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CLINICAL AND LABORATORY STUDIES ON RUPTURED URINARY BLADDER AND URETHRA AS A SEQUELLAE TO OBSTRUCTIVE UROLITHIASIS IN FATTENING CALVES.

(With 9 Tables and 3 Figures)

By

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دراسات إكلينيكية و معملية عن تمزق المثانة البولية وقناة مجرى البول نتيجة
انسدادهما بالحصوات البولية فى عجول التسمين

على صديق ، عرفات صادق ، نبيل عيسى ، فتحى عثمان

تناولت الدراسة الفحص الإكلينيكي والمعملى لعدد ٤٢ من عجول التسمين (البقرى والجاموسى) تراوحت أعمارها ما بين ٨-٢٤ شهرا . اختيرت هذه الحيوانات من مناطق مختلفة (محطات التسمين الحكومية، المزارع الصغيرة للفلاحين ، العيادات البيطرية والمجازر الحكومية) كان من بين هذه الحيوانات عدد ٢٢ حيوان تعانى من الانسداد البولى وانفجار المثانة البولية ، بينما تم اختيار عدد ٢٠ عجل تسمين (جاموسى وبقرى) سليمة إكلينيكية و أخذت كمجموعة ضابطة. أوضحت الدراسة الإكلينيكية والمعملية الآتى:

- (أولاً) الصورة الإكلينيكية: لوحظ أن عجول التسمين التى كانت تعانى من الانسداد البولى لفترات طويلة (٢ - ٣ أيام) والمسبب بالحصوات البولية ، كانت أهم الأعراض الإكلينيكية بهاعبارة عن اختفاء أعراض المغص الكلوى الحاد واختفاء ظهور البول تماما بسبب الانسداد الكامل لمجرى البول وتراجع البول فى المثانة والحوالب والكلى وأخيرا انفجار المثانة أو قناة مجرى البول . كما شوهد انتفاخات فى الجزء السفلى على جانبي البطن عند منطقة الخصيتين والتي ما تلبث أن تتلون باللون الأحمر المزرق وظهور رائحة الأمونيا مع تنفس الحيوان فى بعض الحالات .
- (ثانياً) تحليل البول : أوضح الفحص الظاهرى والكيميائى للبول عكارة شديدة وتغير فى لون البول الى اللون الداكن وزيادة فى الكثافة النوعية للبول وظهور بروتينات فى البول. هذا وقد أوضح الفحص الميكروسكوبى للبول زيادة فى كميات البلورات الغير ذاتيه وأهمها بلورات

الفوسفات الثلاثية ، كربونات الكالسيوم والاكسالات . كما أوضح الفحص أيضا زيادة فى كريات الدم الحمراء والخلايا الصديدية .

• (ثالثاً) فحص سيرم الدم: أوضح الفحص الكيمياءى لسيرم الدم زيادة معنوية جدا فى مستويات البولينا (اليوريا) والكرياتينين والفوسفور وزيادة معنوية فى الكالسيوم والمغنسيوم وأنزيم الألكالين فوسفاتيز مع نقص معنوى فى مستوى كلوريد مصل الدم. كما لم تكن هناك تغيرات فى مستويات فيتامينات أ ، هـ وكذلك أنزيمات الالانين أمينو ترانسفيريز والأسبرتات أمينو ترانسفيريز والكولستيرول ودهون الثلاثية وبروتينات الدم .

• (رابعاً) الفحص الدموى: أوضح الفحص الدموى زيادة معنوية فى العدد الكلى لكرات الدم البيضاء والخلايا المتعادلة وكذلك حجم الكريات المصمت (PCV).

وفى النهاية يمكن القول أن حصوات المجارى البولية ومضاعفاتها مثل انفجار المثانة البولية وقناة مجرى البول- تمثل مشكلة حقلية ، طبية وعلاجية وتعود بالخسارة على الناتج الاقتصادى لعملية التسمين وربما يرجع السبب الى التغذية المكثفة على العلائق المركزة التى تحتوى على عناصر غذائية غير متزنة تساعد على تكوين الحصوات. وقد أوضحت الدراسة أن كثير من حصوات الجهاز البولى خاصة تلك التى توجد فى الكلى أو المثانة يمكن اكتشافها فقط فى المجازر وربما لاتحدث أى أعراض إكلينيكية . وتعتمد فى كشفها وتشخيصها على الفحص الإكلينيكي للحيوان وفحص البول.

