Özgün araştırma / Original research

Acil servise yan ağrısı ile başvuru nedenleri ve ürolitiyaziste klinik değerlendirme

The causes of emergency department visits due to flank pain and the clinical investigation of urolithiasis

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Özet

Amaç: Yan ağrısı ile acil servise başvuran hastalardaki taş görülme sıklığı, üriner sistem taş hastalığı ile karışabilen durumlar, tanı yöntemleri, taş lokalizasyonu, taş büyüklüğü ve tercih edilen tedavi yöntemleri araştırıldı.

Gereç ve Yöntemler: Acil servise dört aylık süreçte yan ağrısı ile başvuran 377 hasta çalışmaya dahil edildi. Yan ağrısı ile acil servise başvuran hastalarda üriner sistem taş hastalığı sıklığı, cinsiyet, yaş, meslek, vücut kitle indeksi, laboratuar bulguları ve tercih edilen görüntüleme yöntemleri araştırıldı; yan ağrısında karşılaşılan patolojiler belirlendi, üriner sistem taş hastalığında taşın lokalizasyonu, büyüklüğü ve ilave patolojiler değerlendirildi.

Bulgular: Yan ağrısı ile acil servise başvuran hastaların %71.4'ünde üriner sistem taş hastalığı saptandı. Acil servise yan ağrısı ile başvuran erkek hastalarda taş görülme olasılığı daha fazlaydı. Tek taraflı kostovertebral açı hassasiyeti (KVAH) pozitif olanlarda çift taraflı pozitif olanlara göre daha fazla oranda taş saptandı.

Sonuç: Acil servise yan ağrısı ile başvuran hastaların büyük çoğunluğunda taş tespit edildi. Radyolojik olarak görüntüleme tetkiklerinden özellikle üriner sistem USG'nin çabuk ulaşılabilirliği, yan etkisinin olmaması ve ekonomik olmasından dolayı acil servis'te ilk bakıda öncelikle tercih edilmesi gerekir.

Anahtar Kelimeler: Üriner sistem taşı, ultrasonografi, direkt üriner sistem grafisi, taş protokolü batın bilgisayarlı tomografi.

Abstract

Objective: In this study**,** the incidence of stones, the conditions that can be confused with urolithiasis, diagnostic methods, localization and size of the stone and the preferred treatment methods in patients with flank pain were evaluated.

Material and Methods: 377 patients were admitted to the emergency department with flank pain over a four-month period. The frequency of urinary tract stone disease, gender, age, occupation, body mass index, laboratory findings, the preferred diagnostic methods in patients with flank pain, the localization and size of the stones and other pathologies that is seen in patients with flank pain were evaluated.

Results: 71.4% of the patients who were admitted to the emergency room with flank pain had urinary tract stone disease. Men with flank pain had higher rate of urinary stone disease than women. Patients suffering from one-sided costovertebral point tenderness (CVPT) had higher rate of urinary stone disease than those who suffered from two-sided costovertebral point tenderness.

Conclusion: The majority of patients admitted to the emergency department with flank pain were diagnosed with urinary system stones. Ultrasonography should be preferred in the first examination in the emergency department because it is a cheap and safe method which is also easily accessible and non-invasive.

Key Words: Urinary tract stone, ultrasonography, plain urinary system graph, non-contrast-enhanced computer tomography.

Introduction

Flank pain is a term used to describe different types of lumbar pain. It is commonly caused by kidney pathologies. The onset of the pain could be sudden and it can go on as tingling. In the differential diagnoses of flank pain kidney and ureter stones should be thought initially but there are many diseases that present with same symptom and findings. Moreover, urinary system diseases like pyelonephritis, ureteropelvic junction obstruction; intestinal, gynecologic, retroperitoneal and vascular pathologies that apply pressure to the ureter from outside can cause flank pain (1).

Renal colic is a frequently seen emergency condition that is characterized by acute severe pain which arises due to urinary tract stone diseases. Over one million people per year apply to the emergency department with renal colic in America (2). Nausea, vomiting, psychomotor agitation and costovertebral angle tenderness could accompany severe flank pain (1). Pollakiuria and urgency could be seen in distal ureter stones.

