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Review Article

Managing Renal Colic in Emergency

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Abstract

Introduction: Renal colic disease is a very common disease in medicine. Ureteric colic is a more clinically correct term for the ailment since it more accurately describes the source of renal colic, which is typically obstruction of the urine flow by stones in the upper urinary tract (urolithiasis). By increasing the pressure in the urinary tract wall and encouraging the production of prostaglandins, the blockage in the ureter leads to vasodilation. This causes diuresis, which raises kidney pressure even further. Rarely, renal colic can develop for reasons other than urinary stones, such as blood clots that can form from upper urinary tract hemorrhage, sloughed renal papilla (caused, for example, by sickle cell disease, diabetes, or prolonged painkiller usage), or lymphadenopathy. Rapid and efficient management of this excruciatingly painful disease is possible in the Emergency Department with prompt diagnosis and proper treatment implemented.

Aim of the Study: The present literature reviews the acute clinical evaluation of renal colic patients, outlines appropriate diagnostic approaches using lab testing, imaging, and conservative treatments, appropriate options for analgesia, and specifies when surgical intervention is necessary for an emergency.

Methodology: The present literature review is a comprehensive research of PUBMED since the year 1973 to 2021.

Conclusion: Due to the significant issues with our diet, renal colic illness is highly prevalent in the community. Therefore, it is crucial that we understand how to manage these patients and when to use medicine and when to come up with new treatments. The majority of nations utilize opiates and NSAIDs to treat renal colic pain. Future studies should examine the efficiency of quick pain relief for renal colic and any side effects brought on by these drugs. We should have a population for screening, such as people with metabolic syndrome and people with kidney illness, and don't forget to employ non-contracted enhanced computed tomography, the gold standard for diagnosis.

Keywords: *Renal Colic; Opiates; NSAIDS; Emergency Treatment*

Introduction

Approximately 5 - 15% of the American population may experience renal colic disease at some point in their lives. Due to the complication and diseases that it shares many characteristics with, it can have a high rate of morbidity and fatality if not treated. Acute renal colic is a severe type of abrupt flank pain that often starts over the costovertebral angle and radiates anteriorly and inferiorly toward the groin or testicle. It is typically brought on by acute calculus blockage of the urinary system and is frequently accompanied by nausea and vomiting. Although stone size can be a reasonable indicator of the likelihood of spontaneous transit, the degree of pain is proportional to the degree of obstruction and not the size of the stone. Although kidney stones are not the sole cause of flank pain, they are the most common cause, and because of how painful they are, nephrolithiasis is the most likely presumptive diagnosis when flank pain strikes suddenly [1].

It is primarily brought on by a crystal or crystalline aggregate that leaves the kidney and travels through the genitourinary system before getting lodged and obstructing the flow of urine, usually in the ureter. The immediate cause of the severe pain associated with renal colic is proximal ureteral and renal pelvic dilatation brought on by this blockage. While the type and timing of the pain vary depending on its severity, exact location, and underlying reason, for the majority of patients, the pain peaked one to two hours after it first started. Because more kidney stone attacks occur, quality of life scores will inevitably decline. This became especially clear when the total number of renal colic episodes over a lifetime reached five or more, indicating the need for preventative measures like 24-hour urine testing at least at that point [2].

Emergency departments (ED) and healthcare systems around the world deal with a large burden from acute flank discomfort brought on by obstruction by a stone. Assessment and treatment of patients who report to the emergency room with renal colic have four top concerns. The initial step is to confirm the presence of an obstructing stone in the renal pelvis or ureter. The patient may be experiencing their first bout of symptoms or may already have a history or urolithiasis diagnosis. The second is to control the frequently excruciating pain, accompanying nausea, and vomiting that come with an episode of renal colic. While assessing if the patient is fit for a trial of spontaneous stone passage or whether definitive care is necessary, the initial pain must be managed. The identification of concerning symptoms and signs that demand admission and/or urgent decompression of the affected renal unit is the third priority. The final priority is to make sure that a discharge plan is in place to encourage spontaneous stone passage with appropriate follow-up and to maximize ongoing pain control [3].

According to data, urolithiasis causes between 60 000 and 1.1 million visits to emergency rooms annually, costing the US economy $2.1 billion in total when treatment costs, lost workdays, and third-party payments are taken into account. Administrative data sets have revealed notable disparities in the handling of ED patients; around half of patients undergo imaging studies and blood tests, 10% are admitted to hospitals, one in five patients do not receive a urinalysis, and a quarter are given antibiotic prescriptions. In this study, at least two drugs were administered to at least two-thirds of the patients. It is evident that symptomatic urolithiasis emerges robustly in the practice of the ED physician, with a considerable economic burden that reverberates beyond the ED visit, even though some of these data sets extrapolate to population-level estimates using representative samples [3,4].