SUMMARY

The present study involved clinical and laboratory investigations of 42 fattening cattle and buffalo-calves, 8-24 months old and belonged to fattening stations, small private farms, veterinary clinics and abattoirs. 22 out of them were suffering from ruptured urinary bladder and/or urethra and the rest of 20 were clinically healthy and kept as control. The present study declared that long standing obstruction of urinary passages (2-3 days) especially when the stones were lodged in penile urethra resulted in complete retention of urine, and may precedes to urethral or urinary bladder rupture. Disappearance of colicky pain and other signs of obstructive urolithiasis, followed by bilateral swelling on the ventral abdomen, near the root of the penis and around the scrotum were the main signs observed in ruptured bladder and / or urethra. Reddish or bluish discolouration of the infiltrated areas and ammoniacal breath with lethargy, depression, weakness were also the main consequent symptoms. Puncture of the lower abdomen revealed passage of urine from the peritoneal cavity. Rectal examination confirmed the diagnosis, where the bladder was empty with flabby wall.

The obtained urine were mainly dark yellow, turbid with increased specific gravity. Urine sediments were composed mainly of crystals of triple and amorphous phosphates, calcium-oxalates and calcium carbonate with

increased amounts of pus and red cells. Significant increase in the levels of blood serum urea, creatinine, phosphorus, calcium and magnesium were noted, however blood serum chloride was significantly decreased. Insignificant difference were recorded in blood serum levels of vitamin A, vitamin E, AST, ALT, total lipid, cholesterol and triglyceride. Significant increase of PCV, total leucocytic count and neutrophils were markedly seen. The blood serum protein pattern showed only slight insignificant changes. Isolated bacteria were mainly *E. Coli* and *Staphylococci*. Stone analysis revealed that struvite (magnesium, ammonium phosphate) uroliths were found pure in 4 cases and in association with traces of calcium carbonate in 2 cases, while ammonium silicates, oxalate and little phosphates were found in two cases. Finally the study declared that urolithiasis with its subsequent complications such as urinary bladder and /or urethral rupture come in the first line among the common urinary tract disorders in fattening calves and contribute to a serious managemental, medical and economical hazards for beef industry.

Keywords: *Calves, ruptured bladder, urolithiasis.*

INTRODUCTION

Ruptured bladder and urethra occur most commonly in castrated male ruminants, because of urethral obstruction with stones and is characterised clinically by anuria, weakness, lethargy, tachycardia, ammoniacal breath, dehydration, ruminal atony and anorexia (Smith, 1990). Furthermore bilateral swelling in the lower abdomen and ballotment of abdominal fluid were usually noticed. It is often difficult to decide whether the bladder was ruptured or not, but paracentesis, 4-5 cm to the right of the midline posterior of the umbilicus usually yield copious amounts of urine (Itaya, 1981; Donecker and Bellamy, 1982). The resulting syndrome of uraemia may take 1-2 weeks to develop to the point where euthanasia is obligatory (Radostits *et al.*, 1994). Diagnosis of uraemia in animals is based clinically on the presence of erosions, haemorrhages of the visible membranes, rupture of the urethra or bladder and inflammation of the kidney and is diagnosed in cattle mainly with meat inspection (Radostits *et al.*, 1994).

Urinary calculi or uroliths are general terms used to describe concretions formed in the urinary tract. The calculi are usually composed of salts of inorganic or organic acids or other material such as cystine or xanthine (Böll and Gründer, 1981). A number of factors can predispose to stone formation in the urinary tract, those which favour the development of nidus about which concretion can occur, those which facilitate precipitation of solutes on the nidus and finally those which favour concretions by cementing the precipitated salts to the developing calculus (Tsuchiya and Sato, 1988).