Urolithiasis is the third most common urologic problem following urinary system infections and prostate diseases (3). In Turkey its frequency is 14.8% (4). Although there are improvements in treatment methods, urolithiasis frequency and recurrence rate still increases (5). Moreover, its frequency is higher in men than women and it is generally seen between ages 30-50 (5). The recurrence rate of urolithiasis is 50% in the first 5-7 years and 75% in 20 years without treatment; the most common types of stones are calcium oxalate and calcium phosphate stones (6).

In this study, the frequency of urinary tract stone disease, gender, age, occupation, body mass index, laboratory findings, the preferred diagnostic methods in patients with flank pain, the localization and size of the stones and other pathologies that is seen in patients with flank pain were investigated.

Material and Methods

This is a prospective observational study done over a four-month period in the Emergency Department of Dışkapı Yıldırım Beyazıt Education and Research Hospital. After approval of the local ethical committee, 377 patients that were admitted to the emergency department who were suffering from flank pain were included in the study. Patients under the age of 15 and patients with flank pain due to trauma were excluded from the study. Also patients who rejected the diagnostic methods were excluded.

The history, physical examination, urine and blood samples and kidney-ureter-bladder radiography (KUB) of the patients were analyzed. If the diagnose was not definite or there was a suspicion of pregnancy, urinary ultrasonography (USG) was performed by a radiologist; if the diagnose was still uncertain, non-contrast-enhanced computer tomography (NCCT) was performed. NCCT is accepted as gold standard method for the diagnosis of stone.

KUB was performed without colon cleansing in emergency conditions by digital x-ray unit. Stone localization was determined by its location according to radiologic anatomy of the organs. The localization of the stones was classified as kidney, ureter, both kidney and ureter. Stones that are localized to ureteropelvic junction and 1/3 upper region of ureter were classified as upper ureter stones; stones localized to 1/3 middle region were classified as middle ureter stones; stones localized to 1/3 distal region of ureter and ureterovesical junction were classified as distal ureter stones.

Admission times, chronic diseases, weight, height, body mass index (BMI) of the patients were recorded and their relation to the urinary system stone diseases and other causes of flank pain were investigated. Moreover, frequencies of recurrent stone disease and urine analysis were conducted.

Urine samples were centrifuged at 3000 cycle/min speed for 3 minutes and the sediment was examined under the microscope with 40 hpf; 5 or more leukocyte or erythrocyte was accepted as leukocyturia or hematuria.

269 patients that are diagnosed as urinary stone disease were called after three months and were asked whether they passed a kidney stone; whether extracorporeal shock wave lithotripsy (ESWL) or any other invasive procedure was performed. Hospital records of patients that undergone ESWL or any other invasive method were investigated in detail.

Statistical analyses were done by SPSS (Statistical Package for Social Science) 17.0 for Windows. The normal distribution of continuous variables were evaluated by histogram and One-Sample Kolmogorov-Smirnov Test;

Table 1. Demographic features of the patients

		Patients with urolithiasis n=269 (71.4%)	Patients without urolithiasis n=108 (28.6%)	p
Sex	**Male**	173 (64.3%)	43 (35.7%)	**<0.001**[c]
	Female	96 (35.7%)	65 (64.3%)	
Age[a]		37 (15-84)	36 (15-83)	0.458[d]
BMI[b]	**All**	26.0 ± 3.8	25.3 ± 4.7	0.165[e]
	Male	25.8 ± 3.3	25.0 ± 3.2	0.157[e]
	Female	26.4 ± 4.7	25.6 ± 5.5	0.329[e]

[a] Age expressed as median (min-max)
[b] BMI values expressed as mean ± sd
[c] Pearson Chi-Square Test
[d] Mann-Whitney U Test
[e] Independent Samples t-Test

Table 2. The relationship between costovertebral point tenderness (CVPT) and urolithiasis

CVPT		Patients with urolithiasis	Patients without urolithiasis	Urolithiasis frequency of patients with CVPT
	Unilateral	**255**	**95**	**% 72.9**
	Right	108	49	% 68.8
	Left	147	46	%76.1
	Bilateral	**14**	**13**	**%51.9**
Total		**269**	**108**	**% 71.3**

Table 3. The localizations and size of the urinary system stones

		N	%	Size
Ureter		160	59.5	1-10 mm
	Upper ureter	51	19.0	
	Middle ureter	11	4.1	
	Distal ureter	98	36.4	
Kidney		151	56.1	1-25 mm
Kidney + Ureter Stones		42	15.6	1-12 mm

p>0.05 was accepted as normal distribution. Normally distributed continuous variables were expressed as mean ± standard deviation; continuous variables that are not normally distributed as median (minimum-maximum); nominal variables as number and percentages. The difference between normally distributed independent variables was calculated by Independent Samples t-Test; Mann-Whitney U Test was used if the distribution was not normal. The relationship among nominal values was determined by Pearson Chi-Square Test. All calculations were done by two-tailed and p<0.05 was accepted as significant.

