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Conservative Management of Obstructive Uropathy Secondary to Stones

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Introduction

Obstructive uropathy is defined as structural obstruction to urine flow along the urinary tract. It can lead to dilatation of renal pelvis and calyces. (1). However renal pelvis can be dilated without obstruction. Therefore hydronephrosis and dilated renal pelvis are not synonymous terms. The damage to renal tissue caused by these conditions often leads to obstructive nephropathy contributing to renal failure (2) and if treated early is a potentially reversible form of kidney disease. (3).The most common cause for obstructive uropathy is renal stones. Obstructive uropathy can be unilateral, bilateral or can be classified as acute or chronic.

Epidemiology

It is a common condition effecting patients in both inpatient and outpatient settings. It can be unilateral or bilateral. In a healthy individual unilateral obstruction can cause little or no change in renal functions. However the less common bilateral form of obstruction can lead to considerable renal failure.
Stone disease is more common in males (3:1) and commonly effect adults. However it affects elderly person more then children. The prevalence of urolithiais is approximately 2-3 percent in the general population and 12% of white males will have stone in there life time (4). Patients with previous stones had 50% chances of making further stone in 5-10 years. (5)

Urolithiasis effects more white population then Asian community followed by patients of black ethnicity. In addition urolithiasis occurs more frequently in hot humid climate than temperate regions. Decreased fluid intake and consequent urine concentration are among the most important factors influencing stone formation.
Etiology:
Obstruction can be unilateral or bilateral. Impacted calculus is the most common and reversible cause for the obstruction. In most cases level of obstruction is uretreovesical junction (VUJ) or pelviureteric junction (PUJ).
Other causes of unilateral obstruction are obstructing clot in ureter, uretric tumour and PUJ obstruction. Bilateral obstruction can be due to bladder outflow obstruction, bilateral obstruction to uretrs secondary to pelvic malignancy (cervical, prostate and rectal cancer), retroperitoneal fibrosis and rarely bilateral ureteric stones.

Pathology

The development of nephropathy depends on the degree of obstruction. In bilateral complete obstruction, deterioration of renal functions impeded quickly and if not resolved quickly can lead to permanent loss of renal functions. Vaughan and Gillenwater experiments on dogs revealed a direct relationship between renal functions impairment and the duration of obstruction. The results postulated that complete recovery of function occurred when the obstruction was relieved within 7 days. However permanent loss of function was observed when the obstruction continued for 42-56 days.
Acute unilateral and bilateral obstruction leads to a triphasic relationship between renal blood flow and ureteric pressure. In phase 1 &2 ureteric pressure rises and RBF falls. In phase 3 of acute unilateral obstruction, ureteric pressure falls while RBF continues to fall. However in acute bilateral phase 3ureteric pressure remains elevated while RBF declines. Release of bilateral obstructive uropathy leads to marked diuresis.

Radiological evaluation

The effective and important investigation for diagnosis is ultrasound of upper tracts. It is a rapid, low-cost test with no radiation hazards as well as with acceptable sensitivity. Ultrasound is the diagnostic modality of choice in pregnancy.[8] Ultrasound is 98% sensitive for detecting hydronephrosis, but the specificity is 78%. [9]
X-ray KUB can reveal obstructive stone (10) however alone it does not prove the calculi to be the cause of obstruction. As plan X-ray can miss out radiolucent calculi and radio-opacity due to any other cause.

The standard investigation is intravenous urogram (IVU) for the detection of ureteral obstruction. IVU has superiority because it can show both anatomical details as well as functional attributes of the kidneys [1]. It can show exact site of obstruction, degree of hydronephrosis and the status of renal parenchyma. All these characteristics help in the best management.
CT KUB (non contrast CT) is the gold standard for stone detection as well as it helps in ruling out other causes of obstruction. However it will not be very helpful in functional capacity of kidneys until it is combined with contrast. With spiral scanners, images can be performed effectively without contrast media, take only 5 to 10 minutes to perform, and cost about the same as IVPs.
Magnetic resonance imaging (MRI) has no added advantage over CT scan in diagnosing obstruction. In addition it does not visualize the stone. However it correctly identifies the point of obstruction and the non-calculus causes of obstruction.

Management strategies

The crucial step in management is to identify patients who require emergency urological treatment. For example a patient with sepsis in conjunction with an obstructing stone represents a true emergency. Patients who are unable to maintain oral intake due to refractory nausea, extremes of age or patients with severe pain will require hospital admission.

After initial treatment i.e. adequate analgesia, blood and urine tests as well as after ruling out emergency situations, the next step is to formulate a strategy for managing the stone. The management of patients with urolithiasis is becoming increasingly well defined. It depends on two major prognostic factors i.e. stone size and location of stone. These two factors also help in arranging follow up investigations and outpatient's management. Depending on these two factors different treatment options are conservative management, shock wave lithotripsy (ESWL), Uretreoscopy, Ureteronoscopy, PCNL and open surgery.
Obstructive nephropathy can lead to kidney failure within a few weeks or a few years. Obstruction maintained for > 6 weeks results in hydronephrosis of the affected kidney with significant irreversible loss of functional renal parenchyma. [6] Renal function is also affected by relatively short-term obstructions. [7] Mustonen et al found that glomerular and tubular function partially improved during the first month following immediate correction of an obstruction. [7]
The goals of the conservative management of ureteric calculi are to allow safe passage of the stone with no loss of renal function, to select which stones are likely to require intervention, and to identify the optimal timing of intervention.

The conservative management of calculi of 5mm leads to successful passage of the stones in > 90% of cases. (1 1]. Larger calculi are less likely to pass spontaneously

and more likely to require intervention, particularly if associated with a reduction in renal function. (1 1].
The use of radionuclide renography to determine renal function in ureterolithiasis has been described previously [1) 1–14]. MAG3 isotope renography is suitable for assessing renal function in the obstructed kidney [1 check 1,5 or 15 5], and particularly for comparing the function of the obstructed and unobstructed sides, although it cannot be used to determine the absolute function of the renal units.
The ability to recover function after complete obstruction has been assessed using radionuclides by Andrén Sandberg [1 check 4], who evaluated 358 patients with ureterolithiasis using radioisotope renography; 27% had impaired renal parenchyma function in the absence of symptoms requiring intervention and 7% had renal impairment up to 17 months after passing the stone

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