Urinary Calculus In Nepal

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INTRODUCTION:

The calculi in the urinary tract is the common condition, bringing the patients to our hospitals. A small boy holding his long penis, crying with pain due to inability to pass the urine because of vesical calculi is the common scene in our Out Patient Department or in the Emergency room. This is as true at Kathmandu as in Surkhet, Pokhara or Biratnagar. Having gone through the medical records of Bir Hospital, Kathmandu, for the last five years the annual rate of admission of the cases of urinary calculi will prove that this condition alone accounts for about 1.50% of the hospital admissions.

ANNUAL ADMISSIONS OF URINARY CALCULI IN BIR HOSPITAL, KATHMANDU.

Years	2030	2031	2032	2033	2034	2035
Urinary Stones	98	109	96	124	139	108
Kidney or ureteric stones	39	39	26	46	49	46
Vesical stones	59	70	70	78	90	62

Similar figures will be available at the other centres. Peculiarly, the vesical calculi are more prevalent among people of poor economic condition: whereas the renal and

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ureteric calculi are seen in all the section of our society. The condition is as diasab to the patients as it is rewarding to the treating team. The paper is aiming at initial the research on this colossal problem, affecting the people in endemic form, so t preventive measures could be taken to control it. We firmly believe that if a patient passed a stone, a knowledge of its composition is essential for the proper treatment of case. We want to be very frank for making a humble start by furnishing the composit of the various urinary stones found in our country. We are quite aware that lot of w has got to be done along, the nutritional status of the patients, the food and drinking hat of the individual, the 24 hours urinary excretion of crystalloids and colloids of the patien the serum calcium and phosperus levels and the incidence of urinary tract infect amongst the patients, before drawing any conclusion about the cause of the condition

METHODS AND MATERIAL

119 cases of urinary calculi has been included in our series for study. 36 stones (20 fr the kidney, 3 from the ureter and 13 from the urinary bladder) were collected by one of t author (A.K.S.) during the last eighteen months from Bir Hospital, Kathmandu and Kos Anchal Hospital, Bijatnagar. 83 vesical stones were collected during the last ten years. / these 119 stones were analysed (by H. G. S.) chemically for the inorganic and organ contents (Appendix 1 and 2). The size of the stone varied from 10 milligrams to 500 Gram (needing forceps delivery for its removal, at the time of operation). The results of chemi analysis is as follows:-

FINDINGS OF CHEMICAL ANALYSIS (qualitative) OF URINARY CALCULI 119 CASES, RENAL/URETERIC CALCULI 23 CASES AND VESICAL CALCULI 96 CASES & THEIR PERCENTAGES.

No. 1 Chemical composition Urinary calculi Renal/Ureteri Vesical Calculi.

CHEMICAL	URINARY		RENAL/UR		VESICAL	
	Positive	%	Positive	%	Positive	%
1 Calcium	119	100 %	23	100 %	96	100 %
2. Oxalate	85	71 %	61	68 %	69	72 %
3. Phosphates	73	61 %	15	65 %	58	60 %
4. Uric acid, urates	97	81 %	10	44 %	87	90 %

5. Ammonia	54	45 %.	2	8 %.	52	54 %.
6. Magnesium	35	29 %.	6	26 %.	29	30 %.
7. Xanthine	5	4.2 %.	1	4 %.	4	4.2 %.
8. Indigo	3	2.5 %.	1	4 %.	2	2 %.
9. Cholesterol	3	2.5 %.	3	13	0	0
10. Carbonate	0	0	0	0	0	0
11. Cystine	0	0	0	0	0	0
12. Fibrin	0	0	0	0	0	0

Please note the incidence of phosphates and uric acid and urate stones are substantially higher in our series. The carbonates, cystine and fibrin stones have not been encountered.

