



Incidental findings accompanying ureteral stones on non-contrast computed tomography

Kontrastsız bilgisayarlı tomografide üreter taşlarına eşlik eden insidental bulgular

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ABSTRACT

Aim: We aimed to evaluate what and how important incidentally detected pathologies in non-contrast computed tomography are.

Methods: The tomography images of 341 patients who applied with the complaint of renal colic between January 2022 and June 2022 and were found to have ureteral stones in non-contrast computed tomography were analyzed. Incidentally detected pathologies of the patients were detected. The findings were analyzed in 3 groups: patients under the age of 40, between the ages of 40-65 and over the age of 65. In addition, these findings; They were also categorized as pathologies requiring urgent evaluation, Pathologies requiring frequent follow-up and further investigation, and Pathologies not requiring frequent follow-up and further evaluation.

Results: Of the patients, 22.6% were female, 77.4% were male, and 40.2% were under the age of 40, 49.6% were in the 40-65 age group, and 10.3% were over 65 years of age. The most common pathology is in liver pathologies (24.3% hepatosteatosis). It was observed that the most pathology was detected in patients over 65 years of age. It was determined that the patients with pathologies requiring urgent evaluation or strict follow-up were mostly in the age group of 65 years or older.

Conclusion: Radiology reports must be examined in the requested tomographies, so that the detected pathologies will be detected early and problems that may be experienced will be prevented.

Keywords: computed tomography; renal colic; ureteral stone

ÖZET

Amaç: Kontrastsız bilgisayarlı tomografide insidental saptanan patolojilerin ne olduğunu ve ne kadar önemli olduğunu değerlendirmeyi amaçladık.

Yöntem: Ocak 2022-Haziran 2022 tarihleri arasında renal kolik şikayeti ile başvuran ve kontrastsız bilgisayarlı tomografide üreter taşı saptanan 341 hastanın tomografisi görüntüleri incelendi. Hastaların insidental saptanan patolojileri tespit edildi. Bulgular 40 yaş altı, 40-65 yaş arası ve 65 yaş üstü olmak üzere 3 grupta incelendi. Ayrıca bu bulgular; Ayrıca acil değerlendirme gerektiren patolojiler, sık takip ve ileri inceleme gerektiren patolojiler ve sık takip ve ileri değerlendirme gerektirmeyen patolojiler olarak da kategorize edildi.

Bulgular: Hastaların %22.6'sı kadın, %77.4'ü erkek olup, %40.2'si 40 yaş altı, %49.6'sı 40-65 yaş grubunda, %10.3'ü 65 yaş üstü idi. En sık patoloji karaciğer patolojilerindedir (%24.3 hepatosteatoz). En fazla patolojinin 65 yaş üstü hastalarda saptandığı görüldü. Acil değerlendirme veya sıkı takip gerektiren patolojileri olan hastaların çoğunlukla 65 yaş ve üstü yaş grubunda olduğu belirlendi.

Sonuçlar: İstenen tomografilerde radyoloji raporları incelenerek saptanan patolojilerin erken saptanması ve yaşanabilecek sorunların önüne geçilmesi gerekir.

Anahtar kelimeler: bilgisayarlı tomografi; renal kolik; üreter taşı

Introduction

Urolithiasis is the most common cause of renal colic. Patients with renal colic presenting to emergency departments or urology outpatient clinics are usually examined with non-contrast computed tomography (NCCT) because of its high sensitivity and specificity in the diagnosis of urolithiasis (Chen & Zagoria, 1999). NCCT is especially important in terms of detecting ureteral stones that cannot be detected by ultrasonography and related complications in patients presenting to the emergency department, as well as detecting other organ pathologies that are likely to be missed with other imaging methods (Flannigan et al., 2014). Although these pathologies are mostly pathologies that do not require further evaluation, they may also be malignancies for which early diagnosis is very important (Surov et al., 2014).

