How to Cite:
Iraj, G. ., Tahereh, N., Mohammad, S., Mohammad, H., Hammed, A., Fatemeh, J., & Farzad, B. (2022). Prognostic value of clinical signs and CT-scan findings in renal colic patients referred to emergency department of Imam hospital in sari in 2021. *International Journal of Health Sciences*, *6*(S7), 1294–1310. https://doi.org/10.53730/ijhs.v6nS7.11534

Prognostic value of clinical signs and CT-scan findings in renal colic patients referred to emergency department of Imam hospital in sari in 2021

Golikhatir Iraj
Associate Professor of Department of Emergency Medicine, Faculty of Medicine, Mazandaran University of Medical Sciences, Sari, Iran

Niknejad Tahereh
Emergency Medicine Resident, Faculty of Medicine, Mazandaran University of Medical Sciences, Sari, Iran

Sazgar Mohammad
Assistant Professor of Department of Emergency Medicine Faculty of Medicine, Mazandaran University of Medical Sciences, Sari, Iran

Hosseininejad Mohammad
Associate Professor of Department of Emergency Medicine, Faculty of Medicine, Mazandaran University of Medical Sciences, Sari, Iran

Aminiahidashti Hammed
Aminiahidashti Hammed Associate Professor of Department of Emergency Medicine, Faculty of Medicine, Mazandaran University of Medical Sciences, Sari, Iran.
Corresponding Author, email: igolykhatir@gmail.com

Jahanian Fatemeh
Assistant Professor of Department of Emergency Medicine, Faculty of Medicine, Mazandaran University of Medical Sciences, Sari, Iran

Bozorgi Farzad
Associate Professor of Department of Emergency Medicine, Faculty of Medicine, Mazandaran University of Medical Sciences, Sari, Iran

***Abstract*---**Background: The aim of this study was to investigate the positive predictive value of CT scan findings and clinical signs in choice of clinical management of renal colic patients referred to the emergency department of Imam Hospital in Sari in 2020-2021.

Method: A cross-sectional study was performed on all patients with renal colic who were admitted to the emergency department in Sari Imam Khomeini Hospital, in 2021. 167 patients with acute renal colic in terms of clinical manifestations, laboratory findings, and CT scan findings were evaluated.Results: In the present study, 55 patients (32.9%) underwent TUL treatment and 112 patients (67.1%) had spontaneous excretion. 48.9% of people with clinical symptoms of abdominal pain and 27% of people without symptoms of abdominal pain finally underwent TUL treatment (p = 0.008). The incidence of TUL in patients with stone size> 5 mm was significantly higher than those with stones ≤5 mm (P <0.001) and the majority of patients with stones in the upper and middle third of the ureter were in the TUL group. The majority of patients had spontaneous excretion despite stones in the lower third and UVJ (p = 0.021). Patients with perinephric fluid and periureteral fluid (P = 0.01) also had significantly higher incidence of TUL .Conclusion: Larger stone size, proximal location, and complaints of abdominal pain are the most important parameters for predicting invasive management of acute renal colic.

Keywords---*Prognostic value, Clinical signs, CT-scan findings, renal colic.*

Introduction

The abrupt onset of intense pain, nausea, and even vomiting are all symptoms of renal colic, which demands a precise diagnosis as well as treatment as soon as possible. This discomfort is frequently caused by the movement of stones through the renal collecting system[1]. The intense pain that the patient is experiencing as a result of renal colic makes this one of the most prevalent types of urological emergency[2]. Some investigations have indicated that the prevalence of renal colic is around one percent, but other studies have indicated that the rate might range anywhere from one percent to five percent[3-6]. Acute renal colic is characterized by a rapid onset of flank pain that radiates down into the lower abdomen[7-9]. This symptom is typically accompanied by microscopic hematuria, nausea, and vomiting[7]. The majority of researchers agree that providing pain treatment to these patients while they are still in the emergency department and before they are discharged or have surgery should be the initial step[2]. In the acute stage, one of the most effective therapies is pain relief because the majority of urinary stones disappear with the expected medical care[8]. Imaging is an extremely important part of both the diagnostic process and the therapy plan for these patients. Imaging serves the most essential purpose when it is used to determine the amount of obstruction throughout the urinary system as well as the origin of the obstruction[5,6,12]. Plain radiographs of the abdomen have a lower detection rate for urinary stones (approximately 40–50%), and they are unable to distinguish non-radiopaque stones or obstructive reasons that are not caused by stones. Furthermore, plain radiographs of the lower abdomen are distinctive of the condition, and in all instances, they are unable to effectively differentiate between urinary stones and phlebitis[13]. However, it has been noted that isodence stones fade with a contrast agent and are not visible very well, and intravenous

urography employs injectable contrast material. Therefore, intravenous urography is not the best approach for detecting urinary stones. Instead, intravenous urography (IVP) has been the method of choice for diagnosing urinary stones for many years. Nephrotoxicity and hypersensitivity are two of the potential adverse effects of this method. In addition, it requires a significant amount of time for the examination and makes extensive use of x-rays. Because it is a low-cost and easily accessible approach that does not require the use of X-rays or contrast agents, ultrasound has been the method of choice for imaging renal colic in recent times. However, in cases of severe obstruction, the sensitivity ranges from roughly 85 to 74 percent, depending on how skilled the ultrasound technician is. Its primary deficiency is in the inability to determine the reason and severity of obstruction in the middle of the ureters. This is due to the fact that gas in the loops of the intestine and colon inhibits ultrasound waves from moving through them. Ultrasound cannot detect stones that are less than 5 millimeters in size[12].

