SUMMARY AND CONCLUSIONS

Urolith formation is not a specific disease but the sequela to a group of many disorders. The urinary systems designed to disposed off wastes in liquid form. However, during urolith formation sustained alterations in urine composition promotes over saturation of one or more substances eliminated in urine and resulted in their precipitation and subsequent growth. The fact that the urolith formation is erratic and unpredictable emphasized phenomenon; several interrelated pathologic and physiological factors are oftenly involved i.e. evil urine, imbalance of calculi preventing substances within body and hard water. Therefore, detection of urolithiasis is only the beginning of the diagnostic process. Essential to urolith eradication and prevention is identification of disease and risk factors under laying crystal formation, retention and growth.

The cases of canine urolithiasis have been treated with variable rates of success. Major problems associated with the surgical removal of calculi include post operative uremia and difficulty in removing the calculi from ureter. Renal calculi analysis has been extensively studied and calcium oxalate urinary calculi were found to be predominant. Calcium is a threshold substance and the serum calcium level are regulated by parathyroid, hypercalciurea and hyperparathyroidism appears to be interrelated disease, but do not appear to be taken into consideration while evaluating the causes of urolithiasis. Therefore, it was contemplated to study partial and complete urethral obstruction with special reference to parathyroid hormone in canine.

The investigation was carried out at Nagpur Veterinary College Hospital, North Ambazari Road, Nagpur during the period from 1-1-2004 to 31-12-2006. Clinical cases of canine suffering with partial or complete urethral obstruction were included in study. Dogs of either sexes belonging to different age groups, localities and breeds were considered for studies. A total of 29 dogs of either sexes suffering with partial and complete urethral obstruction were recorded. These animals were randomly divided into two groups. Group I was consisting of ten clinically normal dogs, while group II A was consisted 14 dogs of either sexes for partial urethral obstruction and group II B consisted of 15 dogs of either sexes for complete urethral obstruction.
During the course of investigation various estimations on urine and blood were scheduled on the day of operation and 7th and 21st day after operation. To determine the base values of different biochemical and urine analyzing samples from 10 healthy and clinically normal dogs were estimated.

Incidence:

During present investigation, the incidence of urethral obstruction recorded in the year 2004 was 5.94% followed by 3.28% and 1.88%, respectively in the year 2005 and 2006. The average percentage of three years was 3.57% among the surgical cases. The more number of cases of urinary calculosis were recorded in the month of April i.e. 26.19%.

Breed:

The maximum number of cases has been recorded in nondescript breeds (28.57%) of dogs followed by German shepherd and Pomeranian (19%), Doberman (16.66%), Cocker Spaniel (4.76%), Boxer, Spitz, Lhasa Apso, Labrador and Dalmatian (2.38%). The incidence of urinary calculosis in male dogs was 92.85%, whereas in female it was 7.15%.

The mean age of obstruction in nondescript dogs was 6.25±0.75 years, in German shepherd 6.69±1.17 and in Pomeranian mean age was 6.75±1.05 year.

Paratharmone:

The level of paratharmone in all the animals of respective group was found within the normal range. There was no significant deviation amongst base value as well as at scheduled interval.

Blood urea nitrogen (BUN):

The blood urea nitrogen level in the animals of control group i.e. group I was found within normal physiological range, whereas it was on higher side on day '0' in the animals of group II A. The level was 110.35±28.61 mg/dl and on 7th and 21st day, the level was 58.81±10.88 and 27.81±2.83 mg/dl, respectively. The increase in BUN level in partial urethral obstruction was found statistically highly significant and it reached to normal physiological limit on day 21st.
In the animals of group II B, the BUN level on '0' day was 118.32±21.71 mg/dl, however on 7th and 21st day it was 65.08±12.38 and 22.34±2.19 mg/dl, respectively which was found statistically highly significant.

Creatinine:

The value of serum creatinine in the animals of control group was within normal physiological limit, whereas in the animals of group II A, the serum creatinine level on '0' day was 3.24±0.61 mg/dl. On day 7th and 21st, the values were 2.01±0.38 and 0.99±0.07 mg/dl, respectively which were statistically highly significant.