Calcium phosphate and carbonate, magnesium phosphate, oxalate and silicate were the mostly observed stones in the urinary bladder and renal pelvis in the slaughtered young fattening bulls (Rosomini *et al.*, 1988). However struvite stones (Magnesium ammonium phosphate) occurs in ruminants during fattening on concentrated rations, high in phosphorus (creal based feedlot rations). High urinary phosphates excretion due to feeding ration with low calcium/phosphorus ratio lead to concentration of urinary phosphate that predisposes to formation of urinary stones (Munakata *et al.*, 1974 and Smith, 1990). The relationship between minerals imbalance, vitamin A and D deficiencies, in addition to unsatisfactory condition of the drinking water supply were considered as factors involved in the occurrence of urolithiasis (Udall *et al.*, 1958 ; Weaver, 1963 ; Romanoviski, 1965 and Munakata *et al.*, 1974).

It was reported that the levels of serum sodium, chloride and calcium were decreased, however the levels of serum potassium, phosphorus, protein, blood urea and creatinine were increased in ruptured bladder and urethra (Smith *et al.*, 1983; Smith, 1990 and Carr *et al.*, 1993). The best indicator of viability available among clinical pathological tests was the serum phosphate level, where all animals with levels greater than 9.0 mg/dl died (Radostits *et al.*, 1994).

The present work aimed to describe the clinical signs associating urinary bladder and/or urethral rupture in fattening calves, to locate the causes of urethral obstruction in these animals and to study the biochemical and haematological changes occurred as a results of uroperitonium.

MATERIALS AND METHODS

1- Animals:

A total number of 42 fattening male calves, 8-24 months old were used in this study, 22 of them were showing signs of urinary bladder and / or

urethral rupture and the rest of 20 fattening calves were selected as healthy control group after clinical and laboratory examinations. These animals were selected from the small private fattening animals, governmental fattening stations as well as from slaughter houses in Assiut and Beni-Suef Governorates. History of dysuria, signs of colicky pain, discomfort, loss of appetite and urine retention were the main alarming signs of diseased cases (Table, 1).

Both healthy and diseased calves were examined clinically according to the methods described by Rosenberger, (1990). Special examination was oriented towards the urine and urinary tract. Observation of the act of urination, rectal palpation of left kidney, bladder and ureters were carried out. Paracentesis of the clinically suspected cases for recognition of urine was done. Post-slaughtering inspection of the affected cases to identify location and causes of ruptured bladder and urethra as well as other associated abnormalities was achieved.

II- Samples and adopted methods:

II.1: Urine Samples: Urine was aseptically drawn by means of a long sterile puncture needle from the lower abdomen for confirmation of ruptured bladder. Urine for analysis from these animals were drawn directly from the urine residue in the bladder after slaughtering. Routine urine analysis was carried out by means of Test Strip supplied by Boehringer-Manheim-GmbH- Diagnostica (tables 2 & 3). Examination of urine sediment was carried out microscopically (table 4) according to Coles, (1986). Bacteriological examination of urine sediment was carried out according to Carter, (1984).

II-2- Blood samples with anticoagulant: About 2-3 ml blood was collected through jugular vein puncture for estimation of PCV (%) total WBCs (G/l) and differential leucocytic count (%) according to the methods adopted in Coles, (1986).

II-3. Blood samples without anticoagulant: For the determination of blood serum levels of Na^+ , K^+ , CL^- , Ca, P, Mg, urea, creatinine, total protein, albumin, globulin, A/G ratio, vitamin A, vit. E., total lipids, cholesterol, triglycerides, AST, ALT and AP. Blood serum Na^+ , K^+ were determined by means of Flame Photometry-Corning 400. Blood serum Cl was determined by chloride meter- Corning-925. Blood serum Ca, P, Mg, urea, creatinine, total protein, albumin, globulin, A/G ratio, total lipids, cholesterol, triglycerides, AST, ALT and AP were determined colorometrically by means of a test-kits supplied by Biomerieux-France

according to the respective methods for each parameters. Serum vitamin A was estimated colourometry after the method of Carr and Price (1926). Vit. E. was determined colorometrically according to the method of Varley (1976).

