Original Articles

CACULOUS ANURIA

Farrakh Ahmad Khan

Abstract

The incidence of calculous anuria seems to be quite high in Pakistan. 104 patients with calculous anuria were studied between 1970-1977. The diagnosis and management is discussed in detail and various investigations available are evaluated (JPMA 29:256, 1979).

Introduction

The incidence of calculous disease in Pakistan seems to be high. However epidemiological data is not available to substantiate the above statement. Calculous anuria, though not often reported in the literature is a common complication in our experience. This is partly due to availability of specialist services and dialysis facilities in our unit.

In any discussion on calculous anuria it is imperative that the meaning of this term should be clarified. Most authors accept calculous anuria as a form of obstructive nephropathy due to upper urinary tract stones resulting in oliguria and/or anuria (Joly 1929; Winsbury-White 1929; Herman 1938; Aird 1958). However, others also include cases of oliguria or anuria of end stage chronic renal failure due to calculous disease (Thomson-Walker 1923; Morris 1901; Philip 1975; Camey 1972; Sreenevasan 1974). Nearly all the above mentioned authors believe in the existence of reno-renal reflex anuria.

The confusion created in defining calculous anuria has prompted us to lay down strict diagnostic criteria of mechanical obstruction of the patients included in the present series. We were sceptical of the existence of reno-renal reflex anuria. However, in two cases suspicion in favour of such an entity was raised.

The sporadic case reports in the literature has prompted us to publish this large series so as to emphasise the clinical features and the diagnostic pitfalls in the management of calculous anuria.

Faculty of Surgery, Postgraduate Medical Institute, Lahore.

Methods and Material

From January 1970 to November 1977 a total of 104 cases of calculous anuria were documented from the admissions to the Urology Department at the Mayo Hospital, Lahore. The actual time covered by this study is 6 years and three months.

These patients were primarily managed conservatively elsewhere and failure to give relief was the criteria for referal to our Department.

The initial diagnosis was based upon the history of sudden onset of severe renal pain followed by oliguria (urine output less than 500ml in 24 hours) or anuria. Only those cases with upper urinary tract stones were included in this study in which presence of obstruction was established by means of intravenous pyelography, renography, retrograde catheterisation or at operation. In cases where spontaneous flow of urine was established before investigations could be started, a subsequent intravenous pyelography was helpful in demonstrating post obstructive changes. However, in two cases difficulty was faced in meeting the strict requirements noted above. These patients presented as calculous anuria but at operation obstructive changes in the kidney were not noted. Since they clinically appeared to fall in the category of calculous anuria we have included them as a separate group in this series.

It is also important to remember that the state of the kidney function prior to the episode of obstruction did not influence us in selecting cases for this series. The sole criteria has been the presence of obstruction severe enough to cause anuria or oliguria (urine flow less than 500ml in 24 hours).

Results

Month of Admission: Majority of patients (39.42%) were admitted during the three hot summer months (June to August) (Table I). The peak was reached in August.

Age and Sex distribution: The age of the patients at admission ranged from 4½ years to 80 years. Table II shows the age distribution pattern. It is clear that the highest incidence is after 40 years of age.

Table I: Monthly Admissions

Month	*Number of patients*
January	9
February	7
March	7
April	4
May	9
June	13
July	10
August	18
September	8
October	7
November	5
December	7

Table II: Age Distribution of Calculous Anuria Patients

Age in years	*Number of patients*
0 — 10	3
11 — 20	3
21 — 30	10
31 — 40	21
41 — 50	28
51 — 60	19
61 — 70	13
71 +	7
	104

There were only 11 females (10.58%) in this series.

Signs and Symptoms at admission: Most patients received treatment by a doctor elsewhere. This usually was in the form of analgesics, anti-spasmodics and intravenous fluids. Occasionally diuretics were also administered. Failure to relieve symptoms prompted the attending doctor to refer the patients to the hospital.

Most patients experienced severe renal pain (unilateral or bilateral) and within a few hours noticed anuria. Patients were nauseated and started vomiting within the first three days. The general condition rapidly deteriorated after the 10th day of anuria.