The CT scan, which does not require a contrast agent injection and is now the method of choice for the diagnosis of urinary stones, is sensitive in more than 99 percent of cases, is a quick method, and does not require the use of a contrast agent. This approach represents clinical instances that are clinically comparable to renal colic very well and reliably estimates the size of the stones[5]. In scenarios when a CT scan is insufficient to distinguish between phlebitis and stones or calcifications surrounding the ureter, secondary symptoms such as hydronephrosis, ureteral dilatation, renal enlargement, and fat infiltration around the kidney and ureter can be employed instead[6,14,15]. Therefore, as a result of the extraordinary significance of the emergency department and the significance of the management of this department in terms of determining patients' tasks in the shortest possible time as well as to prevent congestion and crowding of clients, locating positive news value and CT scan findings or clinical findings is of utmost importance. So, an urgent patient assignment is necessary because the patient has to be admitted to the hospital, or the patient can be referred to the clinic as an outpatient for a short period of time. Therefore, the purpose of this study was to evaluate the various effects of the positive predictive value of clinical findings and CT scan in determining the renal colic patients referred to the emergency department of Imam Sari Hospital in January 2021 and September 2021 . The results of this study can be used to figure out which urology patients need to be hospitalized and which ones can be referred to the clinic as outpatients; what percentage of patients have spontaneous excretion; and what percentage need surgery.

Materials and methods:

The present study is a cross-sectional study conducted in Imam Khomeini Medical Center in Sari. This research was carried out between January 2021 and September 2021. This research included all patients with colic pain caused by kidney stones (R10 code 10 ICD) who were referred to the emergency department of this educational and medical facility. This study was conducted on all patients over the age of 18 who were referred to the emergency department of Imam Khomeini Hospital in Sari with clinical symptoms of renal colic, including sudden onset of abdominal pain, tenderness of the sides, discolored urine, nausea, vomiting, and a history of stones. All of the aforementioned patients entered the

study after providing their own or their companions' informed permission. The ethics committee of Mazandaran University of Medical Sciences authorized the aforesaid plan with the identifier IR.MAZUMS.IMAMHOSPITAL.REC.1399.7238.
The patients were then referred to the radiology unit for a CT scan, and a questionnaire was used to record the results and findings of the CT scan based on the radiologist's report, which included the size and position of the stone, as well as the hydronephrosis rate and perinephric fluid.

Exclusion criteria included the lack of urinary system stones and diagnostic reports other than kidney stones at the time of hospitalization, and also individuals who were allocated without imaging. Pregnant women, those with a history of kidney disease, dialysis, or drug addiction, and those with a final diagnosis other than renal colic (ICD10 code R10), were also eliminated.
Then, demographic data including age, sex, method of referral, duration of emergency hospitalization, duration of hospitalization in urology, and clinical findings of the patient including nausea, vomiting, abdominal pain, testicular pain, discoloration of urine, urinary incontinence and frequent urination, fever and chills, history of stones, the patient or companions were questioned, and the presence of costovertebral tenderness by the physician as pain in the sides in a sitting and outstretched hand position were recorded.

All signs and symptoms were evaluated upon arrival at the emergency department. All patients with suspected renal colic were referred to a CT scan unit for imaging. A CT scan without contrast was performed by a radiologist and read or reported by a radiologist or emergency medicine specialist. In terms of stone and location (UPJ, pelvis and calyx, ureter, UVJ and bladder, and presence or absence of unilateral or bilateral hydroureteronephrosis), presence or absence of peripheral fluid, and presence or absence of periventricular fluid were assessed and the results were recorded in a questionnaire.

In addition, patients who were discharged from the emergency department were examined over the phone within a week of their discharge to determine the eventual fate of the stone, which included spontaneous excretion, the requirement for urological surgery, or the necessity for ESWL. This assessment was carried out by the assistant of emergency medicine with the patient's informed permission during the hospitalization in the form of introducing oneself as a doctor and getting a contact number (mobile or landline) to track the patient's final condition.

Statistical analysis method:

The graphical approach and the Kolmogorov-Smirnov test were used to evaluate and confirm the hypothesis of normality of quantitative data. The mean (standard deviation) was used to describe the quantitative factors, whereas the number was used to represent the qualitative variables (percentage). In order to compare quantitative factors between the two groups of final outcomes (TUL and spontaneous excretion of stone), the T-Test and qualitative variables of Pearson chi-square and Linear by Linear Association tests, as well as the Fisher-Exact Test, if necessary, are used. Due to the fact that the level of statistical significance was lower than 0.05, a significant margin ranging from 0.05 to 0.1 was taken into

consideration. The SPSS software, version 24, was utilized for each and every statistical analysis that was carried out.

Results

General characteristics of the subjects:

In this study, 167 patients were referred to the emergency department with renal colic ages ranging from 15 to 83 years, with a mean (standard deviation) of 41.15 (11.74) years. There were 116 male patients, which consists of 69.5 percent of the total, and 51 female patients, which consists of 30.5 percent. In terms of the overall results, TUL therapy was administered to 55 patients (32.9%), while spontaneous excretion occurred in 112 patients (67.1%).

Table 1 presents a comparison of the eventual results of the individuals (spontaneous excretion or TUL) in terms of the demographic and clinical data that were present at the time of the study's beginning. As can be seen in the mentioned table, there is not a statistically significant difference between individuals who have spontaneous excretion and individuals who are receiving TUL treatment in terms of gender, age, systolic and diastolic blood pressure, heart rate, how they were referred to the emergency department, referral season, and duration of hospitalization (P > 0.05). TUL was ultimately effective in treating 43.1% of patients who reported a history of kidney stones and 28.4% of those who did not have a history of kidney stones; nevertheless, the difference between the two groups was statistically significant (P = 0.06).