Clinical presentation

A frequent presenting complaint to the ED is flank pain. Renal colic caused by an obstructed calculus typically manifests as rapid onset, acute, and sharp flank pain that radiates to the lower abdomen, groin, or genitalia. Vomiting and nausea are frequently associated with it. Distal ureteric stones frequently cause urinary symptoms, most frequently frequency and urgency, with inadequate voiding volumes. These signs alert the ER doctor to the diagnosis of a stone, although there is still a wide range of potential diagnoses, particularly in atypical presentations. In the absence of blockage, pyelonephritis can manifest with a similar set of symptoms, but this diagnosis is frequently supported by fever and a prior history of urinary symptoms typical of cystitis. Colic-like symptoms can also be caused by other intrinsic

or extrinsic ureteric obstructions. Intraluminal blood clots, fungal balls, or tumors can suddenly block the flow of urine; however, extrinsic compression usually has a more subtle progression, particularly if it is brought on by a growing mass impinging on the ureter. In pregnant patients, the mass impact of a gravid uterus is a frequent source of flank pain [5].

Diagnosis

Initial lab investigation should include a urine culture and sensitivity test, a urinary dipstick test to check for the presence of red blood cells, white blood cells, nitrites, and pH, as well as a full blood count, renal profile, uric acid, calcium level, and a C-reactive protein coagulation screen (if intervention is anticipated) for emergency presentations of acute ureteric colic. The key to diagnosing ureteric blockage and urolithiasis is imaging. This could use a combination of computed tomography, ultrasonography, and flat-plate abdominal radiography (CT). In the past, an intravenous urogram could be used to determine the presence and location of ureteric obstruction. Although cross-sectional imaging by spiral CT has largely supplanted this modality, it may still be useful for EDs with limited access to CT. In prospective comparisons, CT was reported to be quicker, less expensive, and more accurate than intravenous urograms [6].

X-ray

Abdominal plain films or KUB (kidney ureters-bladder) radiographs are commonly used as they can detect an opacity that is indicative of a stone. The numerous structures and interfaces (bowel gas) depicted in these two-dimensional images, particularly the spinous processes and the bony pelvis, as well as the bowels (and feces), abdominal, and pelvic organs, may make it difficult to locate the stone. Additionally, some stone compositions, such as those made of uric acid or specific drugs like indinavir, adenosine, ephedrine, or guaifenesin, are radiolucent and so cannot be seen on conventional radiography. In comparison to stones seen on CT, it has been reported that the sensitivity of plain abdomen radiography imaging for urinary stones is between 48 and 63%. However, a lot of clinicians do find KUB useful [7].

However, a lot of clinicians do find KUB useful. Knowing a stone's position as determined by CT may help in the interpretation of KUB results. This may be helpful in determining the circumstantial passage of a stone, repeating an assessment of persistent or recurrent discomfort, or tracking a stone's journey through the urinary tract under conservative therapy. As fluoroscopic guidance is the norm for stone targeting, urologists who use extracorporeal shockwave lithotripsy in the definitive care of stones may find that being able to view a stone on KUB simplifies their planning and execution of extracorporeal shockwave lithotripsy [8].

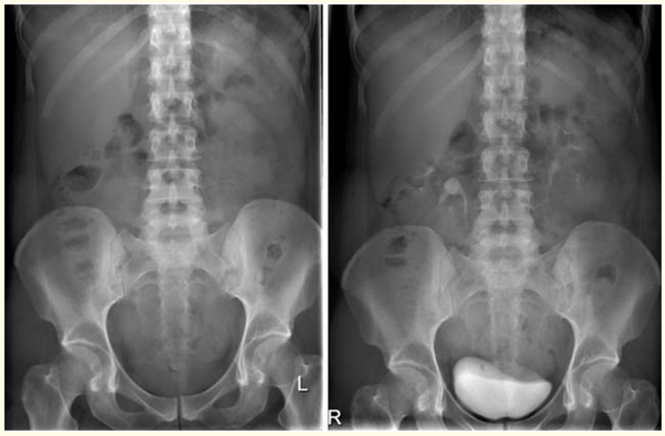

Figure 1: *Plain radiograph of the pelvic region showing renal stone [9].*

Ultrasound (US)

When compared to KUB, ultrasound imaging offers the advantage of not exposing the patient to radiation while also offering a more focused and thorough anatomic assessment. In many EDs, it is also frequently accessible at the bedside. Hydronephrosis may result from ureteric blockage and is easily detected in the US. However, the ureters may be challenging to locate and follow, and 12 - 44% of the time, the US will miss identifying stones found on CT. In the ED, Moak, and colleagues evaluated patients with probable urolithiasis using bedside ultrasound. Although only 31% of cases were affected by the use of the US, they discovered a sensitivity of 76.3% for stones that were later discovered on CT [10].