PRESENTING FEATURES:-

The pain is the commonest presenting feature, the site, intensity and the nature varied with the position in the urinary tract and the size of the stone. The cases of renal stones presented with dull aching pain over the loin, haematuria, pyourea or with the signs of infection. The cases of ureteric calculi presented with severe ureteric colics, needing high dose of antispasmodic and sedatives. The patients with vesical calculi comes with difficulty and pain during micturation, with dribbling of white coloured urine. One of our patient (B.M) had enlargement of prostate with asymptomatic bilateral staghorn calculi. The cases of urinary calculi were investigated on the following lines:-

- A. Age, sex, address, family and social history, eating and drinking habits of the community, nutritional status of the patient.
- B. The examination of the urine for reaction, specific gravity, sugar, albumin and microscopic examination for red cells, crystals. The urine was also sent for culture and sensitivity tests.
- C. Blood- Hb, TC, DC, Urea, uric acid sugar contents.
- D. Plain X-Ray of the abdomen and pelvis were routinely performed. Intravenous pyelography was performed on cases with renal or ureteric stones to know the position of the stone in the diseased kidney, function of the diseased and the other kidney. Retrograde catheterisation and pyelography were done in few cases.

TREATMENT:

Almost all the cases except one (S.K.) needed surgical removal of the stones. Two cases of renal stones (D. B. & K. D.) needed nephrectomy. Those cases with stones in the lower poles of the kidneys were subjected to partial nephrectomy: one (D. D.) developed haemorrhage during the post operative period and required nephrectomy. Other cases of renal stones needed pyelolithotomy or nephrolithotomy (I. M.). The ureteric stones needed ureterolithotomy. The cases of vesical calculi needed suprapubic cystolithotomy.

DISCUSSION:

About 1.5% of hospital admission accounts for urinary stones. Dr. Shrestha (1971) confirmed that 30.4% of children with urinary trouble had vesical calculi. Stewart working in Great Britain remarked that the urinary calculi is the result of metabolic disturbances of the individuals and the defect of the kidney or its drainage system. This according to him will explain the recurrence rate (15-50%) following simple removal of the stones, because the procedure does not remove the cause of its initial formation. To introduce preventive measures in the particular community, it is desirable that a fair knowledge of the composition of the stones prevalent in the community is essential.

The urinary calculi, particularly, the vesical calculi is commonly seen amongst children coming from poor economic condition, who are usually malnourished. The malnutrition, specially the Protein Calorie malnutrition (PCM) is quite prevalent amongst Nepalese children. Nicolas Black (1978) working in Surkhet district, concluded that over 43% of children between 3-4 years are malnourished. Philippe Pourbaix (1974) working for W.H.O. under Nutritional Survey in Nepal concluded that the Protein Calorie Malnutrition (PCM) amongst Nepalese children is quite prevalent. In some places the per capita protein intake is 45.5 grains (Normal 50-75 Grams) a day. In the states of malnutrition or deficiency of vitamin A, the epithelium of the urinary tract is desquamated, forming the nidus for the future stone. Arora (1979) working in India found low Vitamin A level amongst children with vesical calculi.

In infection of the urinary tract, the epithelium are similarly desquamated forming the nidus for the stones. There were 19 cases of urinary infection amongst 36 cases of urinary stones, making it 53%. The pus cells, fibrin, necrotised tissues and the clumps of

bacteria may form the nucleus of the stone. Dr. Gurubacharya (1979) informed me that 25% of urine of patients with clinical signs of urinary tract infections are infected.

The hypercalciurea or crystaluria is the commonest cause of precipitation of calcium calcium salts to form the stone. Of the total calcium content, 60% of the calcium in the serum is ionized and is filtered through the glomerulus of the kidney. Of the total nonionized form, only 5% is bound to the plasma protein, which is not filtered by the glomeruli. According to Newsam and Patriea (1975) in hypoproteinaemia, the protein bound calcium is also lowered, producing relative calciurea. Gravy and Boyce postulated that the crystalloids are deposited on the nidus formed by the pus cells, epithelium etc. to form the stones.

Walter and Isrel further suggest that the crystalloids are held in solution by absorption on the colloid particles, and when the concentration of crystalloids increases or the colloids decreases, the crystalloids will precipitate out, forming the stone. Coc and Raisen (1973) confirmed hyperuricemia or hyperuricosuria in cases of uric acid stones.