Table 1
Comparison of baseline demographic and clinical findings of patients on the basis of eventual therapeutic action

p-value	**eventual therapeutic action**		**Measured parameter**
	TUL	Spontaneous passage	
0/67	(31%/9) 37	(% 68/1) 79	Male	**Gender (Number (%))**
	(% 35/3) 18	(% 64/7) 33	Female	
0/15	± 13/14 43/00	40/24 10±/92	Years	**Age**
0/88	27/35 ±61/127	± 13/81 128/64	mmHg	**Systolic blood pressure (SD ± M)**
0/28	± 14/36 85/76	81/76 ± 8/25	mmHg	**Diastolic blood pressure (SD ± M)**
0/47	± 15/35 85/90	± 20/83 80/79	Rate in minutes	**Heart rate (SD ± M)**
0/99	(% 33/3) 55	(% 66/7) 110	Personal reference	**How to referred to the emergency department**
	0	(100%) 2	Referral by ambulance 115	
0/63	(% 30/3) 33	(% 69/7) 76	Spring	**Referral season**

	(% 41/7) 5	(% 58/3) 7	Summer	
	0	(% 100) 1	Fall	
	(% 37/8) 17	(% 62/2) 28	Winter	
0/28	± 109/47 192/58	± 79/51 176/57	Minutes	**Duration of hospitalization (SD ± M)**
0/06	(% 43/1) 22	(% 56/9) 29	Yes	**History of kidney stones**
	(% 28/4) 33	(% 71/6) 63	No	

Clinical symptoms of the subjects

The comparative status of the participants' ultimate results (spontaneous excretion or TUL) is shown in Table 2, and it is organized according to the clinical symptoms. As can be seen in the mentioned table, there is not a statistically significant difference between individuals who experience spontaneous excretion and individuals who are receiving TUL treatment in terms of clinical signs such as nausea, vomiting, testicular pain, sudden flank pain, discoloration of urine, urinary incontinence, fever and chills, and costovertebral tenderness (P> 0.05). TUL was ultimately applied to 48.9 percent of the patients who were experiencing clinical symptoms of abdominal pain and only 27 percent of the patients who did not have symptoms of abdominal pain. The difference in treatment outcomes between the two groups was observed to be statistically significant (P = 0.008).

Table 2. Comparison of patients' clinical symptoms between different groups of eventual therapeutic action

p-value	Eventual therapeutic action			Examined symptoms
	TUL ((%) number)	Spontaneous passage ((%)numbres)		
0/93	(% 32/7) 35	(% 67/3) 72	Yes	Nausea
	(% 33/3) 20	(% 66/7) 40	No	
0/91	(% 33/3) 28	(% 66/7) 56	Yes	Vomit
	(% 32/5) 27	(% 67/5) 56	No	
0/008	(% 48/9) 22	(% 51/1) 23	Yes	Abdominal pain
	(% 27) 33	(% 73) 89	No	
0/59	(% 38/1) 8	(% 61/9) 13	Yes	Testicular pain
	(% 32/2) 47	(% 67/8) 99	No	
0/22	(% 30/9) 43	(% 69/1) 96	Yes	Sudden flank pain
	(% 42/9) 12	(% 57/1)16	No	
0/13	(% 43/2) 16	(% 56/8) 21	Yes	Discoloration of urine
	(% 30) 39	(% 70) 91	No	
0/85	(% 31/7) 13	(% 68/3) 28	Yes	Urinary incontinence and frequent urination
	(% 33/3) 42	(% 66/7) 84	No	
0/61	(% 50) 1	(% 50) 1	Yes	Fever and chills
	(% 32/7) 54	(% 67/3) 111	No	
0/74	(% 34/1) 28	(% 65/9) 54	Yes	Costovertebral

	(% 31/8) 27	(% 68/2) 58	No	tenderness

Laboratory findings of the studied subjects

Table 3 displays the comparison status of the ultimate result of the subjects (spontaneous excretion or TUL) based on laboratory findings. As can be seen in the table, no statistically significant differences were observed between spontaneously excreted individuals and TUL-treated individuals in terms of pyuria status and levels of WBC, creatinine, and urea (P> 0.05). TUL was ultimately provided to 39.3% of individuals who did not have hematuria, 41.5% of individuals who had microscopic hematuria, and 66.7% of individuals who had gross hematuria; nonetheless, the observed difference between the groups was statistically marginally significant (P = 0.06).

Table 3. Comparison of different laboratory findings between different groups of eventual therapeutic action

p-value	Eventual therapeutic action			Measured parameter
	TUL (number (%))	Spontaneous paasage (number (%))		
0/63	(% 25) 2	(% 75) 6	Yes	Pyuria
	(% 33/3) 53	(% 66/7) 106	No	
0/06	(% 39/3) 36	(% 70/7) 87	No hematuria	Hematuria
	(% 41/5) 17	(% 58/5) 24	Microscopic hematuria	
	(% 66/7) 2	(% 33/3) 1	Gross hematuria	
0/93	± 3099/26 44/9604	± 3065/13 69/9557	Number per ml	WBC
0/45	1/13 ± 0/3	1/97 ± 8/30	mg/dl	Creatinine
0/77	38/12 ± 10/04	39/29 ± 28/64	mg/dl	Urea

Imaging findings (CT scan) of the subjects

As shown in Table 4, the percentage of patients who receive TUL treatments has grown as the severity of hydronephrosis has increased, and the observed difference has been statistically marginally significant (P = 0.1). Then, after integrating the subgroups without and with low hydrophilicity as well as the subgroups with moderate and severe hydronephrosis, it was discovered that the occurrence of TUL treatments in the first subgroups (28.9%) was lower than the occurrence in the second subgroups (46.2%), and the difference between the two was statistically significant (P = 0.05). In addition, the occurrence of TUL treatments was statistically substantially greater in patients with possessed perinephric fluid (P> 0.001) and periurethral fluid (P = 0.01) than in patients who did not have either of these fluids, and this difference was found to be statistically significant between the groups. The incidence of TUL therapy was greater in

patients with stones bigger than 5 mm as compared to patients without stones and stones smaller than 5 mm (P > 0.001), and it was also higher in patients with multiple stones as compared to people without stones or a single stone (P = 0.08), and the observed differences were statistically significant. The data showed that there was not a statistically significant association between the direction of kidney involvement and the kind of therapy that was ultimately provided (P = 0.61).