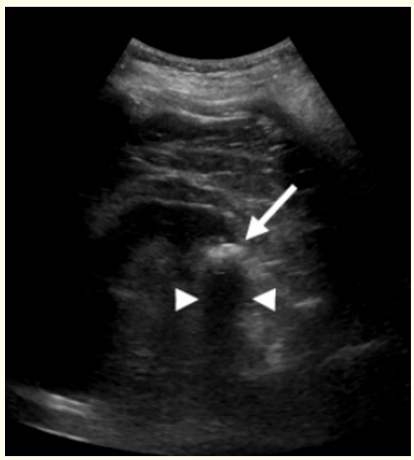

Figure 2: *Ultrasound of kidney suggestive of kidney stone [11].*

Computed tomography

The use of CT as the preferred imaging method for determining the presence of ureteric calculi and an examination of renal colic. Modern spiral CT machines allow for quick image collection with minimal radiation exposure and no need for contrast administration. With reported values of 94 - 98% and 94 - 100%, specificity and sensitivity are likewise very good. To establish the diagnosis of urolithiasis, it should be regarded as the conclusive imaging test. For the examination of abdominal or flank pain when a stone is not present, cross-sectional imaging by CT may also provide potentially important information on the other intra-abdominal structures [12].

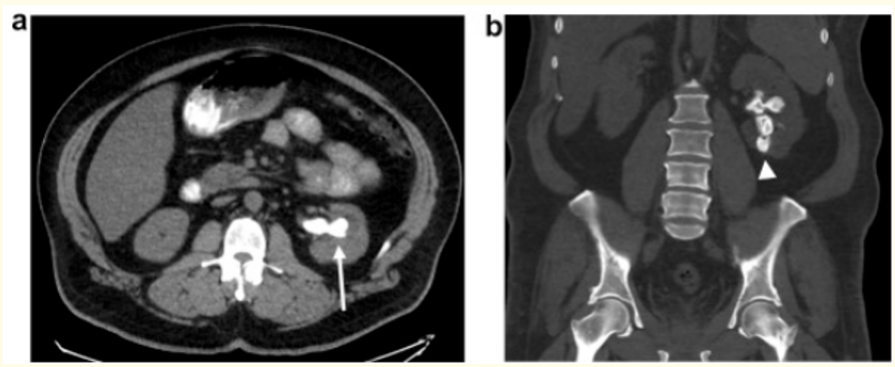

Figure 3: *A. Axial and B. Coronal view of non-contrast CT showing a large staghorn calculus (arrow) occupying the majority of the left renal collecting system [11].*

But controversy hasn't avoided CT when it comes to urolithiasis examination and treatment. The utilization of a second CT scan on a patient who was initially sent home with instructions to handle an obstructing stone with conservative or medicinal measures is one point of debate. Goldstone and Bushnell discovered that only 6.5% of patients had their therapy modified after a repeat CT, while a total of 18% had a different diagnosis after a repeat CT. The usefulness of using the scout pictures produced during CT in place of formal KUB is another factor to take into account. The KUB may be helpful in the monitoring or treatment of a stone, as previously mentioned [13].

Treatment

Despite its dramatic presentation, an obstructed ureteral calculus may not immediately offer considerable danger to the patient for morbidity. Traditional canine studies have demonstrated that after 7 days of total obstruction, full renal function is recoverable. 70% of the recovery was still present after 14 days of total obstruction, 30% at 4 weeks, and none at 6 weeks. Data from humans are less reliable because there is no experimental control, yet renal function can recover even after extended durations of partial or total ureteric obstruction. However, there are some situations where a cautious approach or discharge home is not necessary, and an urgent referral to a urological specialist is suggested. One of these is the existence of an obstruction stone [14]:

1. In a solitary or kidney transplant (absolute).
2. Related to signs of infection (absolute).
3. With severe symptoms, including pain, nausea, or vomiting, that does not go away after receiving the first conservative treatment (absolute).
4. A stone bigger than 1 cm (relative).
5. Representation of renal colic caused by the same stone in the ED (relative).

Patients who have a single kidney or a kidney transplant that is obstructed by a stone need prompt decompression, as do the uncommon patients who have bilateral ureteric stones. Candidates for immediate therapy include infection-related symptoms like fever, severe constitutional symptoms, and substantial pyuria or bacteriuria. An obstructed kidney will be unable to deliver antibiotics to the infection's site, and the obstruction farther downstream will make it difficult for the kidney to filter blood via the glomerulus. Pyonephrosis, or urinary blockage in this situation, essentially produces a closed pus pocket similar to an abscess. The pyelovenous backflow phenomenon, in which retrograde transmission of the infected urine through the distal nephron may spread bacteria into the bloodstream, may complicate matters further. Candidates for admission and a urologist consultation are those whose pain or nausea cannot be addressed in the emergency room. In many cases, these problems can be treated with parenteral medications that are continued, but short-term decompression of the urinary tract and stone treatment may be necessary [14].

