

How did COVID-19 affect acute urolithiasis? An inner Anatolian experience

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ABSTRACT

BACKGROUND: The COVID-19 pandemic has changed the number of patients seeking medical help from the emergency service (ES) with non-COVID complaints, consequencing in postponed presentations of different surgical and medical situations. Acute urinary stone disease is one of these situations and needs to be investigated in terms of the effect of COVID-19 on its presentation to the ES.

METHODS: In this observational, retrospective, and single-center study, we scanned each abdominopelvic computed tomography requested in ES for possible acute urolithiasis during 1 year before and after the outbreak of COVID-19. We searched to state the number of abdominopelvic computed tomographies applied and the number of ratifying urinary stone positivity. We enrolled patients' gender, age, stone location, and stone size. We also recorded C-reactive protein, leukocyte count, and creatinine and noted how long the patients suffering from pain, the duration until the intervention, and the management option selected for each case.

RESULTS: Total number of abdominopelvic computed tomographies performed was 1089. Of these, 517 were pre-pandemic and 572 were peri-pandemic. The number of pre and peri-pandemic stone-positive scans were, respectively, 363 (70.2%) and 379 (66.2%) ($P=0.643$). The females' percentage in the COVID-19 period (37.2%) was significantly lower than in the pre-pandemic period (54.3%) ($P=0.013$). The median size of ureter stones of the pre and peri-pandemic groups were, respectively, 4.8 mm and 3.9 mm depicting no significant difference ($P=0.197$). No significant difference was sighted between the pre and peri-pandemic groups concerning stone locations, blood parameters, painful duration, treatment options, and time to intervention.

CONCLUSION: The COVID-19 pandemic resulted in neither sicker nor fewer patients suffering from acute ureteric colic in the ES.

Keywords: COVID-19; emergency service; renal colic; surgery; urolithiasis.

INTRODUCTION

The severe pain arising out of stones moving down the urinary tract through to the ureter is named ureteric or renal colic and is one of the most prevalent urological diseases necessitating an emergency service (ES) visit.^[1] Urinary stones prevalence is reported to vary from 11 to 15% in Turkey.^[2] Ureteric colic, classically, is an insufferable pain spreading from the flank to the groin, has an acute onset, and always mandates immediate referral to ES. Postponed appeals may end up with acute kidney injury and urosepsis. Engrossingly, urosepsis on account of an infected kidney with impaired urinary drainage or a stone matrix taking action as a supply for mi-

crobial growth is even more frequent now than in the past.^[3]

Studies propound that the numbers applying to ES with acute and common complaints fell perilously while the COVID-19 pandemic spreads all around the globe, in other words, patients were postponing requesting health care until the disease becomes more serious. It can be speculated that people are delaying consulting the ES until their complaints turn into intolerably serious during the pandemic when they would generally have presented sooner before the pandemic.

This study dealt to inspect the impact of the pandemic on acute urinary stone presentations in the ES of our hospital located in the Inner Anatolia region. Thus, we aimed to de-

Cite this article as: Üntan İ. How did COVID-19 affect acute urolithiasis? An inner anatolian experience. *Ulus Travma Acil Cerrahi Derg* 2023;29:780-785.

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Ulus Travma Acil Cerrahi Derg 2023;29(7):780-785 DOI: 10.14744/tjtes.2023.36067 Submitted: 23.12.2022 Revised: 26.12.2022 Accepted:07.04.2023
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termine if the pandemic had ended up with fewer stones or sicker patients.

MATERIALS AND METHODS

In this retrospective, single-center, and observational study, we scanned each abdominopelvic computerized tomography (CT) ordered in the Kirsehir, Ahi Evran University, Training and Research Hospital, ES for ascertainment of acute renal colic during 1 year before and after the outbreak of COVID-19. The cut-off date, March 16, 2020, was picked as the day that the Turkish Ministry of Health broadcasted the urgent standstill of all non-urgent surgeries due to increasing anxiety over the incipient pandemic. The number of scans administrated was seized through an isolated computer exploration of all CTs on our hospital radiology system. All stone-free and elective scans were excluded so that only those from the ES interrogating possible acute urinary stones were added to the study. In our hospital, non-contrast, cross-sectional, low-dose, abdominopelvic CT is the imaging procedure of preference for all suspected renal or ureteric colic cases unless contraindicated. We did not count in other imaging techniques, such as renal ultrasonography or plain radiography. We searched to state the number of abdominopelvic CTs applied and the number of ratifying urinary calculi. We then extracted the data of included patients such as gender, age, stone location, and stone size. The blood parameters such as leukocyte count, C-reactive protein (CRP), and creatinine were involved in the study. The duration of patients' pain was also noted which was obtained from ES papers. Eventually, the management of each patient with a ratified urinary stone was recorded, expectant management or conservative treatment, admission for surgical or radiological intervention, or given dates for surgery were noted.