The primary or metabolic stones are the result of increased crystalloids contents of the urine, and probably defective lymphatic flow through the kidney. Lot of work has been done on the mode of formation of Randall's Plaques and Carr's concretions for forming primary renal stones. Lymphatic obstruction has been blamed to produce them, Babics (1951). Foldi, Rusznyak and Szabo (1952) and Mayerso (1963) have worked in detail about the renal lymphatic system. Carr postulated that the calcium crystals deposited in the kidney substance, whether within or outside the renal tubule were removed by the lymphatics and that the Rendall's plaques or Carr's concretions were formed, if the lymphatics were blocked. With the shading of the overlying epithelium the crystalloids are deposited on the exposed concretions to form the stone. Frankly, we have not worked on these lines and hence no comment. In our country, poor people live on sishnu, spinach and rice. Manandhar (1979) tells me that the calcium contents of sishnu is over 2,000 mgm/100 Gm and oxalate contents of spinach is 658 mgm/100 Gm. The secondary stones are the result of obstruction of the urinary flow, infection of the urinary tract, hypoproteinaemia, hypovitaminosis A and increased excretion of calcium salts, uric acid or urates, xanthine and cystine in the urine. The infection of the urinary tract by the urea splitting

organism, helps in the formation of the stones. The infection may have taken place during childhood, due to metrel ulceration or urethritis or stricture. This infection may ascend up to produce pyelonephritis. The chemical composition of stones varies from country to country, depending upon the social, dietetic, and environmental factors.

Having gone through the results of our investigation, the incidence of calcium oxalate stones are similar to the findings of Stewart working in Britain or Peter R. Scott working in Australia. The incidence of phosphatic stones are definitely greater in Nepal

COMPARITIVE FINDINGS OF CHEMICALS IN THE URINARY STONES.

Components	A.K.S. & H. G. S. (Nepal)	STEWART H. H. (Gr. Britain)	PETER R. SCOTT (Australia)
OXALATE	71 %.	75 %.	60 %.
PHOSPHATES	61 %.	15-20 %.	30 %.
URIC ACID, URATES	81 %.	5-10 %.	0

(60 %) than in Gr. Britain or Australia. The higher incidence of uric or urates stones in our patients (81 %) indicates that the urine of Nepalese patients contains high percentage of uric acid and urates. The uric acid and urates were found in 90 % of vesical calculi and 44 % of renal or ureteric calculi. It may be the result of breakdown of tissue nucleoprotein following hypoproteinaemia and intake of sweet bread (sishnu, sag, wol, karkalo, pindalu). Ian Aird also agrees that the uric acid is much more common in vesical calculi than the renal or ureteric calculi. The incidence of Xanthine calculi in our series (4.5 %) which is rare in other community is also due to the lack of activity of enzyme xanthine oxidase in the liver, resulting in increased secretion of urinary xanthine.

The absence of cystine calculi in our series could not be explained. It is said to be present in 3.5 % of subjects of cystinuria, an inherited disease transmitted as a recessive Mendelian character. The ammonium containing stones were also more common (45 % in urinary calculus and 54 % in vesical calculus) in our series.

CONCLUSION:

The high incidence of stones in the urinary tract in Nepal may be the combined effect of hypoproteinaemia, hypovitaminosis A, infection of the urinary tract and probably lymphatic obstruction. The greater incidence of phosphates stones are due to infection of the urinary tract. The greater incidence of uric acid and urate stone are due probably to high secretion of uric acid or urates in the urine because of our eating habits. S shnu, spinach and rice are the staple food of our poor people and may be the cause of crystalluria and stone formation. We are used to sweet bread (sishnu, wol, spinach karklo pindalu), in our diet which is rich in uric acid contents. The absence of cystine and carbonates stones could not be explained. Further studies about the causes of the urinary calculi will be necessary to come to a definite conclusion about the causes of urinary calculi.

SUMMARY:

119 stones of the urinary tract have been studied and analysed chemically. Their chemical components are compared with the findings of other authorities. The phosphates, uric acid and urates stones are more prevalent in the Nepalese population. The causes of the formation of the stones are discussed.

ACKNOWLEDGEMENTS:

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Thanks to colleagues, at Bir Hospital and Koshi Anchal Hospital, Biratnagar for providing us with stones and suggestions. We are grateful to Mr. S. B. Adhikari, Miss Sakya and Mr. S. P. Khanal for their help. This work has been possible due to generous donation from the founder member of Lions Club, Kathmandu.