Pain management

There are numerous methods for managing the extreme discomfort that blocking ureteric stones cause in people with renal colic. Narcotic analgesia has long been a mainstay of quick and efficient early symptom relief. Patients with acute renal colic frequently receive analgesia with NSAIDs. Through several methods, they support analgesia, which is particularly advantageous when there is a unilateral renal blockage. As mediators of the pain response generated by the stretching of the renal capsule as a result of the downstream blockage, arachidonic acid metabolites are produced less frequently when NSAIDs are taken. Additionally, NSAIDs encourage the constriction of the afferent arterioles that supply the glomerulus, which lowers the glomerular filtration rate and lowers hydrostatic pressure [15].

The elderly and those with renal impairment should use caution. The quickest alleviation is obtained with intravenous treatment, although there are more side effects. Regardless of the administration method, overall pain management is the same. Numerous studies have compared the analgesic effects of NSAIDs and narcotics. Using NSAIDS instead of opioids, Holdgate and Pollock conducted a systematic review of 20 such investigations. In ten of the 13 studies that recorded pain scores, patients who were taking NSAIDs had lower scores. These patients also needed rescue analgesia for insufficient pain relief less frequently than those on narcotics, and side events were more frequently documented in the narcotic arms [16].

The authors advise using parenteral NSAIDs as the primary treatment for individuals who present with renal colic and narcotics as adjuvant or breakthrough analgesia. It has also been demonstrated that paracetamol works well as an analgesic for severe colic. There was no discernible difference between intravenous paracetamol and intravenous morphine in terms of the degree of pain control or the time to relief, with the paracetamol group experiencing fewer side effects. On smooth muscle, hyoscine has an antispasmodic action. Its analgesic capabilities are weaker when taken as a monotherapy than either NSAIDS or opiates; when combined with opiates, there is no evidence that the overall opiate requirement will be decreased; however, when combined with NSAIDs, they may prolong the positive effects of these medicines [17].

Passage of stone spontaneously

After being released from the emergency room, patients with ureteral stones must obviously continue receiving adequate analgesics. A regimen of regular or on-demand NSAID and/or paracetamol may be used for this, together with breakthrough access to a narcotic. It's interesting to note that just 40% of patients sent home from the emergency department could remember the precise verbal instructions for taking their analgesics. By just giving the patient written instructions before discharge, the authors of this study saw a considerable improvement in the proper analgesia usage (to 71% of patients), leading to greater patient satisfaction [18].

If a stone's size increases, it is reasonable to assume that the frequency of spontaneous passing of urinary tract stones will decrease. When creating their joint guidelines on managing stones, the AUA and the EAU combined data from various published studies. They found that the rate of spontaneous stone passage was 68% for stones smaller than 5 mm and 47% for stones between 5 and 10 mm [18].

Medically augmented spontaneous stone passage

The idea of medically enhancing spontaneous stone passing, which is based on the ideas of increased luminal diameter and suppressed smooth muscle tone in the ureter and ureterovesical junction, has lately come into existence. Steroids and NSAIDs have been used to prevent the ureteral caliber from becoming too narrow due to inflammation. These have frequently been combined with medications designed to relax the ureteral smooth muscle and reduce unpleasant spasms, as well as medications that may widen the upper urinary tract and lessen pain. Medical expulsive therapy is the term for the use of drugs specifically intended to help stones pass (MET) [19].

It is generally known that adrenergic receptors are present in the human ureter (with increasing density in the distal ureter), that the -1 subtype predominates, and that -blocking medications can reduce ureteral contractility. The importance of -blockers and other therapy in MET has grown during the past ten years. Additionally, calcium channel blockers (CCB) have demonstrated sedative effects on ureteral smooth muscle. Early studies of MET using -blockers and CCB produced extraordinary results; Dellabella and colleagues discovered that in patients with symptomatic distal ureteral stones, the -blocker tamsulosin, when combined with the steroid deflazacort, resulted in the nearly universal stone passage as compared to the CCB nifedipine and the weak anticholinergics phloroglucinol [19].

Conclusion

Due to the significant issues with our diet, renal colic illness is highly prevalent in the community. Therefore, it is crucial that we understand how to manage these patients and when to use medicine and when to come up with new treatments. The majority of nations utilize

opiates and NSAIDs to treat renal colic pain. Future studies should examine the efficiency of quick pain relief for renal colic and any side effects brought on by these drugs. We should have a population for screening, such as people with metabolic syndrome and people with kidney illness, and don't forget to employ non-contracted enhanced computed tomography, the gold standard for diagnosis.

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