Table 4
Comparison of CT scan findings between different groups of eventual therapeutic action

p-value	Eventual therapeutic action			Examined symptoms
	TUL ((%)number)	Spontaneous passage ((%)number)		
0/1	(% 66/7)2	(% 33/3)1	Severe	The rate of hydronephrosis in CT scan images
	(% 44/4) 16	(% 55/6) 20	Moderate	
	(% 28/4) 23	(% 71/6) 58	Mild	
	(% 29/8) 14	(% 70/2) 33	No hydronephrosis	
<0/001	(% 52/6)40	(% 47/4)36	Yes	Existence of perinephric fluid
	(% 16/5)15	(% 83/5)76	No	
0/01	(% 50)19	(%50)19	Yes	Existence of periurethral fluid
	(% 27/9)36	(% 72/1)93	No	
<0/001	(% 25)1	(% 75)3	No stone was seen	Stone size
	(% 15)16	(% 85)91	≤ 5 mm	
	(% 67/9)38	(% 32/1)18	> 5mm	
0/08	(% 25)1	(% 75)3	No stone was seen	Number of stones
	(% 28/3)30	(% 71/7)76	Single	
	(% 42/1)24	(% 57/9)33	Multiple	
0/61	(% 34/2) 27	(% 65/8) 52	Right	The involved kidney
	(% 30/2) 19	(% 69/8) 44	Left	
0/021	(% 45) 9	(% 55) 11	Cialis	The position of the stone
	(% 63/2) 12	(% 36/8) 7	upper ureter 1/3	
	(% 21/9) 6	(% 57/1) 8	middle ureter 1/3	
	(% 25/5) 12	(% 74/5) 35	1/3 lower ureter	
	(% 26/8) 15	(% 73/2) 41	UVJ	
	(% 12/5) 1	(% 87/5) 7	Bladder	
	0	(% 100) 3	No stone was seen	

Discussion

In the present study, 55 patients (32.9%) underwent TUL treatment and 112 patients (67.1%) had spontaneous excretion. There were no statistically significant differences found between spontaneously excreting individuals and those who were treated with TUL in terms of the clinical signs of nausea, vomiting, testicular pain, sudden flank pain, urinary discoloration, urinary incontinence, fever and chills, and costovertebral tenderness. The difference between the two groups was statistically significant: 48% of individuals with clinical symptoms of abdominal pain and 27% of individuals without such symptoms received TUL therapy.

The predictive relevance of clinical symptoms of renal colic for invasive procedures that have yielded varying results has only been investigated in a relatively limited amount of research up to this point. This was the case, for example, in a retrospective study by Aubrey-Bassler and colleagues on patients with suspected UTS who had non-contrast abdominal CT. The CT images obtained from their study revealed that out of 2331 patients, 49 patients (2.2 %) had an emergency result, and 239 patients (10.6%) underwent urological surgery within 8 weeks after receiving CT. The presence of abdominal pain, the number of WBCs, the RBCs in the urine, and the maximum temperature were the primary predictors of the first result[16]. However, a study conducted in 2020 by Seyed Mohammad Hosseini Nejad et al. with the purpose of assessing the consequences and determinant factors of invasive intervention and readmission in patients with renal colic. There was a total of 581 individuals who participated in the research, and of those patients, 140 (24.1%) underwent invasive therapy. The presence of symptoms of nausea and vomiting and ultrasound results with moderate to severe hydronephrosis were predictive of the requirement for invasive surgery and surgery to treat these patients[17].

A research project carried out in the year 2019 by Erkan Arslan et al. The purpose of this study was to evaluate the parameters that can predict the diagnosis and the necessity for intervention in patients who are hospitalized and have renal colic. Patients participated in the study and were assigned to one of two groups based on whether or not they needed intervention: "no need for intervention," or "need for intervention." In the first group were patients who required medical therapy in addition to surgical surgery because of stones, and in the second group were patients who either did not have stones or had stones that did not require any additional intervention beyond medical care. In this study, it was discovered that patients who also suffered from nausea and vomiting had a considerably increased risk of requiring medical treatment for urinary stones. In addition, the results of this study demonstrated that patients who had the beginning of urinary symptoms because of an irritable bladder did not require medical intervention owing to the presence of stones in the urinary tract[18].

If the kidney stone becomes obstructed, colic pain will emerge. The sudden onset of severe low back pain is the classic presentation of renal colic. However, depending on the location of the obstruction, the pain can extend to the sides, the groin, the testicles, or the labia majora[18]. If the kidneys and calyces are occluded

because of stones in the pelvis, then the patient will have pain in the lower back. On the other hand, dilation of the kidney capsule causes non-colic pain[19].

An additional cause of renal colic is the dilatation and hyperperistalsis that can occur in the ureter and retina. Stones in the ureter are responsible for the symptoms of acute colic in 60 to 95 percent of individuals who seek medical attention. Pain can also be caused by regional circumstances such as mucosal irritation, inflammation, edema, or hyperperistalsis. For instance, edema can produce colic pain because it stretches the free nerve endings in the abdomen[18].