II.4- Calculi: Position, size and shape of the calculi only from 8 different cases were described and sent for analysis. Chemical analysis was carried out by means of a chemical test-kits supplied by the Egyptian-American Company for Laboratory Services according to the enclosed scheme (table, 9).

III-Statistical analysis:

The obtained data were analysed for obtaining mean, S.D. , analysis of variance using a software computer program (SPSSWIN, 1995).

RESULTS

I- Clinical and post-mortem findings :

Fattening calves with obstructive urinary stones showed complete loss of appetite, they were reluctant to move with stiff gait and finally anuria. Depression, weakness and dehydration, swelling around the root of penis, the umbilicus, the inguinal and scrotal regions with cyanosis and bluish colouration especially around the scrotum were observed (tab. 1 & fig. 1 & 2). A dull thrill was auscultated over a distended left paralumber fossa and ammoniacal breath was noted. Urinary stones of variable sizes and shapes were located in the urethra just before the sigmoid flexure in all cases (22). Additionally, 3 small calculi were located in renal pelvis and 5 stones were located in ureters (fig. 3).

II- Laboratory findings:

Urine analysis: Physical, chemical, microscopical and bacteriological findings of the obtained urine are illustrated in table 2 , 3 & 4 . The results of biochemical and haematological examinations for the healthy and diseased cases are showed in tables (5 - 8). The results of stone analysis were showed in table 9.

DISCUSSION

Rupture of urinary bladder and / or urethra are the more common sequellae of obstructive urolithiasis in fattening calves (Donecker & Bellamy,

1982 and Sockett and Knight, 1984). Urolithiasis occurs in all species but it is of great economic importance in feeder steers being fed heavy concentrate rations and stock running in particular areas containing pasture plants with large quantities of oxalates, oestrogen or silica (Radostits *et al.*, 1994). The observed clinical signs in fattening calves suffering from ruptured bladder and/or urethra in consequence to urolithiasis were mostly similar to that of obstructive urolithiasis in addition to signs of azotaemia and uroperitoneum. Calves with uroliths associated with ruptured bladder showed anorexia, slow movement, swelling at the inguinal area and scrotal region which extended to the umbilicus with signs of oedema, and bluish colouration (Fig.1 & 2). Similar observations were reported by Oehme (1965) and Ahmed *et al.*, (1989).

The signs of colicky pain and restlessness which were observed in cases of urine retention were disappeared and replaced by lethargy and depression indicating that the pain caused by retention of urine in the bladder was alleviated due to urinary bladder or urethral rupture. Marked subcutaneous oedematous swelling near the root of penis, behind and around the scrotum, bilateral swelling of the ventral abdomen associated with a ping auscultated sound over the lower abdomen and anuria within 2-3 days after onset of signs were evident. Ammoniacal breath was detected by oral smelling. The obtained clinical findings were suggestive of ruptured bladder and confirmed by paracentesis of lower abdomen just behind and lateral to the umbilicus, that revealed a passage of a large amount of a yellowish fluid with the a physical and chemical characters of urine. Many similar reports regarding clinical signs of ruptured bladder and urethra in cattle were previously recorded by many authors (Donecker and Bellamy, 1982; Sockett and Knight, 1984; Sockett *et al.*, 1986 and Tsuchiya and Sato, 1988).

Post slaughtering findings of calves with ruptured bladder and urethra were confined mainly in oedema of subcutaneous tissues and accumulation of urine in the abdominal cavity. Congestion, haemorrhage and erosions were markedly noted on the mucosae of urinary bladder, urethra and peritoneum with slight renal enlargement which could be attributed to the presence of stones and uraemia. Our findings were closely similar to those described in cases of artificial rupture of urinary bladder (Sockett *et al.*, 1986 and Tsuchiya and Sato, 1990).

The obtained urine samples were mainly dark yellow in colour, turbid with increased specific gravity (Table 2). Urine sediments were composed mainly of crystals of triple and amorphous phosphates, calcium-oxalates and

calcium carbonate with increased amounts of pus and red cells (table, 4). These findings were similar to those obtained by many authors (Cornelius, et al., 1959; Munakata et al., 1974; Khamis and Saleh (1970); Smith et al., 1983 and Roussel and Ward, (1985).