Serum creatinine value in animals of group II B revealed increased creatinine level i.e. 3.24±0.61 on day '0' and on 7th and 21st day it was 2.01±0.38 and 0.99±0.07 mg/dl, respectively. This rise in creatinine level in the animals of complete urethral obstruction was statistically highly significant.

The values of serum calcium, alkaline phosphate, magnesium and phosphorus were found within normal physiological limit in all the groups of animals.

Urine analysis:

Colour:

The colour of urine was observed normal in control group. In the animals of group II A, the urine colour varies from slight yellow to reddish on day '0'. On 7th day 35.71% animals exhibited normal urine colour and on 21st day of experiment all patients except one have normal urine colour. In group II B animals, the colour of urine ranged between yellow to red and it becomes normal on 21st day of observation.

Urine pH:

pH of urine in all the animals at different period of observations were within the normal physiological limit and no significant differences were observed between groups within days as well as between days within groups.

Albumin:

The albumin was noticed in all urine samples on '0' day in group II A and group II B, while it was not observed only in 40% of animals of control group. No
traces of albumin was noticed on 7th and 21st day in control group, while it was not observed in group II A and group II B during the similar period of observation.

Crystals in urine:

In animals of group II A and group II B, the crystals/grids in their urine were 85.71% and 46.67% respectively on '0' day, while no crystals/grids were observed in control group.

Subsequently no crystals/grids were observed on 7th and 21st day in all the groups.

Sugar in urine:

During the period of observations no sugar was present in all the urine samples of all animals of three treatment groups.

Epithelial cells:

The epithelial cells were noticed in 20% and 92.86% animals, respectively in control and group II A in patients urine on '0' day, whereas as it was observed on 7th day in group II B. No epithelial cells were observed on 7th, 21st day and 21st day in animals of control group I, group II A and group II B, respectively.

RBC's in urine:

The percentage of animals having RBC in their urine on '0' day were 28.57% and 66.67%, respectively in animals of group II A and group II B, whereas the RBC's were not noticed on 7th and 21st day in all the groups.

Bacteria in urine:

Bacteria were present in group II A and group II B on '0' day in the urine sample. Percentage of bacteria was reduced to 21.43% and 13.33% in dogs of group II A and group II B, respectively and on the 21st day all the urine samples were free from bacteria.

Number of urinary calculus:

The cumulative average stone weight per animal was noticed as 15.93±8.33 and 14.28±9.29 g in group II A and group II B, respectively. The average number of stones recovered from urinary tract were 99.5 and 179.0 in the animals of group II A and group II B, respectively.
Physiological analysis of drinking water:

pH:

No significant difference between the groups for the average pH of drinking water was noticed in all the three groups.

Total hardness:

The level of calcium carbonate was found to be increased in drinking water of dogs of group II B, which was highly significant.

Calcium:

The elevated level of calcium in the drinking water of dogs of group II B was statistically highly significant.

The level of magnesium, copper, fluoride, selenium, manganese and iron in drinking water of all the groups were not significant.

Chloride:

The average chloride content in drinking water of group II A and group II B showed significant difference between the groups.

Sulphate:

A highest sulphate content of drinking water was observed in group II B followed by lowest level in group II A and group I.

Antibiotic sensitivity test:

The Gram positive cocci organisms in group I were sensitive to ampicillin, amoxicillin, gentamycin and norfloxacin on day '0', whereas in group II A, all the samples were sensitive to antibiotics. The average AST of urine ranged between 0.57±0.22 for cephalexin to 2.50±0.45 for ampicillin on '0' day, while the AST ranged between 0.50±0.27 for Amoxicillin to 2.25±0.34 for enrofloxacin on 7th day in group II A. In group II B, all the samples were sensitive for almost all antibiotics on '0' day. The AST was noticed as 0.67±0.27 in amoxicillin to 2.33±0.46 in ampicillin on day '0'. The maximum sensitivity was noticed for enrofloxacin, gentamycin and norfloxacin.
XRD (X-ray diffraction of urolith):

X-ray powder diffraction of urinary calculi revealed presence of different ingredients found in the samples of 1 to 10. The major constituent was struvite i.e. magnesium ammonium phosphate hydrate.