Stones in the ureter cause symptoms when they move through the ureter and deposited in different areas. It is possible that the pain in the abdomen will extend when the stone moves farther down into the pelvis. Pain radiates to the groin and the genital region on the same side when distal ureteral stones are primarily responsible for the condition. Stones near the ureter-bladder junction (UVJ) have the potential to cause bladder irritation and its associated symptoms[18].

Other symptoms, such as nausea and vomiting, may be the result of activation of the celiac ganglion and the embryonic neuronal route that connects the kidneys with the gastrointestinal tract[18].

Therefore, clinical signs are able to indicate the affected region, and variations across studies in reporting clinical signs that predict the likelihood of intervention may be influenced by the percentage of people who are affected in a particular area. In the current study, the majority of patients who had stones in the upper and middle third of the ureter were in the TUL group. On the other hand, the majority of patients who had stones in the lower third of the ureter and UVJ had spontaneous excretion of stones. This was determined by comparing the two groups. This might be the reason why there was a much greater incidence of abdominal pain in the TUL group (40 percent, or 22 out of 55 patients), compared to the individuals who had spontaneous excretion (20.5 percent, or 23 out of 112 patients).

In the present study, when comparing the final results of subjects (spontaneous excretion or TUL) according to laboratory findings, there was no statistically significant difference between individuals treated with TUL and those treated with spontaneous excretion in terms of Pyuria status, WBC count, or creatinine level, or the presence of urea. TUL treatments was ultimately provided to 39.3 percent of persons who did not have hematuria, 41.5 percent of people who had microscopic hematuria, and 66.7 percent of people who had gross hematuria; nevertheless, the observed difference between the groups was statistically marginally significant ($P = 0.06$).

Hematuria can be caused when a stone strikes the mucosa of the calyx or pelvis, and the majority of individuals only have microscopic hematuria[18]. It is also possible for macroscopic hematuria to manifest as episodic bouts of severe hematuria or urine that has a tea-colored appearance[20,21]. However, just because there is no evidence of hematuria does not mean that there are no stones in the urinary system[18].

In research that was quite similar to the one that was just completed, Erkan Arslan and his colleagues found that the presence of microscopic and/or macroscopic hematuria can statistically significantly suggest the need for intervention[18]. A diagnosis of hematuria was made in 72.2% of patients in a study that was carried out by Duran L and colleagues with the purpose of examining patients suffering from renal colic who had been referred to the emergency department[22].

In the current study, it was found that the occurrence of TUL treatment was significantly higher in individuals with stones larger than 5 mm than in individuals without stones or stones smaller than 5 mm. Additionally, the occurrence of TUL treatment was significantly higher in individuals with multiple stones than in individuals without stones. As previously indicated, in the research of the site of stone obstruction, the majority of patients with stones in the upper and middle third of the ureter were in the TUL group, whereas the majority of patients exhibited spontaneous stone excretion despite the presence of stones in the lower third of the ureter and UVJ.

These findings were in line with the findings of previous investigations, including the studies of Lotan et al.[23], Ege et al.[24], Boulay et al.[25] and Demehri et al.[26].

According to the findings of the research by Lotan et al., the results of CT scans performed on 183 patients diagnosed with acute renal colic were analyzed retrospectively in order to determine the role that CT plays in determining whether a patient requires interventional or conservative therapy. Based on the results of the CT scans and the clinical follow-up, the diagnosis of urolithiasis was established in 80 of the patients in the study group. In this study, 42 patients received conservative therapy, which accounts for 52% of the total, and 38 patients received therapeutic treatments, which accounts for 48% of the total. Patients who were treated conservatively and patients who underwent intervention exhibited substantially different stone sizes and densities. The chance of therapeutic intervention was higher in patients who had stones that were larger than 6.5 mm and had a density that was more than 1100 HU. Regarding the location of the stone and how it should be treated, the researchers found that patients who had stones in the proximal ureter at the time of the CT were statistically significantly more likely to receive interventional treatment regardless of the size of the stone, whereas patients who had stones in their bladder were more likely to have their stones passed without treatment. They were substantially more likely to undergo spontaneous stone passing, according to the statistics. Other stone locations, including the middle ureter, the lower ureter, and the UVJ, were insufficient to substantially predict the kind of therapy that was recommended. Patients who were treated conservatively, on the other hand, were more likely to have stones in the distal ureter and UVJ than they were to have stones in the proximal or middle sections of the ureter[20].

Ege et al. conducted research with the purpose of establishing the occurrence of secondary symptoms associated with ureteral stones in advanced cochlear computed tomography (CT) of patients with acute renal colic and their association with patient management and success. According to the findings of this study,

stones that were bigger than 6 millimeters had a greater likelihood of requiring endoscopic resection or lithotripsy[24].

In a study, Boulay et al. evaluated 51 patients with acute ureteral stone disease and performed a retrospective analysis to determine the existence of stones, the size and position of ureteral stones, as well as the presence of secondary symptoms of obstruction and the severity of those symptoms. They found a substantial difference in the size of the stones between patients who were given conservative treatment and those who were given interventional treatment[25].

Similarly, Demehri et al. demonstrated that the maximum mean diameter utilizing soft tissue window settings for ureteral stones that pass spontaneously (4.6 mm) is less than 8/6 mm for stones that require intervention[26].