Results

Demographic features of the patients with respect to age, sex and BMI values are shown in Table 1. There was not any difference between the ages of patients with and without stone (p=0.458). 71.4% of the patients were diagnosed as urolithiasis whose 64.3% were male; M/F ratio was 1.8. Stone frequency was higher in males than females (p<0.001). There wasn't any significant difference between BMI values of the patients with and without stone (p=0.165).

There wasn't any significant difference between chronic diseases and stone occurrence (hypertension, p=0.552; diabetes mellitus, p=0.527; hyperlipidemia, p=0.924; coronary artery disease, p=0.534).

Stone frequency was significantly higher in patients with unilateral costovertebral point tenderness (CVPT) compared to those with bilateral CVPT (p=0.02), CVPT frequencies is shown in Table 2.

125 of the patients have had previous stone history; 85.6 % of them had new stones. The frequency of new stone is higher in patients with previous stone history than without stone history (p<0.001).

There was not any significant difference between white blood cell counts of patients with and without stone (p=0.254). Blood glucose, blood urea nitrogen (BUN) and creatinin levels were higher in patients with stone (glucose p=0.031; BUN p=0.016; creatinin p=0.015). Blood sodium, potassium, calcium and chloride levels

were same for both groups (sodium p=0.869; potassium p=0.986, calcium p=0.694; chloride p=0.441).

354 of the patients have given urinalyses. Hematuria has found in 77.6% of them. Hematuria was present in 81.6% of the patients with stone and in 68.3% of the patients without stone. Hematuria frequency was higher in patients with stone (p=0.06). Sensitivity of hematuria in stone presence is 82% (0.76-0.86, %95 CI) and specifity was 32% (0.23-0.41, %95 CI). Leukocyturia was present in 25.9% of the patients. Leukocyturia was present in 26.4% of the patients with stone, and in 25.0% of the patients without stone. There was not any significant difference in leukocyte count between patients with and without stone (p=0.784). Crystalluria was present in 9.3% of the patients. Crystalluria was present in 9.6% of the patients with stone, and in 8.7% of the patients without stone. There was not any significant difference in crystal count between patients with and without stone (p=0.780).

KUB was performed in 374 of the patients, urinary system USG was performed in 326 and NCCT in 34 of them. 114 of 216 patients had negative KUB but they had urinary stone in fact, so we can say that false negative rate of KUB was 52.7%. 33 of 121 patients had negative USG but urinary stone in fact, so we can say that false negative rate of USG was 27.2%.

The size and localizations of the stones is shown in Table 3. The 50.6% (n=136) of the patients passed the stone spontaneously, 29.0% (n=78) of the patients could not pass the stone and refused the invasive treatment methods. The 7.1% (n=19) of the patients have undergone ESWL, the 7.1% (n=19) ureterorenoscopy (URS), and the 6.3% (n=17) of the patients have undergone percutaneous surgery; open surgery was not preferred for anyone. Sizes of the passed stones were between 1-9 mm; 91.2% (n=124) of them were equal and smaller than 6 mm. Not surprisingly, the ureter stones were smaller than the kidney stones (p<0.001).

The frequency of non-renal pathologies in flank pain was 12.2% (n=46) among the studied patients. Other renal causes of flank pain were urinary system infections, pyelonephritis, acute renal failure, kidney cyst, congenital kidney disease, ureteropelvic junction stenosis and urinary system tumor. The frequencies of main disease groups are as follows; 3.4% (n=13) gynecologic or obstetric pathologies like pregnancy or ovarian cyst pelvic inflammatory diseases; 2.9% (n=11) gastrointestinal pathologies like biliary colic, pancreatitis, perforated peptic ulcer, diverticulitis; 0.8% (n=3) acute appendicitis; 5.0% (n=19) other pathologies causing flank pain like muscle and joint diseases, skin diseases like zoster, pulmonary and coronary diseases and drug abuse. Non-renal pathologies were 12.2%.