In NCCT performed with the complaint of renal colic, the first evaluation is usually made by a urologist, and when ureteral stones are detected, a treatment plan is drawn up for the ureteral stone and the treatment is focused. Unfortunately, it is not possible to report the tomography performed in the

polyclinics of many hospitals by the radiology specialist on the same day due to the patient density in the hospitals. For this reason, incidentally detected findings cannot be noticed by clinicians or are noticed late. The aim of our study is to emphasize that clinicians should be more sensitive about these reports by evaluating the incidental findings and importance status detected by the radiologist in the NCCT requested for ureteral stones from patients with renal colic.

Methods

Between January 2022 and June 2022, 341 patients who applied with the complaint of renal colic and were found to have ureteral stones in non-contrast computed tomography were included in the study. NCCT examinations were performed on the Philips Medical System MX-16-slice and MX-128-slice multidetector device with 120 kV, 250 mA and 5mm slice thickness, without contrast. The images were readily transferred to the picture archiving and communication system and evaluated on the workstation. Incidentally detected lung, liver, gall bladder, spleen, intestinal, mesentery, pancreas, adrenal,

bladder, musculoskeletal and vascular pathologies of the patients were evaluated. Vascular calcific atherosclerotic changes and degenerative changes in bone structures, which are especially common in elderly patients, were excluded from the evaluation. The urgency of pathologies; They were evaluated in 3 groups as pathologies requiring urgent evaluation, requiring frequent follow-up and further examination, and pathologies not requiring frequent follow-up and further examination. These pathologies were also compared according to gender and patient age. The patients were evaluated in 3 groups as under 40 years old, 40-65 years old and over 65 years old.

Statistical analysis

The analysis of the data obtained within the scope of the research was carried out using the SPSS 25.0 program. Frequency analysis was used to determine the percentile distribution of pathologies. Chi-square (χ^2) analysis was used to compare the distributions of pathologies according to gender and age group. The level of significance was set as $p < 0.05$.

Ethical aspect of research

Permission numbered 2022/145 (Date: 20.09.2022) was obtained from Malatya Turgut Özal University Non-invasive Clinical Research Ethics Committee for our study.

Results

Of the patients, 22.6% were female, 77.4% were male, 40.2% were under 40 years old, 49.6% were in the 40-65 age group, and 10.3% were over 65 years old (Table 1).

Table 1. Frequency and percentage distribution of the patients participating in the study by gender and age groups

Variable	Category	f	%
Gender	Woman	77	22.6
	Male	264	77.4
Age group	Under 40	137	40.2
	40-65 years	169	49.6
	Over 65 years old	35	10.3

While no pathology was found in the liver of 68% of the patients, hepatoseatosis was found in 24.3%, cyst and calcification in 5.9%, and solid lesion in 3.2% (Figure 1). Again, 83.9% of the patients had no pathology in their lungs, 11.1% had pleural pathologies, 4.7% had cysts and solid lesions, 1.8% had infection and 0.3% had other pathologies (Figure 2). While there was no pathology in the gallbladder in 94.1% of the patients, 5.9% had calculus, 0.6% had hydropos, 98.8% had no pathology in their spleen, 0.6% had splenomegaly, 0.3% had Cysts and calci were found in 0.3% of them and solid lesions were found in 0.3% (Figures 3, 4). While 91.8% of the patients had no intestinal pathology, 1.2% had inflammation, 0.3% had cysts, solid lesions, 6.5% hernias, 0.6% had other pathologies, 96%. While no pathology was found in the mesentery of 0.8 of them, a mass was found in 1.2% and other pathologies in 2.1% (Figure 5). Pancreatic pathology was not found in 99.1% of the patients, 0.3% had pancreatitis, 0.9% had solid lesion, 99.4% had no adrenal pathology, 0.6% had solid lesion, While no pathology was found in the bladder of 89.7%, 1.8% had diverticulum, 2.6% had stones, 6.7% had wall thickening, and 0.6% had a mass. While 93.8% of the patients had no pathology in the muscle-bone structure, 2.12% had cysts, solid lesions, 0.9% had fractures, 3.5% had other pathologies, 97.4% had no pathology in their vasculature. 1.2% had aneurysm and 1.5% had other pathologies.