IBM SPSS Statistics for Windows, Version 24.0 (IBM Corp., Armonk, NY, USA), was utilized to perform statistical analysis. Frequencies, medians, and ranges were used to summarize distributions. The Pearson's Chi-square test, and independent sample t-test were used to appraise the association between categorical and continuous variables, respectively. A $P < 0.05$ was considered as statistically significant.

RESULTS

The total number of abdominopelvic CTs performed was 1089. Of these, 517 were pre-pandemic and 572 were peri-pandemic. The number of pre and peri-pandemic stone-positive scans were, respectively, 363 (70.2%) and 379 (66.2%) ($P=0.643$). The females' percentage in the COVID-19 period (37.2%) was significantly lower than in the pre-pandemic period (54.3%) ($P=0.013$). Patients' age at the time of diagnosis was not significantly different and the median was 40 in both groups ($P=0.752$) (Table 1).

No significant differences in stone locations were seen between the pre and peri-pandemic groups (Table 2). The most common location of urinary stones was found to be the distal ureter in general with 305 stones (41.1%). In the pre-pandemic group, 143 stones (39.3%) were placed in the distal ureter and, in the peri-pandemic group, 162 (42.7%) stones (39.3%) were located. The following common location of urinary stones was found to be the proximal ureter in general with 231 stones (31.1%). In the pre-pandemic group, 115 stones (31.6%) were located in the proximal ureter; and in the peri-pandemic group, 116 stones (30.6%) were located. The number of stones that had already come down to the urinary bladder at the time of imaging was 27 (7.4%) in the pre-pandemic group and 16 (4.2%) in the peri-pandemic group, respectively. Five stones (1.3%) in the pre-pandemic group and four (1.0%) stones in the peri-pandemic group had even crossed the bladder and passed into the urethra at the time of imaging (Table 2).

When all stones are evaluated without discrimination in terms of stone localizations and groups, the overall median stone size was 4.6 mm (range 1–53), and when only stones located in the ureter are evaluated without making any distinction in terms of groups, the median ureteric stone size was 4.5 mm (range 2–14). The median ureteric stone size in the pre-pandemic group was 4.8 mm, the median ureteric stone size in the peri-pandemic group was 3.9, and no significant difference was calculated ($P=0.197$) (Table 2).

The painful period of the patients before applying to the ES

Table 1. Demographical and imaging features of the study patients

| Variables | Pre-pandemic | Peri-pandemic | P-value |
|-------------------------------------|--------------|---------------|---------|
| Total CT (n) | 517 | 572 | 0.591 |
| Stone positive, n (%) | 363 (70.2) | 379 (66.2) | 0.643 |
| Stone diameter (mm), median (range) | 4.8 (1–53) | 3.9 (1–49) | 0.197 |
| Age (years), median (range) | 40 (21–85) | 40 (20–91) | 0.752 |
| Female, n (%) | 281 (54.3) | 213 (37.2) | 0.013 |
| Male, n (%) | 236 (45.6) | 359 (62.7) | 0.489 |

CT: Computerized tomography

Table 2. Comparison of stone locations between two periods

| Location | Pre-pandemic, n (%) | Peri-pandemic, n (%) | P-value |
|-----------------|---------------------|----------------------|---------|
| Kidney | 66 (18.1) | 77 (20.3) | 0.497 |
| Proximal ureter | 115 (31.6) | 116 (30.6) | 0.773 |
| Mid ureter | 7 (1.9) | 5 (1.3) | 0.891 |
| Distal ureter | 143 (39.3) | 162 (42.7) | 0.596 |
| Bladder | 27 (7.4) | 16 (4.2) | 0.652 |
| Urethra | 5 (1.3) | 4 (1.0) | 0.914 |

