Renal Colic in Adults - An Effective Management Strategy

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Overview

Renal colic describes the pain arising from obstruction of the ureter, although ureteric colic would be a more accurate term. The pain is caused by spasm of the ureter around the stone, causing obstruction and distension of the ureter, pelvicalyceal system and renal capsule.[1]

Although the most common cause is a stone, the term "renal colic" actually refers to a collection of symptoms attributed to the kidney and ureter. There are other intrinsic or occasionally extrinsic causes such as lymphadenopathy, although extrinsic causes tend to present with milder and more chronic discomfort. Other common intrinsic causes are blood clots (from upper tract bleeding) or sloughed renal papilla (which can occur in sickle cell disease, diabetes, or long term use of analgesics).[1]

The underlying cause of acute flank pain is not always a urinary stone and other important conditions can mimic this. A thorough history, examination and investigations are important to determine further management.[1]

Epidemiology

The incidence of urolithiasis is increasing globally, with geographic, racial and gender variation in its occurrence. Epidemiological study in the western population reveals the incidence of urolithiasis to be 124 per 100,000 in males and 36 per 100,000 in females. The lifetime risk of having urolithiasis is higher in the Middle East (20–25%) and western countries (10–15%) and less common in Africans and Asian population. Stone disease carries high risk of recurrence after the initial episode of around 50% at 5 years and 70% at 9 years.[2]

Clinical Presentation

The classic presentation of a ureteric colic is acute, colicky flank pain radiating to the groin. The pain is often described as the worst pain the patient has ever had experienced. Ureteric colic occurs as a result of obstruction of the urinary tract by calculi at the narrowest anatomical areas of the ureter: the pelviureteric junction (PUJ), near the pelvic brim at the crossing of the iliac vessels and the narrowest area, the vesicoureteric junction (VUJ).[3]

If a stone is at the vesico-ureteric junction (VUJ), the patient may often complain of strangury (the urgent desire to pass urine with poor volumes, urinary frequency, and straining) due to irritation of the detrusor muscle from the stone. Nausea with vomiting is common. The pain is a colic and thus comes in waves of varying intensity. Patients will often have completely pain free spells between attacks. Visible haematuria may occur, but in these cases it is important to ensure that the pain is not secondary to a clot as a result of other upper tract pathology. If concomitant urinary infection is present, the patient could complain of fevers and sweats.[1]

Calcium stones (calcium oxalate, calcium phosphate and mixed calcium oxalate and phosphate) are the most common type of stone, while up to 20% of cases present with uric acid, cystine and struvite stones.[3]

Diagnosis

Besides routine history and clinical examination, investigations of patients with suspected ureteric colic include:[3]

- Ultrasound KUB
- Computed tomography (NCCT-KUB)

Management of Renal Colic

The management of renal colic as per the European Association of Urology (EAU) guidelines is as follows:[4] (Table 1)

- Pain relief is the primary goal in patients with an acute stone episode.
- Nonsteroidal anti-inflammatory drugs are effective in patients with acute stone colic and have better analgesic efficacy than opioids.
- Daily alpha-blockers reduce recurrent colic.

Renal colic

Table 1: Recommendations for pain relief in renal colic

Recommendation	GR
In acute stone episodes, pain relief should be initiated immediately	A
Whenever possible, a nonsteroidal anti-inflammatory drug should be the first choice, such as diclofenac[a], indomethacin, or ibuprofen[b]	A
The second choice should be hydromorphine, pentazocine, or tramadol	C
Use α-blockers to reduce recurrent colic	A

GR: Grade of recommendation.
[a]Affects the glomerular filtration rate in patients with reduced renal function (LE: 2a).
[b]Recommended to counteract recurrent pain after ureteral colic.

- Early stone removal should be performed if stone size is more than 10mm (1cm).
- 50 percent chances of natural passage of uretric stone if size is less than 5mm.
  Advise to give trial atleast two week.

Drotaverine

Drotaverine is an inhibitor of Phosphodiesterase 4 (PDE4) in smooth muscles and it has anti-spasmodic activity without anti-muscarinic adverse effects. This drug is structurally similar to papaverine and its structural formula is Diethoxy-1, 2, 3, 4-tetrahydroisoquinoline 1 - (3, 4-diethoxybenzylidene) -6, 7. Drotaverine provides effective analgesia and is used in the treatment of renal colic.[5]

Palea *et al*. in their review on the effects of drotaverine relaxation on the human urethral muscle ring, found that the effect of drotaverine relaxation on the muscles of the human ureter is similar to that of other animal and its power is approximately six times stronger than papaverine: hence, the ureteral muscle relaxant advantage can be used in the treatment of renal colic patients.[5]

Romics *et al*. studied the effect of drotaverine hydrochloride in acute colicky pain caused by renal and ureteric stones. In the study, the authors observed that Drotaverine was effective in 79% of patients and placebo in only 46% ($P < 0.001$). There were no serious adverse effects. The authors concluded that intravenous drotaverine provides effective pain relief in more than two-thirds of patients with renal colic, with no serious side-effects.[6]

Amitabh *et al.* conducted a study to evaluate the analgesic efficacy and safety of intramuscular drotaverine hydrochloride *vs.* diclofenac sodium in treatment of acute renal colic. The observations of the study were as follows: Visual analog scale (VAS) decreased significantly ($P < 0.001$) with both drotaverine (52.4%) and diclofenac (49%) at 30 minutes.

