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URETER IMPLANTATION FOLLOWING COMPLETE CYSTECTOMY IN DOGS (With 1 Table & 7 Figs.)

By

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دراسة تجريبية لزرع الحالب بعد الإزالة الكاملة للمثانة

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أجري هذا البحث لتقييم عملية زرع الحالبين بعد الإزالة الكاملة للمثانة في عدد (21) كلب طبيعى من الناحية الإكلينيكية . وقسمت الحيوانات الي ثلاث مجموعات حيث أجري زرع الحالبين في المجموعة الأولى بالمستقيم والمجموعة الثانية بالفأفي والمجموعة الثالثة تحت الجلد خارج القسم . وقد تم متابعة الحيوانات إكلينيكيًا وراديولوجيًا ومعمليًا وكذلك درست التغيرات التشريحية والهستوباثولوجية بعد إجراء العملية . ونقدت النتائج علي أن المجموعة الثالثة والتي زرع فيها الحالب تحت الجلد أعطت أفضل النتائج بالنسبة لإستمرار كفاءة الجهاز البولي في صورة طبيعية .

SUMMARY

The implantation of ureter was evaluated in 21 clinically healthy dogs. Urinary continence was maintained after surgery and the procedure was completed without technique errors except 3 dogs died within 7 days after surgery.

The dogs were classified into 3 groups (each of 7 dogs). In group (1), the implantation was performed into the colon (ureterosigmoidostomy) and in group (2), the implantation was done into the ileum (ureteroileosigmoidostomy) while in group (3), the implantation was performed subcutaneously (cutaneous ureterostomy) with induction of an external urinary fistula.

In all groups complete cystectomy was performed. Clinical, radiographic, post-mortum, histopathological examinations and biochemical analysis

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all were studied to confirm not only the most suitable technique for implantation of ureter but also the possible pathophysiological changes that accompany this operation. The best results for implantation with good functioning kidney and ureter after complete cystectomy was cutaneous ureterostomy with permanent external fistula.

INTRODUCTION

Urinary bladder is the most common site for neoplasia of the urinary tract in dogs as in human (STRAFUSS and DEAN, 1975; OSBORNE, et al. 1968; GILMORE, 1966 and COTCHIN, 1959). Traumatic rupture of the urinary bladder may occur with partial or total obstruction of urethra (OSBORNE, et al. 1968).

Once the bladder is indicated for removal there should be form of urinary diversion (WARWICK, 1969 and WALLACE, 1966). Ureterosigmoidostomy is the most convenient for patient, with bladder cancer of the poor prognosis. (WARWICK, 1976; ALTWEIN and HOHENFELLNER, 1975 and BLANDY, 1970).

Replacement of the urinary bladder with colon, ileum or ileocecal-colon provides daytime for urinary continence in man (LILJEN and CAMEY, 1984). Implantation of ureter into the colon allows complete excision of the urinary bladder, urethra and prostate with maintenance of urinary continence and offers a reasonable, without urinary problem, quality of life (STONE, et al. 1988; BRENDLER and STEPHENSON, 1981 and BAKKER, et al. 1970).

Variation in blood serum creatinine, blood urea nitrogen and chloride levels were studied by STONE, et al. (1988) in ureterosigmoidostomy in dog.

The purpose of this work is to evaluate the efficiency of the ureter implantation in colon (ureterosigmoidostomy), ileum (ureteroileosigmoidostomy) and subcutaneous (cutaneous ureterostomy) with external permanent fistula.

MATERIAL and METHODS

This work was carried out on 21 apparently healthy dogs of both sexes. The animals weight ranged from 10-15 kg while age range was between 1-5 years old. The dogs were divided into 3 groups, each of 7 dogs. The animals were fasted 24 hours before operation and premedicated with I/M injection of chlorpromazin Hcl (Neurazine) in a dose of 1 mg/kg b.wt. General anaesthesia was induced by I/V injection of pentothal sodium until complete disappearance of the main reflexes.