Table 3. Comparison of durations between two periods

| Continuum | Pre-pandemic | Peri-pandemic | P-value |
|---|--------------|---------------|---------|
| Duration of pain (days), median (range) | 2 (1–10) | 1 (1–5) | 0.098 |
| Time to intervention (days), median (range) | 2 (0–5) | 2 (0–13) | 0.059 |

was obtained from the patients' ES papers. The median duration of pain of the patients suffering from ratified urinary calculi was 2 days (range 1–10) in the pre-pandemic group and 1 day (range 1–5) in the peri-pandemic group and no significant difference was observed ($P=0.098$) (Table 3). When the patients were compared according to the time elapsed from the first admission to the ES to the time of intervention, the pre-pandemic group's median was 2 days (range 0–5) and the peri-pandemic groups median was 2 days (range 0–13), no significant difference was observed ($P=0.054$) (Table 3). Moreover, no significant difference in patients' blood parameters between the pre-pandemic and peri-pandemic groups was monitored (Table 4).

Stone patients in both groups were most frequently treated with a conservative method. Conservatively treated patients' number was 247 (68%) in the pre-pandemic group and 264 (69.6%) in the peri-pandemic group without any significant difference ($P=0.918$). Before the pandemic, the urology crew of our hospital use to specify which patients need surgical or radiological intervention after initial assessment and those patients use to be hospitalized directly at our urology clinic. The procedure remained the same after the pandemic outbreak. Most of the patients who did not receive conservative treatment and required intervention received primary surgical treatment in both groups. In some patients, sepsis symptoms developed due to occlusive stones, and they could not be the subject of surgical intervention, and a nephrostomy

Table 4. Comparison of blood parameters between two periods

| Parameter | Pre-pandemic | Peri-pandemic | P-value |
|------------------------------|--------------|---------------|---------|
| Leukocyte count ($10^9/L$) | 9.8 | 10.7 | 0.934 |
| CRP (mg/L) | 3.6 | 2.4 | 0.201 |
| Creatinine (mg/dl) | 0.83 | 0.99 | 0.571 |

CRP: C-reactive protein

Table 5. Comparison of treatment options between two periods

| Treatment | Pre-pandemic, n (%) | Peri-pandemic, n (%) | P-value |
|--------------|---------------------|----------------------|---------|
| Conservative | 247 (68.0) | 264 (68.6) | 0.918 |
| Surgical | 110 (30.3) | 104 (27.4) | 0.612 |
| Radiological | 6 (1.6) | 11 (2.9) | 0.412 |

was needed. Therefore, the interventional radiology team placed a percutaneous nephrostomy catheter in six patients (1.6%) in the pre-pandemic period and 11 (2.9%) patients in the peri-pandemic period ($P=0.612$) (Table 5).

DISCUSSION

The renowned pandemic has caused a remarkable extent of fear and anxiety among people about becoming infected by this highly contagious virus. These concerns rise particularly in hospitals which are places where hundreds of people who no one can be sure whether they have been diagnosed as negative accurately or whether they comply with the precautions meticulously. Reports discuss that the population of patients seeking medical treatment from ES with classic and usual complaints descended noticeably as the coronavirus emanated across the globe. Alternate reports designate some patients deferring their ES presence until they had attained a more critical condition of illness with unendurably drastic complaints.^[4,5] Some studies indicate that patients suffering from diseases such as acute ischemic stroke and acute appendicitis apply to health-care providers with a delay at a more extreme phase of the disease during the pandemic period.^[6,7]

If we list a few studies from the urological point of view, a study indicates that patients admitted to ES during the pandemic are approximately 50% fewer than during the same 3-week period 1 year ago, while emergency hospitalization rates were higher in the course of the pandemic proposing that patients were indeed applying later and more unwell and another study represents a depletion of more than half in emergent urological consultations through ES in the course of the pandemic while the admission rates were higher.^[8,9]

On the other hand, there is also a study over 6 weeks pointed that the number of applicants to the ES for urinary stone emergencies; complication rates, and stone diameters did not significantly differ during the pandemic but serum creatinine levels significantly increased compared to the pre-pandemic period, advocating a probable postpone in the light of patient appeal to the health-care provider, potentially associated to the apprehension originating from the virus.^[10] Another study encompassing 100 days showed that there was no significant difference in any of the aforementioned variables.^[11] Our findings concur with these two studies. In our study, the females' percentage in the course of the pandemic was found to be significantly lower than in the pre-pandemic period as supported by other studies suggesting that women are more concerned about contracting the virus.^[12]