REFERENCES:

1. Stewart H. H. (1969) Calculus disease of the urinary tract. Clinical Surgery 6, Edited Fergusson, Butterworth, London.
2. Newsam J. E. and Petrie JJB (1975) Urology and renal disease, Churchill & Livingstone, London.

3. Ian Aird (1959) A companion in surgical studies, E. & S. Livingstone, London.
4. Nicolas Black (1978) Surkhet District Nutritional Status Survey.
5. Philippe Pourbaix (1974) Nutritional survey in Nepal, W. H. O. publication, Delhi.
6. Walter J. B. Isrel MS (1974) General Pathology, Churchill & Livingstone London
7. Bailey, H. and Love M (1975) Short practice of surgery, H. K. Lewis & Co. Ltd. London
8. Bell, G. Davidson, J. N. and Scarborough H. (1959) Textbook of physiology and Biochemistry, E. & S. Livingstone, London.
9. Scott, P. R. (1975) An aid to clinical surgery, Churchill Livingstone, London.
10. Aurora et al (1970) Acta Paediatrica Scand 59: 385-398,
11. Coe F. L. and Raisen L. (1973) Lancet 1:129-131 (Jan 20) 1973.
12. Shrestha, S. M. et al (1971) J. Nep. M. Asso. 201 (1971)
14. Miss V. Manandhar- Food resianel section H. M. G., Personal communication.

Method

The urinary calculi were collected during surgical operation from various patients. The stones are of various sizes ranging from 10 milligrams to 500 Grams. All of them are solid and of various colours like yellow, grey, brown, white and dark.

Before processing for chemical analysis the calculi were washed with dist. water and dried. A small piece of each calculus was finely pulverized seperately in the mortar. Careful attention was taken so that the examined specimens have full representation of the whole calculus. The presence of inorganic and organic components were tested on each specimen by qualitative analysis of usual standard chemical technique.

INORGANIC

1. Treat some of the powder in a test tube with cold N-nitric acid. Effervescence indicates carbonate.
2. Boil the mixture, cool and filter. The filtrate contains any calcium, magnesium, phosphate and oxalate, divide the filtrate into three parts and treat as follow:-
 - (A) Add a few drop of ammonium oxalate solution. Adjust the pH of the Solution by dropwise addition of ammonia until just alkaline followed by acetic acid to PH. 5. A precipitate indicates calcium.

Filter off any precipitate. To the filtrate add a few drops of potassium phosphate solution and ammonia until alkaline. A slowly developing crystalline precipitate of magnesium ammonium phosphate indicates magnesium.

(B) Add ammonium molybdate solution and allow to stand at room temp. A yellow colour or precipitate which turns blue on the addition of reducing agent indicates phosphate. Faint blue colours should be ignored.

(C) Add a few drops of calcium chloride solution and adjust the PH to 5 by dropwise addition of ammonia and acetic acid. A precipitate indicates oxalate.

3. Treat some of the powder with potassium hydroxide and nessler's reagent. Yellow colour indicates ammonium.

ORGANIC:

1. Treat some of the powder with sodium carbonate and phosphotungstate (uric acid reagent). Blue colour indicates uric acid or urates.

2. Add a drop of sodium cyanide solution to a little of the powder on a white tile, followed by a drop of fresh sodium nitroprusside solution. A magenta colour indicates cystine.

3. Agitate the powder of calculus with 10ml of chloroform. An indigo calculus will turn the chloroform blue. The Chloroform is then decanted from the insoluble sediment.

4. Add to the chloroform solution of step (3) 5ml of acetic anhydride and 0.5ml of conc. H_2SO_4 . A Liebermann-Burchard reaction (Play of colors ending in a naphthal green-shade) indicates the presence of cholesterol.

5. Divide the insoluble sediment from step (3) into 2 parts. Dissolve 1 part in HNO_3 and cautiously dry over a free flame. A yellow residue which turns orange on the addition of 10% NH_4OH solution and deep red on warming indicates the presence of xanthine.

To the second part add 2mls of Millon reagent and heat. A positive protein (red precipitate) indicates the presence of fibrin in the calculus.