A study was conducted in 2021 by Faris Abushamma and colleagues with the goal of describing the clinical and radiological characteristics that improve the likelihood of early intervention in cases of acute ureteral colic. Patients diagnosed with acute ureteral colic by non-contrast computed tomography (NCCT) images were divided into two primary categories: spontaneous stone passage (SSP) and early intervention (EI). The research comprised a total of sixteen hundred and sixty-one patients. Stones found in the upper and middle ureter were much more common in the El group (n = 54; 62 %) than they were in the SSP group (n = 22; 30 percent). A maximum length of ureteral stones (MCL) of 9 mm (13-16 mm) and a density of Hounsfield unit (HU) 700 were both related to early intervention (490-990). There was a statistically significant association between EI and a urea volume of 0.3 cm^3 (0.6-0.3). Ureteral wall thickness of 3 mm (2–3), presence of extra-renal pelvis (n = 20; 23 %), and renal pelvic AP diameter of 18 mm (13-28) were all substantially linked with greater rates of early intervention ($p < 0.001$). According to their results of a multiple binary logistic regression analysis, MCL is the most reliable indicator of early intervention. They came to the conclusion that the MCL is an independent and powerful predictor of early intervention in acute ureteral colic. They also found that biochemical variables and radiographic characteristics can also operate as supplementary factors for early intervention in this condition[27].

In spite of the advancements that have been made in Point-of-care ultrasound (PoCUS), the utilization of CT is continually growing, and more than 83 percent of patients are now having CT imaging during an acute phase. However, in the absence of any information on the patient's prognosis, it is challenging to determine whether it is best to recommend spontaneous passage, to recommend intervention, or to categorize risk using CT[28]. Several studies have investigated the possibility that secondary symptoms found on NCCT scans, such as hydronephrosis, peripheral edema or fluid, peripheral edema or fluid, or peripheral filament, may help determine whether or not interventional treatment is required as opposed to conservative treatment, but results were not conclusive[23-25,29]. According to the findings of other research, radiological findings such as hydronephrosis, ureteral dilatation, tissue edge marking, perinephric and periurethral fat fibers, decreased renal impairment, and enlarged kidney size do not accurately predict clinical outcome. However, these radiological findings may be helpful as supportive findings.

In the current investigation, it was discovered that as the rate of hydronephrosis was raised, so did the incidence of patients for whom TUL was eventually treated. Furthermore, the observed difference was statistically significant (P = 0.1). Then, after combining the subgroups without and with low hydrophilicity as well as the subgroups with moderate and severe hydronephrosis, it was discovered that the occurrence of TUL treatment in the first subgroups (28.9%) was lower than the incidence of TUL treatment in the second subgroups (46.2%), and the difference between the two was statistically significant.

It is unknown what the predictive value of hydronephrosis is in the emergency department for individuals who are experiencing ureteral colic[28]. Hydronephrosis is commonly utilized by emergency physicians to help direct treatment decisions. However, its association with failure of spontaneous defecation and the potential for intervention is not well understood[30-36]. According to the findings of some researchers, the severity of the hydronephrosis may be able to predict the need for future intervention[32,33,35]. However, other investigations have shown no relationship between the two[34,36]. Studies that suggest that hydronephrosis is associated with a favorable prognosis include shortcomings, such as a limited sample size[33], the collection of patients with and without stones[32], or the examination of a mixture of kidney and ureteral stones[32], which have varying outcomes and treatment options.

If the severity of hydronephrosis is strongly associated with subsequent passage failure, this can help physicians differentiate low-risk patients. In this scenario, low-risk patients are suitable for transit tests. High-risk patients, on the other hand, require immediate CT scans. This is especially helpful for environments with limited imaging capabilities and a high likelihood of requiring multiple CT scans[25].

A study that was conducted by Grant D. Innes and his colleagues aimed to find out whether or not hydronephrosis might differentiate low-risk individuals who were suitable for spontaneous passage testing from patients who had clinically significant stones and were at risk of failing the passage test. In order to evaluate hydronephrosis and stone size, they utilized CT, which is the gold standard for stone imaging. They investigated how well the hydronephrosis severity classification could identify big stones (≥ 5 millimeters in size). 38% of the 3251 patients had large stones, with 23% having no hydronephrosis, 29% having mild hydronephrosis, 53% having moderate hydronephrosis, and 72% having severe hydronephrosis. The failure rates at the crossing were 15%, 20%, 28%, and 43% in the various hydronephrosis groups, respectively, with an overall failure rate of 23%. Hydronephrosis that was described as "absent or mild" was seen in a significant portion of patients (64 percent) who had low pass-through failure rates. It was shown that moderate hydronephrosis indicated a slightly greater chance of transient failure, whereas severe hydronephrosis suggested a much higher risk. They came to the conclusion that individuals with absence or mild hydronephrosis are at a low risk of experiencing passage failure. These patients are candidates for a spontaneous passage test that does not need CT imaging. Hydronephrosis to a moderate degree has a weak association with stones of a bigger size, but it does not have a substantial relationship with transmission

failure. The presence of severe hydronephrosis is a significant discovery that demands conclusive imaging and referral. The risk categorization value that can be gained by distinguishing "moderate-severe" hydronephrosis from "absent or mild" hydronephrosis[25].

In a study conducted in 2017 by Leo et al. comparing ultrasound and computed tomography to determine the severity of hydronephrosis and its significance in renal colic, the researchers discovered that no level of hydronephrosis predicted 30-day outcomes. However, 37 patients with moderate to severe hydronephrosis were studied for the purpose of this research[31].

In their research, Taylor et al. found that "moderate to severe" hydronephrosis had a sensitivity of 37% and a specificity of 88% to predict the likelihood of further intervention. However, it was significant that the majority of their patients had parenchymal stones, and the management and prognosis of the condition are distinguishable from one another[29].