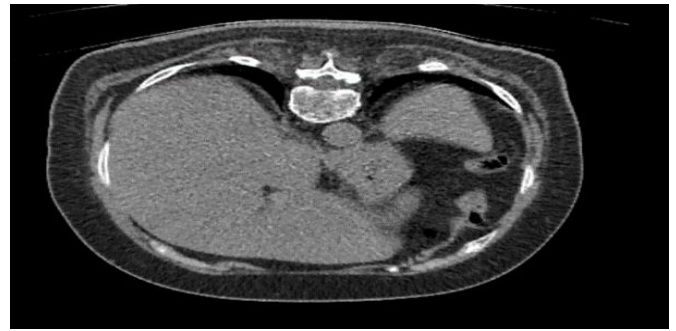


Figure 1. Hepatosteatosis



Figure 2. 20x16mm nodule in the right lung posterior basal



Figure 3. Gallbladder stone

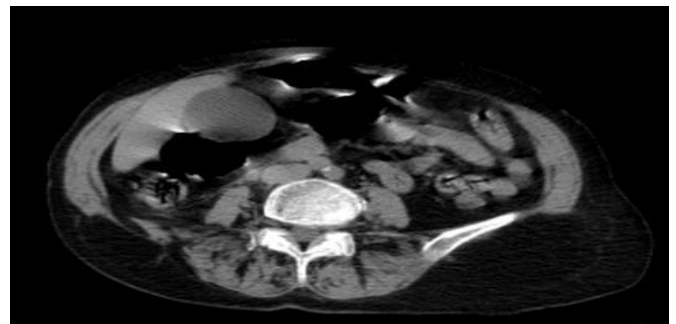


Figure 4. Gallbladder hydrops

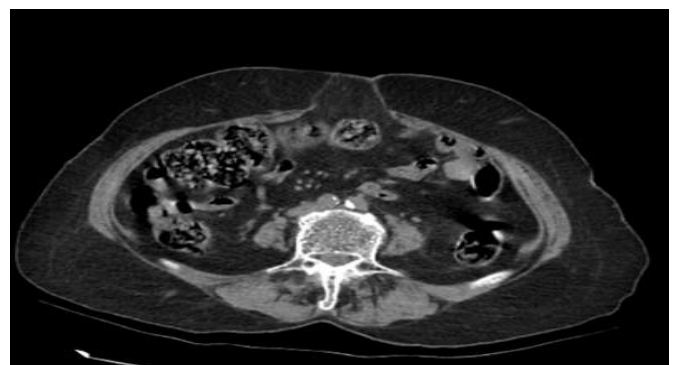


Figure 5. Defect of approximately 4 cm in the umbilicus and herniated omental fat plans

Table 2. Frequency and percentage distributions of pathological findings detected in the organs of the patients participating in the study

Organ	Pathological Finding	f	%
Lung*	Absent	286	83.9
	Pleural Pathologies	38	11.1
	Cyst. Solid Lesion	16	4.7
	Infection	6	1.8
	Other	1	.3
Liver*	Absent	232	68.0
	Hepatosteatosi	83	24.3
	Cyst. Calcification	20	5.9
	Solid Lesion	11	3.2
Gall bladder*	Absent	321	94.1
	Calculus	20	5.9
	Hydrops	2	.6
Spleen	Absent	337	98.8
	Splenomegaly	2	.6
	Cyst. Calcification	1	.3
	Solid Lesion	1	.3
Intestinal*	Absent	313	91.8
	Inflammation	4	1.2
	Cyst. Solid Lesion	1	.3
	Hernia	22	6.5
	Other	2	.6
Mesentery	Absent	330	96.8
	Mass	4	1.2
	Other (Panniculitisi Etc.)	7	2.1
Pancreas*	Absent	337	99.1
	Pancreatitis	1	.3
	Solid Lesion	3	.9
Surrenal	Absent	339	99.4
	Solid Lesion	2	.6
Bladder*	Absent	306	89.7
	Diverticulum	6	1.8
	Stone	9	2.6
	Wall Thickening	23	6.7
	Mass	2	.6
Muscle - bone*	Absent	320	93.8
	Cyst. Solid Lesion	7	2.1
	Fracture	3	.9
Vascular	Other	12	3.5
	Absent	332	97.4
	Aneurysm	4	1.2
Pathologies that should be evaluated urgently	Other	5	1.5
	Absent	278	81.5
Pathologies that require frequent follow-up and further examination	Present	63	18.5
	Absent	274	8.4
Pathologies that do not require frequent follow-up and further evaluation	Present	67	19.6
	Absent	305	89.4
	Present	36	1.6

*More than one pathology was detected in the patient.