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Operative technique:

Labarotomy was made from right prepubic paramedian approach from the right side of the sheath of the penis, about 2 cm was made in males. The skin incision was made about 6 cm, up to the prepubic region and prepubic paramedian in bitches. The underlying aponeurosis of the oblique muscles and rectus abdominis muscle and peritoneum were incised.

Both ureters were resected from the surface of urinary bladder with very small patch without opening of the urinary bladder (seromuscular layer). This patch with ureter was then fixed to the site of anastomosis using Connel suture with chromic cat gut No. 3/0 in group (1 & 2) and using simple interrupted suture in group (3).

Cystectomy:

The urinary bladder was evacuated from the urine by gentle pressure and was completely removed as follows large artery forceps was applied at the neck of urinary bladder to make rough surface and for haemostasis. A ligature with chromic catgut No. 1 was ligated on this rough surface. Total excision of the urinary bladder was done in front of the ligature (O'CONNOR, 1982). In group (1) the ureter was implanted into the colon using end to side anastomosis (ureterosigmoidostomy), while in group (2) the implantation was performed into ileum (ureteroileosigmoidostomy) using end to side anastomosis, in group (3) where subcutaneous implantation was made with inducing permanent external urinary fistula (cutaneous ureterostomy).

The abdominal cavity was washed with sterile normal saline before its closure. A prophylactic dose of streptomycin sulphate was injected i/m in a dose of 20 mg/kg b.wt. for five successive days post-operatively. The skin sutures were removed 7 days following the operation.

Excretory urogram was made to detect the morphologic, tubular and the obstructive uropathy of the urinary tract. Urographin solution was i/v injected in a dose of 2 ml/kg b.wt. I/V. The radiographs were taken before the operation then immediately 5, 10, 15 and 45 minutes post injection of the contrast media.

Careful post mortem examination was done 2 and 3 weeks after operation. Specimens from the kidney, ureter and site of implantation were taken and fixed in 10% neutral buffer formalin. The materials were processed by the conventional techniques. Sections of 5 micron thick were obtained, stained with haematoxylin and eosin and examined microscopically.

Blood samples were taken from each dog at pre-operative and 7, 15 & 21 days post-implantation. Clear non-haemolysed sera were analysed for electrolytes, creatinine, urea nitrogen and phosphorus levels. Blood serum level of sodium and potassium was

estimated using flame-photometer (Corning 400). Meanwhile chloride level was estimated using Chloride Analyzer (model 925). Blood serum creatinine, B.U.N. and phosphorus levels were estimated using test kits supplied from Biomerieux (Bains & France) and after the methods of HAURY and NAUMANN (1965), HUSDAN and PAPOPORT (1968) and MORINL and PROX (1973) respectively.

Statistical analyses of the data was performed according to the methods of SNEDECOR and COCHRAN (1967).

RESULTS

Clinical findings:

All animals withstood the surgery except three dogs in group (1), died within 7 days from peritonitis. Watery faeces were observed in group (1 & 2). Escape of urine was easy without any straining. On the other side skin reactions at the site of the external fistula in group (3) were observed in the first week of operation but subsided with the application of topical anti inflammatory ointment (zinc oxide ointment).

Urographic observation:

Normal urograph (Fig. 1) revealed normal position of both kidneys, (right kidney is opposite to second lumbar vertebra and left one opposite to the first lumbar vertebra), normal renal pelvis (unipapillary) and six branch calyces. The course of ureter was anatomically accepted.

In group (1), the radiographic examination revealed that both kidneys were normal while the ureter was dilated two times than the normal. The descending colon was filled with the contrast media (Fig. 2).

In group (2), there was a marked enlargement of the renal pelvis, dilatation of the calyces with incompletely filled contrast media. The ureters were 3 times distended than normal (Fig. 3).

In group (3), the urograph revealed that both kidneys, renal pelvis, calyces and ureters were normal. Subcutaneous permanent fistula was clearly observed (Fig. 4).