Daniels et al. conducted a study with 835 individuals who were suspected of having ureteral colic. They found that "moderate to severe" hydronephrosis had a sensitivity of 36% and a specificity of 86% for predicting a 90-day intervention. But 47% of patients did not have any stones and did not need to be treated with intervention[36].

According to the findings of the research conducted by Lotan and colleagues, the occurrence of hydronephrosis was not significantly different between those who received conservative therapy and those who had intervention. On the other hand, they demonstrated a statistically significant distinction between the obstructed and unobstructed sides during hydronephrosis[20].

Another notable discovery made by this research was that the occurrence of TUL therapy was much greater in those who had peripheral and periurethral fluid as compared to individuals who did not have either of these fluids.

In the study that was conducted by Lotan and colleagues, the level of edema or peripheral fluid was measured on a scale from 0 to 2, with 0 representing no edema, 1 representing limited edema, and 2 representing extensive edema.

There was no statistically significant difference between the two groups in terms of the mean degree of peripheral edema, which was 1/2 ± 0/7 in the intervention group and 1/2 ± 0/8 in the conservative therapy group. Also, the degree of periurethral edema was evaluated on a scale of zero to three degrees (no equals zero, ureteral fat equals one, and ureteral fluid equals two). There was no statistically significant difference between the two groups' means, which came in at 1/2 ± 0/6 for the intervention group and 1/0 ± 0/6 for the conservative therapy group [23].

In the research carried out by Ege et al., 110 patients who had urinary stones were prospectively examined using unreinforced helical CT for secondary symptoms of obstruction. On the unenhanced spiral CT, they focused primarily on determining whether or not seven secondary symptoms were present. These

symptoms included hydronephrosis, unilateral renal enlargement, perinephric edema, unilateral absence of the white pyramid, hydroverter, periurethral edema, and lateroconal fascial thickening. From a total of 110 patients, 91 (82.7 %) were diagnosed with hydroverter, 88 (80 %) were diagnosed with hydronephrosis, 65 (59 %) were diagnosed with periosteal edema, and 63 (57.2 %) were diagnosed with unilateral renal enlargement. 91 stones passed spontaneously, while 21 stones required assistance. They came to the conclusion that secondary symptoms of urinary tract obstruction are helpful results that assist the interpretation of CT examinations. They found that hydroverter, hydronephrosis, periurethral edema, and unilateral renal enlargement were the most accurate indicators of ureteral obstruction. In addition, individuals who have stones that are bigger than 6 millimeters and are positioned in the proximal two-thirds of the urethra, and those who have five or more secondary symptoms of obstruction, are more likely to require endoscopic resection and/or lithotripsy[24].

References

1. *Travaglini F, Bartoletti R, Gacci M, Rizzo M. Pathophysiology of reno-ureteral colic. Urologia internationalis. 2004;72(Suppl. 1):20-3.*
2. *Ahmadnia H, Younesi RM. TREATMENT OF RENAL COLIC USING INTRACUTANEOUS INJECTION/OF STERILE WATER. 2004.*
3. *Romero V, Akpinar H, Assimos DG. Kidney stones: a global picture of prevalence, incidence, and associated risk factors. Reviews in urology. 2010;12(2-3):e86.*
4. *Fisang C, Anding R, Müller SC, Latz S, Laube N. Urolithiasis—an interdisciplinary diagnostic, therapeutic and secondary preventive challenge. Deutsches Ärzteblatt International. 2015;112(6):83.*
5. *Heidenreich A, Desgrandschamps F, Terrier F. Modern approach of diagnosis and management of acute flank pain: review of all imaging modalities. European urology. 2002;41(4):351-62.*
6. *Bariol S, Moussa S, Tolley D. Contemporary imaging for the management of urinary stones. EAU Update Series. 2005;3(1):3-9.*
7. *Mahmudpour M, Ghasemi M, Ghasemi K. Assessment of the correlation between Plasma level of Chemerin and inflammatory markers in end-stage renal disease patients undergoing Hemodialysis. Journal of Advanced Pharmacy Education & Research| Oct-Dec. 2020;10(4).145-149*
8. *Priya B, Aarti B, Abhishek K, Deepti K. Recent Updates in Treatment of Renal Cell Carcinoma–A Comprehensive Review. Int. J. Pharm. Phytopharm. Res. 2019 Jun;9(3):29-35.*
9. *Bilovol OM, Kniazkova II, Kirienko OM, Bogun MV, Kirienko DM, Abramova LP, Berezin AE. Biomarkers of myocardial fibrosis and renal dysfunction in hypertensive patients with type 2 diabetes mellitus. Pharmacophore, 2020;11(6):132-140.*
10. *O'Connor A, Schug SA, Cardwell H. A comparison of the efficacy and safety of morphine and pethidine as analgesia for suspected renal colic in the emergency setting. Emergency Medicine Journal. 2000;17(4):261-4.*
11. *Holdgate A, Pollock T. Systematic review of the relative efficacy of non-steroidal anti-inflammatory drugs and opioids in the treatment of acute renal colic. Bmj. 2004;328(7453):1401.*
12. *Sidhu R, Bhatt S, Dogra VS. Renal colic. Ultrasound Clinics. 2008;3(1):159-70.*