When the urgency status of these pathologies was evaluated, it was found that pathology requiring urgent evaluation in 18.5%, pathology requiring strict follow-up and further examination in 19.6%, and pathologies not requiring

strict follow-up and further examination in 1.6% (Table 2). It is observed that the distribution of the pathologies detected in the organs of the patients according to the gender variable did not differ statistically significantly ($p>0.05$) (Table 3).

It was determined that the distribution of pathologies detected in the spleen, mesentery, pancreas, surrenal and vascular organs of the patients did not differ statistically significantly according to the age group variable ($p>0.05$). The distribution of pathologies detected in the lung, liver, gallbladder, intestinal, bladder and muscle-bone organs differed statistically significantly according to the age group variable ($p<0.05$), the most pathology was in patients over 65 years of age, the least pathology was in patients younger than 40 years of age. was detected in patients It was determined that the distribution of the pathologies requiring urgent evaluation of the patients, requiring frequent follow-up and further examination, or pathologies that did not require frequent follow-up and further examination, differed statistically according to the age group variable. ($p<0.05$). It was observed that patients with pathologies requiring urgent evaluation or strict follow-up were most in the age group of 65 years and above, patients with pathologies that did not require strict follow-up and further evaluation were mostly in the 40-65 age group (Table 4).

Although all patients had ureteral stones, 209 (61.3%) patients had renal pathologies predominantly kidney stones and cysts.

Discussion

Renal colic is an acute side pain condition that is the reason for frequent admission to the urology outpatient clinic or emergency department. It usually occurs as a result of acute ureteral obstruction due to ureteral stones. While the probability of detecting urinary system stones is 12%, ureteral stones constitute 20% of the stones of these Stones (Pak, 1995). Although renal colic is usually due to ureteral stones, it is a condition that should be considered in order not to miss other life-threatening pathologies (Katz et al., 2000). Non-calculus diseases of the urogenital system, such as gynecological and gastrointestinal system pathologies, can also be detected as the cause of renal colic mimicking stone disease in imaging methods desired for diagnosis (Ather et al., 2009). In addition, other organ pathologies can be detected incidentally in imaging studies in patients with stones other than diseases caused by renal colic. Incidental findings are findings discovered incidentally while screening a patient for other indications (Salman et al., 2007). Especially with the increased use of computed tomography, there has been an increase in the detection of incidental findings (Kelly et al., 2015). Although many of these incidentally detected findings are clinically insignificant, they may also be findings of important diseases such as malignancy, where early diagnosis is important. Again, early diagnosis of diseases that require urgent and rapid treatment such as aortic aneurysm, appendicitis, cholecystitis is important in terms of affecting morbidity and mortality (Surov et al., 2016).

In many studies in the literature, it has been revealed that incidentally detected lesions are mostly detected in elderly patients (Hoffstetter et al., 2008; Barrett et al., 2009). In some studies, it was concluded that these findings were not related to gender (Akçiçek, 2022). In our study, it was observed that incidental findings were more common in the group over 65 years of age and their distribution according to the gender variable did not differ statistically significantly ($p>0.05$). Again, in the same studies, it was concluded that incidental findings were

frequently detected in the abdominal organs. In the study of Boutros et al, the rate of incidental findings detected in the liver was reported as 33% (Boutros et al., 2010).

In our study, the most common incidental finding was found in the liver with a rate of 32%, which was consistent with the literature. The most common lesion in the liver is hepatosteatosi with 24.3%. Solid lesion was detected in 11 patients with a rate of 3.2%. In our study, we included solid lesions in the group that should be evaluated urgently, such as appendicitis, pancreatitis, and fracture. Because we think that due to the possibility of malignancy in solid lesions, further investigation and diagnosis should be done without losing time. In our study, the rate of pathologies requiring urgent evaluation was 18.5%. This rate was determined by Van Vugt et al Incidental findings detected in thorax computed tomography were reported as 11.8% in the study (Van Vugt et al., 2012). Treskes et al detected incidental findings in 43% of the patients and stated that 42% of them could cause serious morbidity (Treskes et al., 2017).