Number of factors influenced the course of the disease. The most important are as follows:—

a) The state of renal function before the episode of obstruction.

b) Urinary tract infection.

c) State of hydration.

These factors were responsible for the variations of classical signs and symptoms of calculous anuria commonly seen in our cases.

The details of important signs and symptoms are as follows:—

a) *Pain*: (Table III). Only 39 patients (37.5%) presented with typical 'renal colic' with pain radiating from the loin to the groin. The severe attack of pain usually persisted for a few hours and then became moderate nagging pain localised to the renal angle. The latter persisted till relief of anuria.

A total of 52 patients had pain fixed in the renal angle. In 14 of these cases the pain was dull in character localised to the renal angle.

Seven patients had lower abdominal pain which could be confused with acute appendicitis or other abdominal pathology

In six patients there was no pain at all.

Table III: Type of Pain

Type of pain		*Side*		*Total Number of patients*	*Percentage*
A.	Fixed	Right	= 25		
		Left	= 13	52	50.00
		Bilateral	= 14		
B.	Radiating	Right	= 16		
		Left	= 17	39	37.50
		Bilateral	= 6		
C.	Unusual	Left iliac fossa to left renal angle	= 2		
		Lower abdominal	= 2	7	6.73
		Right iliac fossa	= 2		
		Left iliac fossa	= 1		
D.	No pain			6	5.77
	Total:			104	100.00

b) *Oedema, Pulmonary Oedema and High Blood Pressure*: A total of 47 patients were found to be over hydrated. Fifteen others were noted to have pulmonary oedema leading to varying degree of dyspnea.

High blood pressure (diastolic over 90mmHg) was noted in 30 patients. Twelve of these patients also had dyspnea.

c) *Abdominal distention*: Mild to severe abdominal distention was noted in 35 patients. In 16 patients the distention was severe and could have been confused with intestinal obstruction. The onset of abdominal distention was usually during the first 5 days of anuria.

d) *Duration of anuria/oliguria at admission* (Table IV): The duration was estimated by the patient or his attendant's statement. The history of anuria was quite definite but in few cases the onset of oliguria was not quite accurate. One patient noted polyuria before developing anuria. Two patients had several episodes of anuria.

Table IV: Duration of Anuria/Oliguria at Admission

Days of Anuria/ Oliguria	*Number of patients*	*Percentage*
1 — 5	49	47.11
5 — 10	32	30.77
10 — 15	13	12.50
15 +	10	9.62

e) *Other Symptoms*: The usual symptoms of uremia were noted in late cases. One patient complained of loss of sight after two weeks of oliguria. The fundus and the disc were normal. Gradual but complete recovery followed relief of obstruction

Past History of Calculous Disease: A total of 84 (80.77%) patients had clinical and or radiological evidence of calculous disease in the past. The duration of the disease is shown in table V.

Table V: Duration of Calculous Disease in Anuria Patients

Duration in years	*Number of patients*	*Percentage*
No previous history	20	19.23
0 — 5	43	41.35
5 — 15	28	26.92
More than 15	13	12.50
Total:	104	100.00

Past History of Stone Operations: A total of 20 patients gave a previous history of surgery for calculous disease. Nine of these cases had nephrectomy.

Past History of Anuria: A total of 10 (9.62%) patients reported episodes of anuria in the past. They all recovered without any surgical intervention.

Investigations: Following history and examination of the patient routine laboratory investigations were carried out (Hb, TLC, DLC, Blood Urea, Serum Creatinine, Serum Sodium and Serum Potassium).

Plain x-ray of the abdomen and pelvis was available at admission. However, in very ill patients dialysis took priority and hence plain x rays were not available. In early cases intravenous pyelography was usually done. Renal scan and renography was carried out in selected cases. Diagnostic retrograde catheterisation was done in patients where stone could not be located on x-ray films.

There is no need to elaborate on the well known biochemical changes in renal failure. However, the x-ray changes, renal scan, renography and diagnostic retrograde catheterisation as diagnostic tools in the management of obstructive nephropathy need to be highlighted.

a) *Plain x-ray of the abdomen and pelvis*: The main reasons for not visualizing the stone were the poor preparation of the patient, non radio-opaque stones, and the small size of the stone. It is not surprising that in 40 out of 86 patients (46.51%), the stone could not be visualised (Table VI).