Increased blood urea and creatinine (Table 6) were a rational and expected results of azotaemia and retained urine (Ward, 1966; Donecker & Bellamy, 1982; Smith et al., 1983 and Sockett et al., 1986). Blood serum phosphorus (P) in this investigation in urolithiatic calves with ruptured bladder were found to be significantly ($P < 0.001$) increased (Table 7). It could be difficult to determine which factors are affecting blood serum P level, but it may be attributed to retention of P and/or resorption of it from uroperitoneum. A similar increase of serum P in cases of obstructive urolithiasis and ruptured bladder in cattle were previously reported by many authors (Donecker & Bellamy, 1982; Smith et al., 1983 and Sockett et al., 1986; Roussel and Ward, 1985 and Carr et al., 1993). Increased serum calcium and magnesium in fattening calves suffering from urolithiasis and ruptured bladder may be attributed to the increased feed intake of ration rich in minerals that predisposed to urinary stones. These findings agreed with Ahmed et al., (1989). Variable insignificant changes in blood serum sodium and potassium levels were reported in calves suffering from urolithiasis and cystorrhexis. Similar results were previously obtained by Ward, (1966) and Smith et al., (1983).

Insignificant changes were obtained in blood serum levels of vitamin A, vitamin E, AST, ALT, total lipid, cholesterol and triglyceride in fattening calves suffering from ruptured bladder and urethra when compared with control group (Table, 8). The significant increase ($P < 0.05$) of PCV in fattening calves with ruptured bladder and / or urethra (Table, 5) may indicate the dehydration state of uraemic animals, that was similar to the previously obtained data by Tsuchiya and Sato, (1988). The recorded significant increase ($P < 0.01$) in the total leucocytic count and neutrophils (leucocytosis and neutrophilia Table, 5) may be attributed to the traumatic inflammation of urinary tract caused by urinary stones (Radostits et al., 1994). The blood serum protein pattern showed only slight insignificant changes (Table, 6).

The bacterial isolates from the urinary sediments and/or the obtained swabs of ruptured bladder and urethra at the site of rupture (Table, 4) were mainly *E. Coli* (12 cases) and *Staphylococci* (4 cases) and could be attributed partly to the local inflammation induced by the trauma of the

present stones that enhance bacterial overgrowth and multiplication or due to stagnation of urine in urinary bladder and urethra for a long period that stimulate bacterial infection which was supported by leucocytosis (Smith, 1990 and Radostits *et al.*, 1994).

The analysis of urinary stones collected from 8 animals revealed that struvite (magnesium, ammonium phosphate) uroliths were found pure in 4 cases and in association with traces of calcium carbonate in 2 cases. Ammonium silicates, oxalate and little phosphates were found in two cases. (Table, 9). The results of stone analysis go parallel with the results of urinary sediment examination (Smith, 1990 and Radostits *et al.*, 1994).

Finally the study declared that urolithiasis with its subsequent complications such as urinary bladder and /or urethral rupture come in the first line among the common urinary tract disorders in fattening calves and contribute to a serious managemental, medical and economical hazards for beef industry. These disorders may be attributed to feeding of fattening calves with unbalanced diet containing higher amount of phosphorus. The study declared also that most of urinary stones that present in renal pelvis or bladder may pass unnoticed and discovered only in slaughter houses.

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Table 1: Clinical findings in fattening calves with ruptured bladder and / or urethra as well as healthy ones.

Clinical status	Animals	Main clinical signs	Post mortem findings
Ruptured bladder and / or urethra (No. = 22)	Buffaloes (12) & Cattle (10)	Anuria, Depression, weakness, vomiting in several cases, absence of colicky signs. constipation, dehydration, distension of lower abdomen urinefrous breath odour, Ballatoment of abdominal fluid. Passage of urine like fluid with exploratory puncture.	Flattened empty bladder, many stones in the penile urethra found just above sigmoid flexture. Large amounts of urine in the peritoneal cavity.
Clinically healthy (No. = 20)	Buffaloes (11) cattle (9)	Clinically healthy, No special findings	No special findings in the 20 slaughtered cases.