The second most common incidental findings in our study were the basal lung findings with a rate of 16.1%, which were visible at the upper border of the sections. The most common incidental finding detected in the lung is pleural pathologies with a rate of 11.1. Pleural effusion and plaques are some of the detected pleural pathologies. Since there are studies suggesting thoracentesis especially in pleural effusion, we included patients with pleural effusion in the 'requiring frequent follow-up and further investigation' group in our study (Karkhanis & Joshi, 2012).

We think that it may be related to the fact that the second most common findings detected in all abdominal non-contrast tomography are in the lung, the upper limit of the examination is high and it includes lung sections. We think that the high number of pulmonary findings, especially during the COVID-19 pandemic, reveals the importance of this situation. In our study, the rate of lesions detected in the pancreas was 0.9%. While many studies did not find pathology related to the pancreas, the rate was reported as 1.2-2.6% in some studies 17. In some studies in the literature related to the incidental findings detected in emergency tomography in trauma patients, it was revealed that 49.8% of the patients had at least one incidental finding and 29.8% of them would require follow-up (Gore et al., 2012). In another study, they found a total of 1029 incidental findings in 675 patients and concluded that this rate is high when compared to the literature. They explained that this height may be related to the fact that they included common and clinically insignificant findings in the study and that the age groups were more advanced (Emekli et al., 2022). Although we excluded clinically insignificant and frequently encountered vascular calcific atherosclerotic changes and degenerative changes in bone structures in our study, our rate of incidental findings was found to be high with 93.7%. We also associate this elevation with the inclusion of thoracic pathologies included in the study and the over-reporting of liver hepatosteatosi rate. While the detected findings were evaluated in the category of pathologies requiring urgent evaluation with a rate of 18.5%, 19.6% were evaluated in the category of pathologies requiring frequent follow-up and further examination.

In another study investigating the incidental findings in abdominal tomography performed in emergency patients in the literature, they reported that they detected 20% of the findings requiring frequent follow-up and further evaluation (Kelly et al., 2015).

Table 3. Comparison of the pathological findings of the patients by gender variable

Pathological finding / follow-up		Woman	Man	χ^2	p
Lung*	Absent	f 60 % 77.9	226 85.6	2.602	.107
	Present	f 17 % 22.1	38 14.4		
Liver*	Absent	f 47 % 61.0	185 70.1	2.239	.135
	Present	f 30 % 39.0	79 29.9		
Gall bladder*	Absent	f 71 % 92.2	250 94.7	.669	.413
	Present	f 6 % 7.8	14 5.3		
Spleen	Absent	f 77 % 100.0	260 98.5	1.181	.277
	Present	f 0 % 0.0	4 1.5		
Intestinal*	Absent	f 74 % 96.1	239 90.5	2.457	.117
	Present	f 3 % 3.9	25 9.5		
Mesentery	Absent	f 76 % 98.7	254 96.2	1.183	.277
	Present	f 1 % 1.3	10 3.8		
Pancreas*	Absent	f 77 % 100.0	261 98.9	.863	.347
	Present	f 0 % 0.0	3 1.1		
Surrenal	Absent	f 77 % 100.0	262 99.2	.587	.444
	Present	f 0 % 0.0	2 0.8		
Bladder*	Absent	f 72 % 93.5	234 88.6	1.535	.215
	Present	f 5 % 6.5	30 11.4		
Muscle – bone*	Absent	f 73 % 94.8	247 93.6	.160	.689
	Present	f 4 % 5.2	17 6.4		
Vascular	Absent	f 74 % 96.1	258 97.7	.611	.434
	Present	f 3 % 3.9	6 2.3		
Pathologies that should be evaluated urgently	Absent	f 61 % 79.2	217 82.2	.351	.554
	Present	f 16 % 20.8	47 17.8		
Pathologies that require frequent follow-up and further examination	Absent	f 63 % 81.8	211 79.9	.135	.713
	Present	f 14 % 18.2	53 20.1		
Pathologies that do not require frequent follow-up and further evaluation	Absent	f 66 % 85.7	239 90.5	1.464	.226
	Present	f 11 % 14.3	25 9.5		

*More than one pathology was detected in the patient.