Pathological signs:

In group (1), in which the ureters were implanted in the colon neither gross nor microscopic alterations could be detected other than dilatation in the ureteric lumen.

In group (2), in which the ureters were implanted in the ileum, 15 days after operation distinct dilatation of the ureters were marked in addition to fluid accumulation in the pelvis (Fig. 5).

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On histopathologic examination (21 days post operation) the kidney showed cystic like dilatation and the collecting tubules were moderately distended (Fig. 6). No changes could be detected at the kidney cortex.

In group (3), neither growth nor microscopic alteration could be seen in the urinary tract. Only slight chronic proliferative inflammatory reaction was seen around the external cutaneous fistula.

Biochemical findings:

Mean values of analyzed parameters are illustrated in (Table 1 & Fig. 7 a, b).

DISCUSSION

Ureteral diversion is an indicated technique, for providing effective drainage of the upper urinary tract with vesical dysfunction, in cases such as congenital defects severe bladder outflow obstruction, megacystis syndrome, dysplasia of the abdominal wall muscles (prune-belly syndrome) and severe refluxing megaloureters (ECKSTEIN and KAPILA, 1970 and ECKSTEIN, 1963).

LILEIN and CAMEY (1984); BRENDLER and STEPHENSON (1981) and GIL VERNAT (1960) mentioned that the ureteral diversion allows complete excision in case of urinary bladder, urethra and prostate malignancy with maintenance of urinary continence.

Cystectomy for control of bladder malignancy has been possible now days since the development of satisfactory operative procedures for urinary diversion (WOLINSKA, *et al.* 1977 and WHITMORE, 1979).

In the present work the three animals which died from peritonitis were substituted in the work and death was probably due to urine leakage. The dilatation of the ureter in the case of ureterosigmoidostomy was attributed to the presence of free reflux of the faecal contents (colon) to the kidneys. It is important to emphasize that this concept not differs from that maintained by STONE, *et al.* (1988); TANAGHO (1984) and SKINNER and RICHIE (1975).

The present study showed that the ureterocolonic anastomosis sites were patent. The kidneys were normal and the degree of ureteral dilatation was similar to that seen on the radiographs. The same findings were also mentioned by STONE, *et al.* (1988) and ECKSTEIN and SHAH (1974).

Ureteriliosigmoidostomy would act as a one way valve preventing the back flow of infected rectal contents into the ureter. Two weeks after operation distinct dilatation of the ureter was marked in addition to fluid and thus accumulation in the

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pelvis could be seen. 21 days post operation, no alteration could be detected. These results are in close agreement with that reported by STONE, et al. (1988); THOMSON (1988); JONES and HUNT (1983) and SKINNER and RICHIE (1979). While BELMAN (1976) stated that the most common post operative problem of any significance is abdominal distention from protracted paralytic ileus.

The investigation in group (3), (cutaneous ureterostomy) revealed no abnormalities in kidneys or ureters. The only defect of this technique was cleared in the presence of severe skin reactions at the external urinary fistula. The same data were recorded by WINTER (1972); BELMAN (1976) and WILLIAMS and RABINOWITZ (1967), the authors mentioned that such technique of implantation is inadvisable to bring the ureter to the skin at any level other than immediately below the ureteropelvic junction.

Biochemical findings of blood serum in all examined groups revealed that blood serum electrolytes, inorganic phosphorus and creatinine levels are within the normal values recorded by COLES (1986) and coincided with those previously obtained by STONE, et al. (1988). Meanwhile metabolic acidosis was evident in group 1 & 2 and this could be attributed to high normal or above normal serum chloride concentration. Such metabolic acidosis was probably initiated by the colonic absorption of hydrogen ion, or ammonium in conjunction with chloride ions (KOCH and McDOUGAL, 1985 and MADSEN, 1964). Blood serum urea nitrogen (B.U.N) values were highly significantly increased ($P < 0.01$) in groups 1 & 2. This can be attributed to increasing absorption of B.U.N. from intestine especially from colon (STONE, et al. 1988).