Table VI. Result of Plain X-Ray of the Abdomen and Pelvis in Anuria Patients

Results of x ray	*Number of patients*	*Percentage*
No stone seen	40	46.51
Stone visualised	41	39.42
Suspicious shadow	5	4.81
X-ray not done	18	

b) I^{131} *Renogram and Renal Scan*: Renal scan was found to be of limited value. However, Renogram was of benefit in certain selected cases.

A total of 13 cases had renography done during obstruction. In 11 of these the correlation between operative findings and renography was good.

c) *Retrograde Catheterisation*: Retrograde catheterisation was used for diagnostic and therapeutic purposes. It is not possible to separate the two functions in individual patients. The ureteric catheter was not only used for shifting the obstructing stone but also for investigating the upper urinary tract on the opposite side.

Retrograde catheterisation was done in 70 patients and found to be a very useful procedure. It has its limitations in some cases. Failure to catheterise the ureter in a small percentage can be frustrating. Rupture of the kidney and haemorrhage occurred in one case. Post operative renal infection was not recorded when catheter was used for diagnostic purposes.

We found retrograde catheterisation most useful in establishing the site of obstruction and the state of the opposite kidney from point of view of diagnosis and future management.

Discussion

Calculous anuria under the diagnostic scrutiny of modern investigative procedures need to be redefined. This study has clarified certain concepts in defining the diagnostic criteria for calculous anuria. We propose that under this heading only those patients should be included who have a urine output of less than 500ml in 24 hours due to calculous obstruction of the upper urinary tract. By specifying the urine output we have actually graded the degree of obstruction to the urine flow from the kidneys. By definition a group of patients have been excluded who developed acute renal failure following chronic renal damage due to long standing stones. It is also important to note that other causes of obstruction such as congenital hydronephrosis, pelvic carcinoma and polycystic disease may be responsible for the stone formation but these cases are strictly not of calculous anuria if the stone does not actually obstruct the urine flow. Cardiac or liver disease may also lead to renal failure with upper urinary tract stones as an incidental finding. The diagnostic difficulties in these situations are obvious.

The aim of this study is to highlight the diagnostic problems of calculous anuria.

The symptoms of established stone disease and incidence of renal colic is known to be higher during the summer months (Bateson 1973). This study also shows a much higher incidence of calculous anuria (39.42%) during the three hot months. This is perhaps the effect of dehydration.

The age incidence of calculous anuria patients starts to show a rise after 30 years of age with the peak between 41 and 50 years of age. The reported age incidence from Western sources is similar (Joly 1929; Winsbury White 1929; Thomson-Walker 1923; Fowler 1937). The low incidence among children has been noted by Eckstine (1960).

There were only 11 females (10.58%) in this series. However, the incidence of females among the patients with upper urinary tract stones without renal failure was 34.7% (Khan et al., 1975). The relative rarity of calculous anuria is difficult to explain on the basis of incidence of stone in the two sexes.

Most patients in this series presented with acute onset of pain usually fixed in one or both renal angles (50.0%) accompanied by vomiting. Few hours later the patient noted anuria which was usually total. Abdominal distention was noted in a total of 27 patients and in 16 of these it was severe enough to require treatment. The cause of distention could be reflex but peritonism due to severely congested kidney cannot be ruled out in large number of patients. Free fluid in the peritoneal cavity at operation or start of peritoneal dialysis was a consistent finding in nearly all these cases. Generalised and pulmonary oedema are signs of salt and water over load, mainly due to indifferent medical mismanagement. High blood pressure was also the result of salt and water excess since relief of anuria or dialysis brought the blood pressure down to normal in all cases. The rise in blood pressure has been studied by Garrat et al. (1970) and Vaughan et al. (1970) in unilateral ureteric obstruction in dogs. They found initial elevation of renin which became normal after 6 weeks with a subsequent rise of norepinephrine later. The role of renin studies in human subjects with bilateral obstruction have produced inconclusive results (Pillay and Dunea, 1971).

