>
105. Nakagawa, Y., et al. A modified cyanide-nitroprusside method for quantifying urinary cystine concentration that corrects for creatinine interference. *Clin Chim Acta*, 1999. 289: 57. <https://pubmed.ncbi.nlm.nih.gov/10556653/>