Radiographic study:

The radiographic study revealed partial urethral obstruction and complete urethral obstruction in male and females with presence of urinary calculi in pelvic urethra in two cases. Post scrotal urethra with single or multiple calculi in three cases and complete urethra lodges with gravel in 10 cases, whereas the cystic calculi were present in three cases of female.

Ultrasonography:

Advanced method of diagnosis by using ultrasonography of abdomen and penis revealed hyperechoic shadow of cystic calculi in female as well the calculi in the urethra of male.

Symptomology:

The unique symptoms exhibited by the animals during partial urethral obstruction were dehydration, sunken of eyeball and rough body coat and expulsion of few drops of urine. The cases of partial urethral obstruction were diagnosed on the basis of clinical signs, radiography and ultrasonography. The catheterization of urethra was made through external urethral meatus by displacing obstructed calculi and established free flow of urine.

Premedication:

In case of complete urethral obstruction, the symptoms were more or less similar with that of partial urethral obstruction. Anuria and distention of abdomen were predominant in complete urethral obstructions. Catheterization of urethra was accomplished under the influence of non-narcotic sedative i.e. Xylazine at the dose rate of 1 mg/kg body weight, while urethrotomy and cystotomy in dogs were carried out under premedication with xylazine and later on under dissociative anaesthesia with Ketamine @ 2 mg/kg body weight and Dizepam @ 0.5 mg/kg body weight.
Cystotomy:

Repair of urethra was accomplished by using 4-0 chromic catgut with simple continuous sutures and penile muscles were repaired by employing simple interrupted sutures using 1-0 chromic catgut.

Surgical wound of the urinary bladder was repaired by employing simple continuous suture followed by interrupted suture with 3-0 chromic catgut was found promising.

CONCLUSIONS:

On the basis of results of present study, following conclusions were drawn.

During the course of study of 3 years i.e. from 1-1-2004 to 31-12-2006, the average percentage of urolithiasis was 3.57% in canine and it was observed to be highest i.e. 26.19% during summer season.

The incidence was observed to be more in nondescript breeds of dog followed by in German shepherd, Pomeranian and Doberman with a mean age of 6.25±0.75, 6.69±1.17 and 6.75±1.05 years, respectively.

Male dogs were more susceptible (92.85%) for urolithiasis than females (7.15%).

Clinical cases of urethral obstruction and cystolith revealed the level of parathormone within normal limit, still the canine suffered from urolithiasis.

Different factors are found involved in urinary calculosis i.e. urinary tract infection, urine pH, type of urine crystals, season, age of animals and hard water from different geographical areas showed possible correlation.

X-ray diffractometry was found useful technique for identification of morphological and chemical structure of the calculi. Very small quantity of the calculus was sufficient for this test, which gives complete details of the chemical structure of the calculus.

Partial/complete urethral obstruction in canines showed systemic changes elevated blood urea nitrogen level, creatinine level and returned to normal after establishment of free flow of urine. Prognosis of the animal was found favourable if obstruction is removed successfully.
Diagnosis of the clinical cases of partial/complete urethral obstruction in males or presence of cystic calculi in male and female could be ascertained either by plain radiography or ultrasonography.

Radiography and ultrasonography of the animals suffering with partial or complete urethral obstruction helped to determine the size of calculi, its number, site of lodgment and shape of calculi.

Easy catheterization of urethra in male dog could be easily accomplished under xylazine sedation and surface analgesia of urethra.

Successful retrieval of obstructing calculi was carried out under the influence of dissociative anaesthesia.

Successful suturing of the urethral wound was carried out with 4-0 chromic catgut using simple continuous sutures.

Cystotomy wound was successfully repaired in two layers using 3-0 chromic catgut.

Post operatively fluids, antibiotics and analgesic were found important to obtained satisfactory recovery.

Biochemical analysis of blood in respect of serum calcium, alkaline phosphatase, phosphorus and magnesium levels were not altered in the cases of urethral obstruction in canine.

The urine sample of dogs of group II A and group II B were positive for albumin on day '0' and after establishment of free flow of urine was found negative.

The calculogenesis, a complex phenomenon invariably occurred in urine reservoir follow a nidus theory. Presence of exfoliated cells, prevalent bacterial infection and altered urine pH due to stagnation of urine together seemed to favour the development of nidus.