(1) N-Nitric acid=6.3 ml of conc. HNO_3 diluted to 100 ml of H_2O

(2) Ammonium Oxalate solution=Approx. 4 gms. per 100 ml in H_2O

(3) 5 N-Ammonium hydroxide=28.6 ml of conce. ammonium diluted to 100 ml with water

(4) N-Acetic acid=6 ml of glacial acetic acid diluted to 100 ml with water

(5) Potassium phosphate solution=10 gm of KH_2PO_4 per 100 ml in water

(6) Ammonium molybdate solution=5 gm per 100 ml in water

- (7) Reducing agent=50mg. of ascorbic acid per 25 ml in water (freshly prepared).
- (8) Calcium Chloride solution=2.5 gm per 100 ml in Water.
- (9) 0.5 N Sulphuric acid=1.4 ml of Conc. H_2SO_4 diluted to 100 ml in Water.
- (10) N Potassium hydroxide=5.6 gm per 100 ml in water.
- (11) folin's uric acid reagent. (Phosphotungstic acid)
- (12) Sodium cyanide=5 gm per 100 ml in Water.
- (13) Sodium nitroprusside=A few crystals dissolved in water (freshly prepared).
- (14) Sodium carbonate=10 percent solution (W/V) of the anhydrous salt.
- (15) Nessler's reagent.
- (16) Millon reagent
- (17) Chloroform
- (18) Acetic anhydride.
- (19) Conc. H_2SO_4
- (20) Conc. HNO_3 .

Appendix-2

CHEMICAL ANALYSIS OF CALCULI

Serial No.	Name	Sex.	Age.	Site	Inorganic										Organic			
					Carbonate	Calcium	Magnesium	Phosphate	Oxalate	Ammonia	Uric Acid (Urates)	Cystine	Xanthine	Indigo	Fibrin	Cholesterol		
1.	JNM		39	Kidney	-	+	-	+	-	-	-	-	-	-	+	-	-	-
2.	PBM		22	"	-	+	-	+	+	-	-	-	-	-	-	-	-	-
3.	GKM		29	"	-	+	+	+	+	-	-	-	-	-	-	-	-	-
4.	IAM		36	"	-	+	-	-	+	-	-	-	-	-	-	-	-	-
5.	DBM		46	"	-	+	+	-	+	-	-	-	-	-	-	-	-	-
6.	CMM		65	"	-	+	-	-	+	-	+	-	-	-	-	-	-	-
7.	GDF		36	"	-	+	-	-	+	-	+	-	-	-	-	-	-	-
8.	SKM		20	"	-	+	-	+	-	-	+	-	-	-	-	-	-	-

Serial No.	Name	Sex.	Age	Site	Carbonate	Calcium	Magnesium	Phosphate	Oxalate	Ammonia	Uric Acid (Urates)	Cystine	Xanthine	Indigo	Fibrin	Cholesterol
9.	SKF		56	Kidney	-	+	-	+	+	-	-	-	-	-	-	-
10.	RPM		4	"	-	+	+	+	+	+	+	-	-	-	-	-
11.	BKF		34	"	-	+	-	+	+	-	-	-	-	-	-	-
12.	DDM		40	"	-	+	+	-	+	-	+	-	-	-	-	-
13.	KDF		23	"	-	+	-	-	+	-	+	-	-	-	-	-
14.	ADM		42	"	-	+	+	+	-	-	-	-	-	-	-	-
15.	YSM		35	"	-	+	-	+	-	-	-	-	-	-	-	-
16.	ANF		30	"	-	+	-	-	+	-	+	-	-	-	-	-
17.	TBM		41	"	-	+	-	+	+	-	-	-	+	-	-	-
18.	AKM		50	"	-	+	-	+	-	-	+	-	-	-	-	-
19.	MSM		29	"	-	+	-	-	+	-	-	-	-	-	-	-
20.	NKM		39	"	-	+	+	+	-	+	+	-	-	-	-	-
21.	MSM		26	Ureter	-	+	-	+	+	-	-	-	-	-	-	-
22.	RDSM		43	"	-	+	-	+	-	-	-	-	-	-	-	-
23.	SRM		26	"	-	+	-	+	+	-	+	-	-	-	-	-
24.	NDM		28	Bladder	-	+	-	-	+	-	-	-	-	-	-	-
25.	SKF		2½	"	-	+	-	+	+	+	-	-	-	-	-	-
26.	YRM		8	"	-	+	+	-	+	+	-	-	-	-	-	-
27.	SBM		1½	"	-	+	-	+	+	-	-	-	-	-	-	-
28.	SNM		8	"	-	+	-	+	+	-	-	-	+	-	-	-
29.	PBDM		22	"	-	+	-	+	+	-	+	-	-	-	-	-
30.	HKM		24	"	-	+	-	+	-	-	-	-	-	-	-	-
31.	KRM		2	"	-	+	-	+	+	+	+	-	-	-	-	-
32.	UMM		4	"	-	+	+	+	+	+	+	-	-	+	-	-
33.	KJM		7	"	-	+	+	+	+	+	-	-	-	-	-	-