13. *Zargar M, Shaver B, Hadizadeh H, Mansouri M. MRU versus Pilogarghy in diagnosis of upper urinary tract obstructions. Iranian Journal of Urology. 2003;33(4):27-33.*
14. *Chen MY, Zagoria RJ. Can noncontrast helical computed tomography replace intravenous urography for evaluation of patients with acute urinary tract colic? The Journal of emergency medicine. 1999;17(2):299-303.*
15. *Maher MM, Kalra MK, Rizzo S, Mueller PR, Saini S. Multidetector CT urography in imaging of the urinary tract in patients with hematuria. Korean journal of radiology. 2004;5(1):1-10.*
16. *Aubrey-Bassler FK, Lee SD, Barter RB, Asghari S, Cullen R, Godwin M. Utility of computed tomography and derivation and validation of a score to identify an emergent outcome in 2,315 patients with suspected urinary tract stone. Canadian Journal of Emergency Medicine. 2013;15(5):261-9.*
17. *Hoseininejad M, Hasannejad R, Mousavi J, Jahanian F, Rezaimehr B, Aminiahidashti H. One-month Clinical and Paraclinical Evaluation of Patients with Renal Colic. Journal of Mazandaran University of Medical Sciences. 2020;29(181):138-43.*
18. *ARSLAN E, PELİT ES. Are There Any Predictive Findings for Surgical Intervention Need in Urinary System Stones? Harran Üniversitesi Tıp Fakültesi Dergisi. 2019;16(1):93-6.*
19. *Martingano P, Cavallaro MF, Stacul F, Cova MA. Imaging of Renal Colic. Pain Imaging: Springer; 2019. p. 275-302.*
20. *Serinken M, Karcioglu O, Turkcuer I, Ozkan HI, Keysan MK, Bukiran A. Analysis of clinical and demographic characteristics of patients presenting with renal colic in the emergency department. BMC research notes. 2008;1(1):1-6.*
21. *Edmonds ML, Yan JW, Sedran RJ, McLeod SL, Theakston KD. The utility of renal ultrasonography in the diagnosis of renal colic in emergency department patients. Canadian Journal of Emergency Medicine. 2010;12(3):201-6.*
22. *Duran L, Acar E, Çelenk Y, Karaca A, Yavuz Y. Evaluation of patients presenting with renal colic in emergency department. 2014.*
23. *Lotan E, Weissman O, Guranda L, Kleinmann N, Schor R, Winkler H, et al. Can unenhanced CT findings predict interventional versus conservative treatment in acute renal colic? American Journal of Roentgenology. 2016;207(5):1016-21.*
24. *Ege G, Akman H, Kuzucu K, Yildiz S. Acute ureterolithiasis: incidence of secondary signs on unenhanced helical CT and influence on patient management. Clinical radiology. 2003;58(12):990-4.*
25. *Boulay I, Holtz P, Foley WD, White B, Begun FP. Ureteral calculi: diagnostic efficacy of helical CT and implications for treatment of patients. AJR American journal of roentgenology. 1999;172(6):1485-90.*
26. *Demehri S, Steigner ML, Sodickson AD, Houseman EA, Rybicki FJ, Silverman SG. CT-based determination of maximum ureteral stone area: a predictor of spontaneous passage. American Journal of Roentgenology. 2012;198(3):603-8.*
27. *Abushamma F, Ktaifan M, Abdallah A, Alkarajeh M, Maree M, Awadghanem A, et al. Clinical and Radiological Predictors of Early Intervention in Acute Ureteral Colic. International Journal of General Medicine. 2021;14:4051.*
28. *Innes GD, Scheuermeyer FX, McRae AD, Teichman JM, Lane DJ. Hydronephrosis severity clarifies prognosis and guides management for emergency department patients with acute ureteral colic. Canadian Journal of Emergency Medicine. 2021;23(5):687-95.*

29. *Ahmed A-f, Gabr AH, Emara A-A, Ali M, Abdel-Aziz A-S, Alshahrani S. Factors predicting the spontaneous passage of a ureteric calculus of⩽ 10 mm. Arab journal of urology. 2015;13(2):84-90.*
30. *Moak JH, Lyons MS, Lindsell CJ. Bedside renal ultrasound in the evaluation of suspected ureterolithiasis. The American journal of emergency medicine. 2012;30(1):218-21.*
31. *Goertz JK, Lotterman S. Can the degree of hydronephrosis on ultrasound predict kidney stone size? The American journal of emergency medicine. 2010;28(7):813-6.*
32. *Taylor M, Woo MY, Pageau P, McInnes MD, Watterson J, Thompson J, et al. Ultrasonography for the prediction of urological surgical intervention in patients with renal colic. Emergency Medicine Journal. 2016;33(2):118-23.*
33. *Fields JM, Fischer JI, Anderson KL, Mangili A, Panebianco NL, Dean AJ. The ability of renal ultrasound and ureteral jet evaluation to predict 30-day outcomes in patients with suspected nephrolithiasis. The American journal of emergency medicine. 2015;33(10):1402-6.*
34. *Leo MM, Langlois BK, Pare JR, Mitchell P, Linden J, Nelson KP, et al. Ultrasound vs. computed tomography for severity of hydronephrosis and its importance in renal colic. Western Journal of Emergency Medicine. 2017;18(4):559.*
35. *Daniels B, Gross CP, Molinaro A, Singh D, Luty S, Jessey R, et al. STONE PLUS: evaluation of emergency department patients with suspected renal colic, using a clinical prediction tool combined with point-of-care limited ultrasonography. Annals of emergency medicine. 2016;67(4):439-48.*
36. *Daniels B, Schoenfeld E, Taylor A, Weisenthal K, Singh D, Moore CL. Predictors of hospital admission and urological intervention in adult emergency department patients with computerized tomography confirmed ureteral stones. The Journal of urology. 2017;198(6):1359-66.*
37. Suryasa, I.W., Sudipa, I.N., Puspani, I.A.M., Netra, I.M. (2019). Translation procedure of happy emotion of english into indonesian in kṛṣṇa text. *Journal of Language Teaching and Research, 10*(4), 738–746