Majority of patients (80.77%) were known to have stone disease in the past and in only 19.23% there was no previous history of stone disease. However, only 20 patients had stone surgery and of these only 9 had previous nephrectomy. The number of patients with previous nephrectomy is rather small as compared to similar series by other workers (Lowe, 1960; Leong et al., 1972; Proca, 1972).

Past history of anuria was reported by 9.62% of these patients. However, only 0.9% of our upper urinary tract patients without renal failure gave history of anuria (Khan et al., 1975). Perhaps the shape of the stone is such that it is more likely to cause obstruction.

The investigation of calculous obstructive disease is limited to mainly three fields. Firstly emergency intravenous pyelography during anuria is very useful. A good follow up will define the severity and the site of the obstructing stone (Bretland, 1972; Rao et al., 1976). Unfortunately emergency I.V.P. could not be done in most of our cases. Plain x-ray of the abdomen and pelvis is of limited value. In only 41 out of 86 cases the stone was correctly located. Furthermore plain x-ray does not give any information regarding the functional renal damage.

I^{131} hippuran renography was found to be very useful in diagnosis and selection of side to be operated. However, limitations of this procedure have to be clearly understood. The absence of the third phase (Obstructive curve) can be seen in other renal disorders (Singh et al., 1969; Britton and Brown, 1971; Vitye, 1972). The history, clinical examination and other investigations would help in establishing the diagnosis in these doubtful cases. 'Nephrectomy curve' was observed in two patients who subsequently made complete recovery. Similar findings have been reported in patients with non-obstructive acute renal failure (Fujita et al., 1972; Lavender and Brown, 1974). In spite of the few drawbacks of renography we rate this investigation as very useful for the purposes of diagnosis and management of calculous anuria. We are hopeful that newer developments in radioactive contrast media such as 99m Technetium Penicillamine would give better and more accurate information (Taylor et al., 1977).

Retrograde pyelography was found to be a very useful tool for diagnosis and treatment in selected cases. We feel that retrograde pyelography is mandatory for unexplained acute renal failure in a previously healthy patient especially because of high incidence of stone

disease in Pakistan. It is also a most useful tool in stone patients with acute or chronic renal failure to assess the degree of obstruction. Retrograde pyelography in our opinion is the most important single investigation in cases of calculous renal failure.

Barratt and Chantler (1970) found good co-relation between plasma and urinary creatinine ratio following release of obstruction and subsequent functional recovery. Ghazali and Barratt (1974) estimated the urinary sodium excertion after release of obstruction and found a high urinary sodium on the first day as a good prognostic signs. These tests are only of value following release of obstruction. Nanninga and O'Connor (1976) have developed an assay method using tetrazolium on renal tissue removed at operation in assessing the extent of renal damage. This test is basically valid in unilateral obstructive disease.

In spite of a number of tests, discussed above, in two of our cases retrograde ureteric catheterisation failed to relieve the obstruction in spite of the catheter by passing the stone. At operation in these two cases the ureter and the kidney above the stone were not distended with urine. The stones were removed and after a delay of about six hours urine flow was established. We are not in a position to speculate as to the reason for this phenomenon. Perhaps renal angiography and renal biopsy could have proved helpful. These two cases do illustrate the diagnostic difficulties faced by the practitioner. Estimation of urinary sodium can be of help in patients with some urine output and in whom the renal function prior to the obstruction is known.

In recent years the use of renal renography and computer assisted Tomography (Cat) in the investigation of renal disease are becoming popular. Both these techniques are non-invasive. The rapid developments in radio pharmaceuticals have also contributed immensely in the investigative field (Becker et al., 1978). Unfortunately these facilities are not available in Pakistan.

References

Aird, I. Compasion in surgical studies. Edinburgh, Livingstone, 1949, p. 645.

Barratt, T.M. and Chantler, C. (1970) Obstructive uropathy in infants. Proc. R. Soc. Med., 63:1248.

Bateson, E.M. (1973) Renal tract calculi and climate. Med. J. Aust., 2:111.

Becker, J.A., Kutcher, R. and Solomon, N. The Radiology of Renal Failure in Stratery in Renal Failure. Ed. E.A. Friedman. New York, John, Wiley. 1978, pp. 63-102.

Bretland, P.M. Acute Ureteric Obstruction. London, Buttermorths, 1972.