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					Carbonate	Calcium	Magnesium	Phosphate	Oxalate	Ammonia	Uric Acid (Urates)	Cystine	Xanthin	Indigo	Fibrin	Cholesterol
34.	SDK M		14	Bladder	-	+	-	+	-	-	+	-	-	-	-	-
35.	DVM		2	"	-	+	-	+	-	-	+	-	-	-	-	-
36.	RSM		16	"	-	+	-	-	+	+	-	-	+	-	-	-
37.	1			"	-	+	-	+	+	-	-	-	-	-	-	-
38.	2			"	-	+	-	+	+	+	+	-	-	-	-	-
39.	3			"	-	+	-	-	+	+	+	-	-	-	-	-
40.	4			"	-	+	-	+	+	-	+	-	-	-	-	-
41.	5			"	-	+	+	+	+	+	+	-	-	-	-	-
42.	6			"	-	+	-	+	-	-	+	-	+	-	-	-
43.	7			"	-	+	-	+	+	+	+	-	-	-	-	-
44.	8			"	-	+	-	+	+	+	+	+	-	-	-	-
45.	9			"	-	+	-	+	+	+	+	-	-	-	-	-
46.	10			"	-	+	-	+	+	+	+	-	-	-	-	-
47.	11			"	-	+	-	+	-	-	+	-	-	-	-	-
48.	12			"	-	+	-	-	+	-	+	-	-	-	-	-
49.	13			"	-	+	-	+	-	-	+	-	-	-	-	-
50.	14			"	-	+	-	-	+	+	+	-	-	-	-	-
51.	15			"	-	+	-	+	-	+	+	-	-	-	-	-
52.	16			"	-	+	+	+	+	+	+	-	-	-	-	-
53.	17			"	-	+	-	-	+	+	+	-	-	-	-	-
54.	18			"	-	+	-	+	-	+	+	-	-	-	-	-
55.	19			"	-	+	-	-	+	+	+	-	-	-	-	-
56.	20			"	-	+	-	-	+	+	+	-	-	-	-	-
57.	21			"	-	+	-	+	-	-	+	-	-	-	-	-

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					Carbonate	Calcium	Magnesium	Phosphate	Oxalate	Ammonia	Uric Acid (Urates)	Cystine	Xanthine	Indigo	Fibrin	Cholesterol
58.	22			Bladder	-	+	-	+	-	-	+	-	-	-	-	-
59.	23			"	-	+	+	-	+	+	+	-	-	-	-	-
60.	24			"	-	+	+	+	-	-	+	-	-	-	-	-
61.	25			"	-	+	+	+	+	-	+	-	-	-	-	-
62.	26			"	-	+	-	-	+	-	+	-	-	-	-	-
63.	27			"	-	+	+	+	-	-	+	-	-	-	-	-
64.	28			"	-	+	+	+	+	+	+	-	-	-	-	-
65.	29			"	-	+	-	-	+	+	+	-	-	-	-	-
66.	30			"	-	+	-	-	+	-	+	-	-	-	-	-
67.	31			"	-	+	-	+	-	-	+	-	-	-	-	-
68.	32			"	-	+	-	+	+	+	+	-	+	-	-	-
69.	33			"	-	+	+	-	+	-	+	-	-	-	-	-
70.	34			"	-	+	-	-	+	+	+	-	-	-	-	-
71.	35			"	-	+	-	-	+	+	+	-	-	-	-	-
72.	36			"	-	+	-	-	+	-	+	-	-	-	-	-
73.	37			"	-	+	-	+	+	+	+	-	-	-	-	-
74.	38			"	-	+	-	-	+	+	+	-	-	-	-	-
75.	39			"	-	+	-	+	-	-	+	-	-	-	-	-
76.	40			"	-	+	-	-	+	+	+	-	-	-	-	-
77.	41			"	-	+	-	+	-	-	+	+	-	-	-	-
78.	42			"	-	+	-	-	+	-	-	-	-	-	-	-
79.	43			"	-	+	-	+	-	+	+	-	-	-	-	-
80.	44			"	-	+	-	-	+	+	+	-	-	-	-	-
81.	45			"	-	+	+	+	-	+	+	-	-	-	-	-