Discussion

The 10-15% of the population experience urolithiasis at least once throughout life (7). About 50% of patients with stone experience recurrent stone in a lifetime (8). Highly recurrent disease is observed in slightly more than 10% of patients (8). After the first stone, the recurrence rate in the first five years is 40%, in the first twenty years it is 75% (7). In our study 39.8% of the patients with stone had a previous history of stone. Patients with previous stone history had 85.6% of new stone formation.

In our study, patients with unilateral costovertebral point tenderness (CVPT) are more likely diagnosed with urolithiasis compared to those with bilateral CVPT (p=0.002). The 72.9% of the unilateral CVPT and 51.9% of bilateral CVPT were diagnosed as urolithiasis. So we can say that the unilateral CVPT is more likely to be urolithiasis.

USG should be preferred as the primary diagnostic imaging method for the diagnoses of stone. For stones >5 mm, USG has a sensitivity of 96% and specificity of nearly 100% (9). For all stone locations, sensitivity and specificity of ultrasound reduces to 78% and 31%, respectively (9). KUB isn't recommended if NCCT is considered (10), but it is helpful in differentiating between radiolucent and radiopaque stones and for comparison during follow-up (8). The sensitivity and specificity of KUB is 44-77% and 80-87%, respectively (11). In our study false negative rate of KUB was 52.7% and false negative rate of USG was 27.2%.

NCCT has become the standard for diagnosing acute flank pain, and has replaced intravenous urography (IVU), which was the gold standard for many years (8). NCCT can also determine stone diameter and density (8). It is superior to IVU in the diagnoses of the other causes of abdominal pain when stone is absent. Compared with IVU, NCCT shows higher sensitivity and specificity

for identifying urinary stones (8), so NCCT is accepted as gold standard in our study. Recently low-dose computed tomography is recommended to reduce the radiation (12). Niemann et al. (13) showed that the low-dose computed tomography has a sensitivity of 96.6% and a specifity of 94.9% in diagnose of urolithiasis. However, a contrast enhanced computed tomography is recommended if stone removal is planned and the renal collecting system anatomy is not known (8). Although NCCT is more useful than direct radiography and also have nearly similar doses of radiation; in our emergency department KUB was performed in 374 of the patients, and NCCT in 34 of them. We don't know the exact causes of underuse of NCCT, it could be a result of the past habits or lack of every-time availability. This concern could be another study topic.

Li et al. (14) showed that hematuria is not universally present in patients with painful urolithiasis and does not correspond to the degree of obstruction; absent hematuria was noted in 9% of the patients with proved urolithiasis. They also showed that there was no correlation of the degree of obstruction with absent hematuria. In our study the frequency of hematuria in patients with stone was 81.6% but this ratio was 68.3% in patients without stone; hematuria frequency was higher in patients with stone but the sensitivity of hematuria in stone presence is 82% and the specifity was 32%. So it is not an excellent finding for differential diagnoses. In the same way, Bove et al. (15) reported that in the patients with flank pain, absence of hematuria is not enough to exclude the stone and there are several other causes of hematuria.

Ather et al. (16) reported that the 78% of the patients admitted to the emergency department with flank pain were diagnosed as urolithiasis; also in this study they showed that the 9.9% of the patients have had non-renal pathologies. In our study, the frequency of urolithiasis among the patients with flank pain was 71.4%; the most frequent localization was ureter (31.3%). Non-renal pathologies were 12.2%. Our findings are similar with the literature.

The likelihood of ureteral stone passage of ureteral stones was 68% in the stones <5mm and 47% in the stones >5mm diameter (17). In our study, spontaneous passage was observed in 50.6% of the stones. The diameters of the spontaneously passed stones was between 1-9 mm. 91.2% of the spontaneously passed stones were smaller than 6 mm. In patients with newly diagnosed ureteral stones <10mm, if active removal is not indicated, observation with periodic evaluation is optional initial treatment; such patients may be offered appropriate medical therapy to facilitate stone passage during observation (8). The treatment method varies according to the localization, count, diameter, patient choice and cost (18). Some of the treatment methods are extra-corporal shock wave lythotripsy (ESWL), open surgery, endoscopic procedures, medical and follow-up without medication (19).

As a result we can say that the most frequent cause of flank pain is renal colic but the differential diagnoses should be done from other acute abdominal pain causes. The initial diagnostic method in the emergency department is ultrasonography which is the easily accessible, non-invasive, cheap and safe method.

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