Table 4. Comparison of the pathological findings of the patients by age group variable

Pathological Finding / Follow-Up			<40 Years	40-65 Years	65 Years<	χ^2	p			
Lung*	Absent	f	135	136	15	66.757	.000			
		%	98.5	80.5	42.9					
	Present	f	2	33	20					
		%	1.5	19.5	57.1					
	Liver*	Absent	f	124	100			8	70.777	.000
			%	90.5	59.2			22.9		
Present		f	13	69	27					
		%	9.5	40.8	77.1					
Gall Bladder*		Absent	f	134	158	29	11.542	.003		
			%	97.8	93.5	82.9				
	Present	f	3	11	6					
		%	2.2	6.5	17.1					
	Spleen	Absent	f	135	167	35			.513	.774
			%	98.5	98.8	100.0				
Present		f	2	2	0					
		%	1.5	1.2	0.0					
Intestinal*		Absent	f	132	157	24	29.091	.000		
			%	96.4	92.9	68.6				
	Present	f	5	12	11					
		%	3.6	7.1	31.4					
	Mesentery	Absent	f	131	165	34			.999	.607
			%	95.6	97.6	97.1				
Present		f	6	4	1					
		%	4.4	2.4	2.9					
Pancreas*		Absent	f	137	167	34	2.964	.227		
			%	100.0	98.8	97.1				
	Present	f	0	2	1					
		%	0.0	1.2	2.9					
	Surrenal	Absent	f	137	167	35			2.048	.359
			%	100.0	98.8	100.0				
Present		f	0	2	0					
		%	0.0	1.2	0.0					
Bladder*		Absent	f	135	149	22	39.436	.000		
			%	98.5	88.2	62.9				
	Present	f	2	20	13					
		%	1.5	11.8	37.1					
	Muscle – Bone*	Absent	f	134	155	31			6.737	.034
			%	97.8	91.7	88.6				
Present		f	3	14	4					
		%	2.2	8.3	11.4					
Vascular		Absent	f	136	163	33	3.777	.151		
			%	99.3	96.4	94.3				
	Present	f	1	6	2					
		%	0.7	3.6	5.7					
	Pathologies that should be evaluated urgently	Absent	f	130	132	16			47.360	.000
			%	94.9	78.1	45.7				
Present		f	7	37	19					
		%	5.1	21.9	54.3					
Pathologies that require frequent follow-up and further examination		Absent	f	124	127	23	16.605	.000		
			%	90.5	75.1	65.7				
	Present	f	13	42	12					
		%	9.5	24.9	34.3					
	Pathologies that do not require frequent follow-up and further evaluation	Absent	f	127	143	35			9.842	.007
			%	92.7	84.6	100.0				
Present		f	10	26	0					
		%	7.3	15.4	0.0					

*More than one pathology was detected in the patient.

In another study these findings were found in 53% of all patients, and it was revealed that 59% of them required follow-up (Barrett et al., 2009). We associate this difference between the literatures with the absence of objective data to decide what clinically important and urgently needed pathologies and insignificant findings are. In all studies, it was reported subjectively in which category the findings would be evaluated.

Since our study was retrospective and only included patients with ureteral stones, the relatively small number of patients and the fact that the findings were not included in the stealing can be counted among the limitations of the study.

Conclusions

Many studies have been conducted regarding the incidental findings detected as a result of thorax and abdominal imaging, and a high rate of incidental findings has been detected. Early detection of these findings both leads to positive results in terms of early diagnosis and patient health, and prevents the economic burden reflected in the future. For all these reasons, it is important that the scans are reported correctly and the findings are included in the patient records as required, and that clinicians do not focus only on the ureteral stone and accurately convey these findings in the reports to the patients.

Conflict of Interest

The authors declare that there is no conflict of interest in the study.

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Ethics Committee Approval

Ethical Permission: Permission numbered 2022/145 was obtained from Malatya Turgut Özal University Non-invasive Clinical Research Ethics Committee for our study. (Approval no: 2022/145, Date: 20.09.2022).