CHEMICAL ANALYSIS OF CALCULI

Serial No.	Name	Sex.	Age.	Site	Inorganic						Organic					
					Carbonate	Calcium	Magnesium	Phosphate	Oxalate	Ammonia	Uric Acid (Urat)	Cystine	Xanthine	Indigo	Fibrin	Cholesterol
82.	46			Bladder	-	+	+	+	-	-	+	-	-	-	-	-
83.	47			"	-	+	-	-	+	+	+	-	-	-	-	-
84.	48			"	-	+	-	-	+	+	+	-	-	-	-	-
85.	49			"	-	+	-	+	+	+	+	-	-	-	-	-
86.	50			"	-	+	-	+	-	-	+	-	-	-	-	-
87.	51			"	-	+	-	-	+	+	+	-	-	-	-	-
88.	52			"	-	+	-	+	-	-	+	-	-	-	-	-
89.	53			"	-	+	+	-	+	+	+	-	-	-	-	-
90.	54			"	-	+	-	+	-	+	+	-	-	-	-	-
91.	55			"	-	+	+	-	+	+	+	-	-	-	-	-
92.	56			"	-	+	-	-	+	+	+	-	+	-	-	-
93.	57			"	-	+	+	-	+	+	+	-	-	-	-	-
94.	58			"	-	+	+	+	+	+	+	-	-	-	-	-
95.	59			"	-	+	-	+	+	-	+	-	-	-	-	-
96.	60			"	-	+	+	-	+	+	+	-	-	-	-	-
97.	61			"	-	+	+	+	-	-	+	-	-	-	-	-
98.	62			"	-	+	-	+	-	-	+	-	-	-	-	-
99.	63			"	-	+	-	+	+	+	+	-	-	-	-	-
100.	64			"	-	+	+	+	+	+	+	+	-	-	-	-
101.	65			"	-	+	+	-	+	+	+	-	-	-	-	-
102.	66			"	-	+	+	+	+	-	+	-	-	-	-	-
103.	67			"	-	+	-	-	+	-	+	-	-	-	-	-
104.	68			"	-	+	+	+	-	-	+	-	-	-	-	-
105.	69			"	-	+	-	-	+	-	+	-	-	-	-	-

CHEMICAL ANALYSIS OF CALCUTI

Name	Sex.	Age	Site	Inorganic						Organic					
				Carbonate	Calcium	Magnesium	Phosphate	Oxalate	Ammonia	Uric Acid (Urates)	Cystine	Xanthine	Indigo	Fibrin	Cholesterol
70			Bladder	-	+	-	+	+	+	+	-	-	-	-	-
71			"	-	+	-	-	+	-	+	-	-	-	-	-
72			"	-	+	+	+	-	-	+	-	-	-	-	-
73			"	-	+	-	-	+	-	+	-	-	-	-	-
74			"	-	+	-	+	+	-	+	-	-	-	-	-
75			"	-	+	+	+	-	+	+	-	-	-	-	-
76			"	-	+	-	+	+	+	+	-	-	-	-	-
77			"	-	+	+	+	+	+	+	-	-	-	-	-
78			"	-	+	-	+	+	-	+	-	-	-	-	-
79			"	-	+	-	+	+	+	+	-	-	-	-	-
80			"	-	+	+	+	+	+	+	-	-	-	-	-
81			"	-	+	+	-	+	-	+	-	-	-	-	-
82			"	-	+	+	-	+	-	+	-	-	-	-	-
83			"	-	+	+	+	+	+	+	-	-	-	-	-

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