Table 2: Physical examination of urine samples from fattening calves suffering from ruptured bladder and /or urethra as well as healthy ones.

Clinical status	Animals	Specific gravity	Color	Aspect	Odour	Deposit
Ruptured bladder and / or urethra (No. = 22)	Buffaloes (12) & Cattle (10)	1.026-1.034	Yellow Dark yellow Brownish yellow in 2 cases	Cloudy turbid urine	Ammoniacal fruity	Little whitish mucoid sediment in all cases
Clinically healthy (No. = 20)	Buffaloes (11) cattle (9)	1.010-1.020	Amber yellow	Clear, slightly hazy	Urinefrous	No sediment.

Table 3: Chemical examination of urine samples from fattening calves suffering from ruptured bladder and /or urethra as well as healthy ones.

Clinical status	Animals	pH	Protein	Glucose	Bilirubin	Urobilinogn	Ketones	Nitrite
Ruptured bladder and/ or urethra (No. = 22)	Buffaloes (12) & Cattle (10)	7.0-8.5	Traces - (++)	Nil.	Nil.	Normal	Nil.	Nil.
Clinically healthy (No. = 20)	Buffaloes (11) cattle (9)	6.0 - 6.5	Nil - traces	Nil.	Nil.	Normal	Nil.	Nil.

Table 4: Microscopical and bacteriological examinations of urine sediment from fattening calves suffering from ruptured bladder and/or urethra as well as healthy ones.

Clinical status	Animals	RBCs. /HPF	Pus cells /HPF	Epithelial cells /HPF	Crystals / HPF	Casts / LPF	Isolated bacteria
Ruptured bladder and/or urethra (No = 22)	Buffaloes (12) & Cattle (10)	10-20	2-8	5-15	Triple & amorphous phosphate *** (14) Ca- carbonate + Ca-oxalate** + trace of phosphate (8).	Hayline & granular casts ^a (14) No casts (8)	Staph. spp. (4) E. Coli (12)
Clinically healthy (No = 20)	Buffaloes (11) & cattle (9).	0-4	0-5	1-4	Ca-oxalate ^c (4) Nil. (16)	No casts (16) Hayline casts ^a (4)	-

Little amounts **: Moderate amounts *** : Excess amounts ^a: (0 - 2 / HPF) ^b: (2- 4/ HPF) ^c: (more than 4 /HPF).

Table 5: Means, S.D. and ANOVA of Packed cell volume (PCV), Total and differential leucocytic count in fattening calves suffering from ruptured bladder and/or urethra as well as healthy ones.

Clinical status	Animals	Statistical analysis	PCV %	TWBCs G/l	Imm. %	Mature Neut. %	Lymph %	Monocyte %	Eosin. %
Ruptured bladder and/or urethra (No= 22)	Buffaloes (12) & Cattle (10)	Mean	40.19	11.39	5.363	48.19	41.00	2.454	2.89
		S.D ANOVA	5.85 ↑*	2.89 ↑***	2.03 ↑***	11.565 ↑**	11.49 n.s.	1.213 n.s.	1.48 n.s.
Clinically healthy (No. = 20)	Buffaloes (11) & cattle (9).	Mean	36	7.53	2.65	38.25	48.8	4.90	4.85
		S.D	4.63	1.85	1.292	8.325	7.26	1.63	1.93

S.D. : Standard deviation ANOVA: Analysis of Variance ↑: Increase * : P<0.05 ** : P<0.01 ***: P<0.001
The number between brackets indicate the number of diseased conditions.

Table 6: Means, S.D. and ANOVA of blood serum urea, creatinine, total protein, albumin, globulin and A/G ratio in fattening calves suffering from ruptured bladder and /or urethra as well as healthy ones.