Informed Consent

Written informed consent was waived because the study was retrospective.

Peer-review

Externally peer-reviewed.

Author Contributions

M.S.A.: Conception and design, Writing manuscript, Material preparation, Data collection, Analysis, Revising, Read and Approving Manuscript.

E.A.: Writing manuscript, Revising, Read and Approving Manuscript.

References

- Akçiçek, M. (2022). Incidental findings in chest computed tomography of patients with thoracic trauma: what we need to know. *European Review for Medical and Pharmacological Sciences*, 26, 3237-3248.
- Ather, M. H., Faizullah, K., & Irani, F. (2009). Alternate and incidental diagnoses on noncontrast-enhanced spiral computed tomography for acute flank pain. *Urology Journal*, 6(1), 14-18.
- Barrett, T. W., Schierling, M., Zhou, C., Colfax, J. D., Russ, S., Conatser, P., ... & Wrenn, K. (2009). Prevalence of incidental findings in trauma patients detected by computed tomography imaging. *The American Journal of Emergency Medicine*, 27(4), 428-435.
- Boutros, C., Katz, S. C., & Espat, N. J. (2010). Management of an incidental liver mass. *Surgical Clinics of North America*, 90(4), 699-718.
- Chen, M. Y., & Zagoria, R. J. (1999). Can noncontrast helical computed tomography replace intravenous urography for evaluation of patients with acute urinary tract colic? *Journal of Emergency Medicine*, 17, 299-303.
- Emekli, E., & Gündoğdu, E. (2022). Frequency of incidental findings in unenhanced abdominal computed tomography for diagnosis of urinary system stone. *Kocatepe Medical Journal*, 23, 38-44.
- Flannigan, R., Choy, W. H., & Lange, D. (2014). Renal struvite stones—pathogenesis, microbiology and management strategies. *Nature Reviews Urology*, 11, 333-341.
- Gore, R. M., Wenzke, D. R., & Berlin, J. W. (2012). The incidental cystic pancreas mass: a practical approach. *Cancer Imaging*, 12(2), 414-421.
- Hoffstetter, P., Herold, T., & Schreyer, A. G. (2008). Nicht raumaassoziierte Nebenbefunde bei Ganzkörpercomputertomografien im Rahmen der Polytraumadiagnostik. *Fortschr Röntgenstr*, 180(2), 120-126.
- Karkhanis, V., & Joshi, J. (2012). Pleural effusion: diagnosis, treatment, and management. *Open Access Emergency Medicine*, 4, 31-52.
- Katz, D. S., Scheer, M., & Lane, M. J. (2000). Alternative or additional diagnoses on unenhanced helical computed tomography for suspected renal colic: experience with 1000 consecutive examinations. *Urology*, 56(1), 53-57.
- Kelly, M. E., Heeney, A., & Winter, D. C. (2015). Incidental findings detected on emergency abdominal CT scans: a 1-year review. *Abdom Imaging*, 40(6), 1853-1857.
- Pak, C. Y. (1998). Kidney stones. *Lancet*, 351, 1797-801.
- Salman, R., Whitely, W. N., & Warlow, C. (2007). Screening using whole body magnetic screening: who wants an incidentaloma? *Journal of Medical Screening*, 14, 2-4.
- Surov, A., Bach, A. G., & Schramm, D. (2016). Clinically relevant cardiovascular findings detected on staging computed tomography in patients with several malignancies. *Angiology*, 67, 630-637.
- Surov, A., Bach, A. G., & Schramm, D. (2014). Non-osseous incidental findings in low-dose whole-body CT in patients with multiple myeloma. *British Journal of Radiology*, 87, 20140185.
- Treskes, K., Bos, S. A., & Goslings, J. C. (2017). High rates of clinically relevant incidental findings by total-body CT scanning in trauma patients; results of the REACT-2 trial. *European Radiology*, 27(6), 2451-2462.
- Van Vugt, S., Broekhuizen, L., & Verheij, T. (2012). Incidental chest radiographic findings in adult patients with acute cough. *Annals of Family Medicine*, 10(6), 510-515.