Britton, K.E. and Brown, N.J.G. in Clinical renography. London. Lloyd-Luke Ltd., 1971.

Camey, M., Leduc, A., Bonaud, Ph., Denis, M. and Humm, K. Renal insufficiency during lithiasis (abstract). Year Book of Urology pp. 58-61 (1972).

Eckstine, H.B. (1960) Calculous anuria in children. Br. J. Urol., 32:269.

Fowler, H.A. Obstruction nephropathy, in Nelson's surgery, ed. A.O. Whipple, V. 6. London, 1937, pp. 597.

Fujita, K., Nakauchi, K., Masumoto, T., Nakanishi, T., Kasamatsu, T. and Oyamada, H. (1972) Corelation between radio-isotope renographic findings and results after relief of ureteral obstruction. J. Urol., 107:23.

Garrett, J., Polse, S.L. and Morrow, J.W. (1970) Ureteral obstruction and hypertension. Am. J. Med., 49:271.

Ghazali, S. and Barratt, T.M. (1974) Sodium excretion after relief of urinary tract obstruction in children. Br. J. Urol., 46:163.

Herman in practice of urology. Philadelphia, Saunders, 1938, p. 351.

Hoffman, L.M. and Suki, W.N. (1976) Obstructive uropathy mimicking volume depletion. JAMA. 236:2096.

Joly, J.S. Stone and calculous diseases of the urinary organs. London, Heinemann, 1929, p. 371.

Khan, F.A., Akhtar, F.K. and Farooqi, S. (1975) Stone in the upper urinary tract. (A preliminary report on 222 cases). JPMA, 25:278.

Lavender, S. and Brown, J.N. (1974) Blood background subtraction renography in acute renal failure. Br. J. Urol., 46:247.

Leong, C.H., Yu, H. and Ong, G.B. (1972) Emergency surgery for calculous diseases of the upper urinary tract. Ann. R. Coll. Surg. Engl., 31:410.

Lowe, K.G. (1960) Anuria in patients with single functioning kidney. Br. J. Urol., 32:267.

Morris, H. Surgical diseases of the kidney and ureter. Vol. 2. London, Cassell, 1901, p. 145.

Nanninga, J.B. and O'Connor, V.J., Jr. (1976) Use of tetrazolium to determine hydronephrotic damage in human kidneys. J. Urol., 116:286.

Philip, P.F. Investigations of urinary tract in Baily and Love's short practice of surgery. Edited by A.J. Harding Rains and H.D. Ritchie. 16th ed. London, Lewis, 1975, pp. 1098-11.

Pillay, V.K.G. and Dunea, G. (1971) Clinical aspects of obstructive uropathy. Med. Clin. North Am., 55:1417.

Proca, E. (1972) Errors and pitfalls in the management of acute urinary obstruction complicated by uremia with special reference to stone. Br. J. Urol., 44:9.

Rao, M.S., Bapna, B.C., Vladyanathan, S., Chugh, K.S. and Sodhi, J.S. (1976) Infusion pyelography in

anuric patients. J. Urol., 116:297.

Singh, S.M., Datta, N.S., Bapna, B. and Rao, M.A.P. (1969) Radioisotope renography in acute renal failure. Indian J. Med. Res., 57:1969.

Sreenevasan, G. (1974) Bilateral renal calculi. Ann. R. Coll. Surg. Engl., 55:3.

Taylor, A., Davis, G., Halpern, S. and Ashburn, W. (1977) 99m Technetium penicillamine; A renal cortical scanning agent. J. Urol., 117:418.

Thomson-Walker, J. Sir, A system of surgery. Edited by C.C. Choyle Vol. II. London, Cassell, 1923, p. 1257.

Vaughan, E.D. Jr., Sweet, R.C. and Gillenwater, J.Y. (1970) Peripheral renin and blood pressure changes following complete unilateral urethral occlusion. J. Urol., 104:89.

Vitye, B. (1972) Quantitative analysis of the third segment of the renogram and its application for the detection of urinary tract obstruction and renal arterial constriction. J. Urol., 107:21.

Winsbury-White, H.P. in Stone in the urinary tract. J.A. Churchill, London pp. 29 (1929).