Two studies that encompassed 3 weeks have revealed a depletion in general urological and particularly urinary calculi presentations in the course of the pandemic.^[13,14] Different results of the 3-week or shorter studies and the 6-week or longer studies made us believe that the period in these researches may not have been long sufficient to absolutely appreciate the effects of COVID-19 and led us deliberately pick 1 year. Moreover, using a long timeframe like 1 year, al-

lowed us to see if any early hesitation to apply to ES during the pandemic abated in later weeks as patients' anxiety was relieved. It is reasonable that those other studies may have demonstrated an abatement in activity in the early days of the pandemic when apprehension and anxiety levels were at their highest, but with longer follow-up and an easing of patients' worries, their findings could have appeared very distinct. Our study in which only 231 CTs were performed in the first six peri-pandemic months and the number rose to 341 in the remaining 6 months justifies this statement ($P=0.088$). We also intentionally preferred to choose not to compare any period of the year with the same period of the previous or next year and to evaluate the periods immediately before and after the cut-off point as we perceived that this would more plainly symbolize any instantaneous or unexpected change in patients' behavior caused by the pandemic as the global situation expeditiously worsened.

It is difficult to be completely sure about how unwell a patient was at admission to ES unless all medical records are reviewed but we think that glancing at blood parameters such as creatinine, CRP, and leukocyte count as well as analyzing the urgent nephrostomy insertion requirements ensures a spiffing reflection of the patient's clinical status. In our study, the pandemic did not seem to result in sicker patients with urinary calculi.

Experts have argued that patients suffering from renal colic ought to be managed as conservatively as possible in the course of the pandemic.^[15] In practice, studies have pointed out that the portion of patients suffering from ureteric colic who were given prompt double J stent treatment or underwent endoscopic surgery was higher in 2020 than in the identical period in 2019, probably to save patients from recurrent admissions to the hospital which could have eventually escalated the risk of being infected by the virus.^[16] Consistent with this reality, in our study, no significant difference occurred in the way we administered our ratified stone patients applied to ES between the two time periods. Before the pandemic, our institutional policy was to promptly admit anyone with a ratified urinary calculi who we believed required intervention such as double j placement, and ureterorenoscopic surgery, and according to the findings of our study, the same scenario remained after the pandemic outbreak and no significant difference occurred. This result was derived from the unusual situation of our country. As the virus swept across the globe, like all government hospitals in our country, our hospital had to take care of additional patients in addition to its routine. Inevitably, both the distribution of duties and physical boundaries have changed to be able to derive work units and employees. Thus, urologists, whose workload has already been escalated, may have preferred to perform the most effective and curative therapy expeditiously when they first examine the patients, to rule out the possibility of repeated referrals and complications of conservatively treated patients so as not to enlarge their workload a bit.

Our study has a few limitations. One of them, our numbers come from a single center. Naturally, the results of a multi-center study might have been different. Second, the study is retrospective, since retrospective studies appertain to a review of papers that were fundamentally not conceptualized to gather data for research, and some information is destined to be missing. Selection and recall biases also affect the findings and reasons for differences in treatment between patients and lost follow-ups can frequently not be inquired about and can guide to bias. Fortunately, in our study, all the data to be recorded could be accessed and the recorded parameters were objective data with a very low probability of bias.

We would argue that as with our results during the pandemic period that when patients have acute colic, the pain is classically so enormous and so unendurable that patients will still address ES. We discovered CTs practiced on the 1st days of both two religious holidays in our study showing that patients with intense pain are inclined to present regardless of anything else taking place in their life. Our study also has strengths. Thanks to performing an abdominopelvic CT is an institutional policy within our hospital for all suspected cases of acute colic, unless contraindicated, the number of stones missed is negligible since CT is the gold standard modality to diagnose urolithiasis.^[17] The fact that the study covered 1 year from both periods prevented any imbalance due to long eid holidays and the month of Ramadan because the former can be quiet and the latter can be crowded in ESs, and so, that period cannot properly symbolize what occurs during the rest of the year.^[18,19] Seasonal variations of renal colic have been documented by several authors in different countries worldwide. Picking a 1-year study period also prevented us to be affected by the seasonal variations of stone presentations.^[20]