Clinical status	Animals	Statistical analysis	Urea mmol/l	Creatinine umol/l	T. protein gm/dl	Albumin gm/dl	Globulin gm/dl	A/G
Ruptured bladder and / or urethra (No= 22)	Buffaloes (12) & Cattle (10)	Mean	58.597	509.45	73.93	32.77	41.16	0.782
		S.D	13.048	87.60	10.46	4.85	8.67	0.22
		ANOVA	↑***	↑***	n.s.	n.s.	n.s.	↑*
Clinically healthy (No.= 20)	Buffaloes (11) cattle (9)	Mean	13.52	152.88	74.57	30.40	45.14	0.753
		S.D	8.35	38.43	11.35	5.814	12.087	0.254

Table 7: Means, S.D. and ANOVA of blood serum calcium (Ca), phosphorus (P), Magnesium (Mg), Sodium (Na), Potassium (K) and chloride (Cl) in calves suffering from ruptured bladder and /or urethra as well as healthy ones.

Clinical status	Animals	Statistical analysis	Ca mmol/l	P mmol/l	Mg mmol/l	Na mmol/l	K mmol/l	Cl mmol/l
Ruptured bladder and / or urethra No= 22	Buffaloes (12) & Cattle (10)	Mean	6.40	19.921	4.03	132.509	4.209	73.25
		S.D	2.85	6.95	2.99	8.871	0.94	10.43
		ANOVA	↑**	↑***	↑**	n.s.	n.s.	↓**
Clinically healthy No.= 20	Buffaloes (11) cattle (9)	Mean	3.366	2.985	0.833	129.07	3.92	91.50
		S.D	0.81	1.63	0.494	13.83	1.47	9.6

S.D.: Standard deviation ANOVA: Analysis of Variance ↑: Increase **; P<0.01 ***: P<0.001
 n.s.: insignificant. The number between brackets indicate the number of diseased condition.

Table 8: Means, S.D. and ANOVA of blood serum vitamin A, Vitamin E, AST, ALT, AP, Total lipid, cholesterol and triglyceride in fattening calves suffering from ruptured bladder and / or urethra as well as healthy ones.

Clinical status	Animals	Stat. analysis	Vit. A ug/dl	Vit. E. ug/dl	AST U/l	ALT U/l	AP U/l	T. lipid g/l	Cholest. mg/dl	Triglyc. mg/dl
Ruptured bladder and / or urethra (No= 22)	Buffaloes (12) & Cattle (10)	Mean S.D. ANOVA	18.55 ± 6.79 n.s	374.8 ± 197.8 n.s	169.20 ± 40.3 n.s	45.2 ± 11.7 n.s	143.6 ± 42.6 ↑**	3.53 ± 1.13 n.s	149.47 ± 63.90 n.s	24.26 ± 9.86 n.s
Clinically healthy (No = 20)	Buffaloes (11) cattle (9)	Mean S.D.	17.25 ± 9.75	517.64 ± 212.1	148.9 ± 25.02	48.9 ± 9.8	91.01 ± 21.92	4.41 ± 1.67	136.07 ± 43.31	16.99 ± 6.09

S.D. : Standard deviation ANOVA: Analysis of Variance ↑ Increase **; P<0.01
n.s. : insignificant. The number between brackets indicate the number of diseased condition.

Table 9: Analysis of stones obtained from fattening calves suffered from ruptured bladder and /or urethra.

Physical Characters	Physical finding	Chemical components
Size	variable sized stones, 0.5-1.5 cm diameter	Struvite (magnesium, ammonium phosphate) uroliths were found pure in 4 cases.
Shape	variable oval, round, rossette, spinated	Struvite+ traces of calcium carbonate in 2 cases.
Color	Whitish milky, brown	Ammonium silicates, oxalate and little phosphates were found in two cases.
Texture	Weak fragile (2) Hard (6)	
Weight	Varies from few mg to 10gm	



Fig. 1: 18 months old calf suffering from urolithiasis with consequent ruptured urethra. Signs of bilateral swelling on the ventral abdomen extending forward and around the root of the penis. Lethergy and depression of the animal was also noted.



Fig. 2: 14 months old calf suffering from ruptured urethra. Urine leaks through the subcutaneous tissue around the root of the penis and scrotum with subsequent severe cellulitis.



Fig. 3: Urinary stones of different sizes and shapes were collected from fattening calves after slaughtering