Reduction of VAS at 60 minutes was 61.3% with drotaverine in comparison to 60.4% with diclofenac. Forty-five patients (90%) in the drotaverine group and 44 (88%) in the diclofenac group found the therapy effective. The authors concluded that the efficacy and safety of drotaverine as analgesic in renal colic is noninferior to diclofenac and may be used as an alternative or add-on therapy to currently available options.[7]

Combination therapy of Spasmolytics and NSAIDs

Spasmolytics are traditionally used in renal colic, biliary colic, or dysmenorrhoea for relief of smooth muscle spasm. As spasmolytics relieve the pain associated with smooth muscle spasm, the combination of NSAIDs with spasmolytics is likely to be synergistic.

Fixed dose of combinations (FDC) of mefenamic acid, aceclofenac with spasmolytics such as drotaverine have been demonstrated to be highly effective in relief of acute spasmodic pain.[8]

In the study performed by Pareek *et al*., addition of spasmolytic such as drotaverine to aceclofenac was found to provide significant therapeutic benefit as compared to monotherapy with aceclofenac.[8]

Vinod *et al.* conducted a study to compare the efficacy of Drotaverine- Aceclofenac combination with Aceclofenac alone in treatment of postoperative spasm and pain. The authors concluded that Drotaverine with Aceclofenac combination is more effective than Aceclofenac alone.[9]

Tamsulosin

Tamsulosin, is a potential agent of medical expulsive therapies as it increases the passage rate and reduces the passage time for stones up to 10 mm.[10]

Tamsulosin exerts a stimulatory action on α-adrenergic receptors present in the ureter. Stimulation of these receptors causes an increase in both, the force of ureteral contraction and the frequency of ureteral peristalsis. This results in increase in the intraureteral pressure gradient around the stone, which raises the urine bolus above the stone (increased intraureteral pressure above the stone). Concurrently, peristalsis below the ureter (and consequently intraureteral pressure below the stone) decreases along with fall in basal and micturition pressure even at the bladder neck. For these reasons, the urge to expel the stone gets intensified.[10]

In a study by Dellabella M and his colleagues, the authors concluded that tamsulosin not only increased the stone expulsion rate and decreased expulsion time, but also served as a spasmolytic drug during renal colic due to juxtavesical calculi.[11]

Potassium Citrate

Dietary replacement with potassium citrate therapy has revealed better outcomes. This can be validated by a study conducted by Kang and coworkers, wherein 11 patients with hypocitraturic nephrolithiasis taking potassium citrate therapy were compared with 11 matched patients on lemonade therapy.

It was found that although both the therapies increased the urinary citrate levels, the effect with potassium citrate (mean increase +482 mg per day) was remarkably better than the lemonade (mean increase +383 mg per day).[12]

AUA (American Urology Association) medical management of kidney stones guidelines recommends potassium citrate as first line treatment for the prevention of uric acid stones with a target pH of about 6.[13]

Prognosis

Most stone formers have no genetic, anatomical or tubular defect predisposing them to stones. They have calcium-containing stones, often in the context of modifiable metabolic and lifestyle factors.[14]

Prevention of Renal Stones

In preventing recurrent stones, some principles apply to all patients and some are specific to the type of stone. The recommendations on prevention of recurrent stones are described below in Table 3.[14]

Table 3: Therapy for prevention of recurrent stones
Non specific Therapy
Increase in fluid intake to achieve a 24-h urine output of >2 L
Specific therapy
Medical
Calcium oxalate stones
Hypercalciuria
Dietary excess: restrict sodium intake, adequate calcium intake
Drugs: Thiazides
Hyperuricosuria
Dietary excess: restrict purines and animal protein intake
Drugs: Allopurinol
Hypocitraturia
Drugs: citrate supplements
Hyperoxaluria
Dietary excess: restrict oxalate intake
Drugs: restrict intake of Vitamin C
Urate stones
Dietary excess: restrict purine intake
Drugs: citrate supplements or bicarbonate for urine alkalinisation; allopurinol for recalcitrant stones
Surgery
PCN/ PCNL/ URS/DJ Stending
ESWL (Lithotripsy)

Conclusion

Renal colic is a common presentation causing pain and morbidity.[1]

Non-steroidal anti-inflammatory drugs offer the best initial analgesia, with opiates as a second line treatment.[1]

In addition to conventional approaches, other possible treatments for renal colic can be tried.[5]

Intravenous drotaverine provides effective pain relief in patients with renal colic.[6]

Drotaverine with Aceclofenac combination is more effective than Aceclofenac alone.[9]

Tamsulosin increases the stone expulsion rate and decrease expulsion time.[10]

Potassium citrate has been recommended as first line treatment for the prevention of uric acid stones.[12]

If uretric stone size >10 mm early surgical intervention is must.

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