Conclusion

To the best of our knowledge, this is the longest-period study with the largest number seeing particularly CT-manifested, emergent acute colic presentations in the course of the renowned pandemic. The COVID-19 pandemic and its concomitant anxieties and fears did not affect the presentation of patients with acute ureteric colic applying to our ES. Based on findings such as stone size, creatinine, leukocyte, CRP, and the ruling method for patients with CT-proven stones, no obvious delay in presentation occurred and no plain increased seriousness of the caseload was observed. We hypothesize that ureteric colic pain is so insufferable that it forces appearance at ES regardless of the prevailing global or national circumstance.

Ethics Committee Approval: This study was approved by the Ahi Evran University Training and Research Hospital Clinical Research Ethics Committee (Date: 23.03.2022, Decision No: 2022-06/60).

Peer-review: Externally peer-reviewed.

Authorship Contributions: Concept: İ.Ü.; Design: İ.Ü.;

Supervision: İ.Ü.; Resource: İ.Ü.; Materials: İ.Ü.; Data: İ.Ü.; Analysis: İ.Ü.; Literature search: İ.Ü.; Writing: İ.Ü.; Critical revision: İ.Ü.

Conflict of Interest: The author has no conflicts of interest to declare.

Financial Disclosure: The author declared that this study has received no financial support.

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ORJİNAL ÇALIŞMA - ÖZ

COVID-19 akut ürolityazisi nasıl etkiledi? Bir iç Anadolu deneyimi

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AMAÇ: COVID-19 pandemisi, COVID-19 dışı şikayetlerle acil servisten tıbbi yardım isteyen hasta sayısını değiştirmiş, farklı tıbbi ve cerrahi durumların ertelenmiş başvurularına neden olmuştur Akut üriner taş hastalığı da bu durumlardan biridir ve COVID-19'un acil servise gelişine etkisi açısından araştırılması gerekmektedir.

GEREÇ VE YÖNTEM: Bu gözlemsel, retrospektif ve tek merkezli çalışmada, acil serviste olası akut ürolityazis için istenen her abdominopelvik bilgisayarlı tomografiyi COVID-19 pandemisinden önceki ve sonraki 1 yılı ele alarak taradık. Uygulanan abdominopelvik bilgisayarlı tomografi sayısını ve üriner taş pozitifliğini doğrulayan sayıyı belirledik. Hastaların cinsiyetini, yaşını, taşın yerini ve taş boyutunu kaydettik. Ayrıca C-reaktif protein, lökosit sayısı ve kreatinin değerlerini kaydettik ve hastaların ne kadar süredir ağrı çektiğini, müdahaleye kadar geçen süreyi ve her vaka için seçilen tedavi metodunu not ettik.

BULGULAR: Yapılan toplam abdominopelvik bilgisayarlı tomografi sayısı 1089 idi. Bunlardan 517'si pandemi öncesi dönemde, 572'si pandemi sürecindeydi. Pandemi öncesi ve sırasında taş pozitifliği sırasıyla 363 (%70.2) ve 379 (%66.2) idi ($p=0.643$). Kadınların COVID-19 dönemindeki oranı (%37.2), pandemi öncesi dönemden (%54.3) anlamlı derecede düşüktü ($p=0.013$). Pandemi öncesi ve pandemi süreci gruplarındaki üreter taşlarının medyan boyutu sırasıyla 4.8 mm ve 3.9 mm idi ve anlamlı bir fark göstermedi ($p=0.197$). Pandemi öncesinde ve sırasında gruplar arasında taşın yerleri, kan parametreleri, ağrı süresi, tedavi seçenekleri ve müdahale süresi açısından anlamlı bir fark görülmedi.

TARTIŞMA: COVID-19 pandemisi, acil servise akut üreterik kolik vakaları ile başvuran daha az veya daha ciddi hasta ile sonuçlanmadı.

Anahtar sözcükler: Acil servis; cerrahi; COVID-19; renal kolik; ürolityazis.

Ulus Travma Acil Cerrahi Derg 2023;29(7):780-785 doi: 10.14744/tjtes.2023.36067