In conclusion, the subcutaneous implantation with external permanent fistula is considered the safe and rather convenient that method can be confirmed by the obtained biochemical, radiological and histopathological findings.

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LEGENDS

- Fig. 1: Dorsoventral urogram, showed normal position of right and left kidneys. Normal renal calyces (1) and normal ureter (2).
- Fig. 2: Lateral urogram revealed dilatation of ureter two times than normal (2), the seat of implantation (3) the colon was filled with contrast media (arrows).
- Fig. 3: Dorsoventral urogram, showed marked enlargement of the renal pelvis and dilatation of the calyces (1), the ureters were distended 3 times than normal (2).
- Fig. 4: Lateral urogram, showed normal kidney, renal pelvis (1), normal ureter and subcutaneous urinary fistula (3).
- Fig. 5: Kidney, showing dilatation of collecting tubules (H & E X 400).
- Fig. 6: Urinary system, showing dilatation of the ureters.

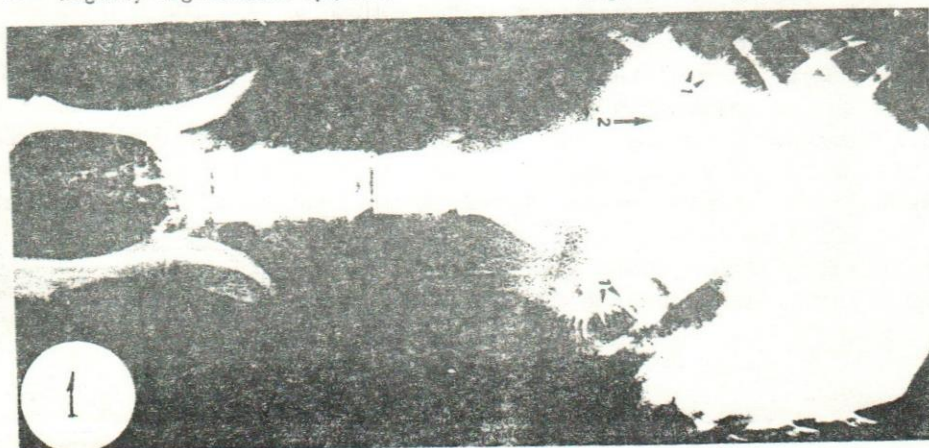
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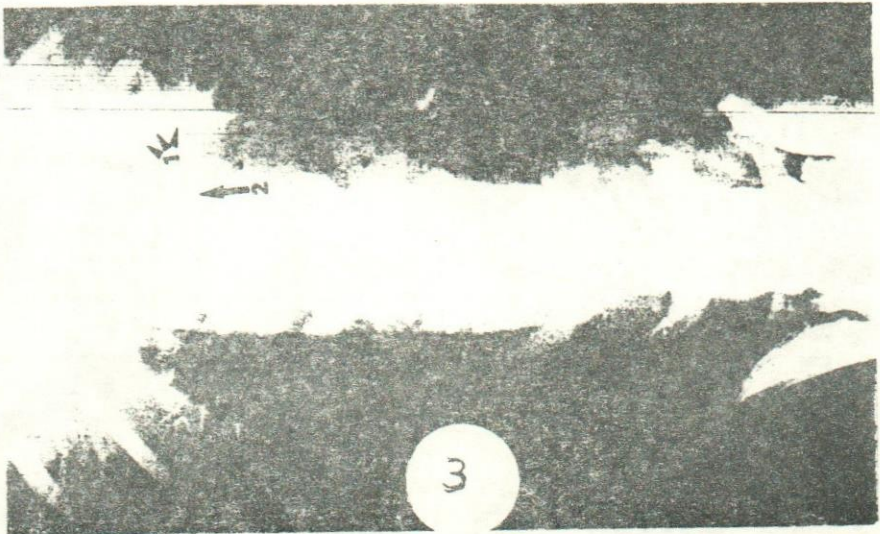
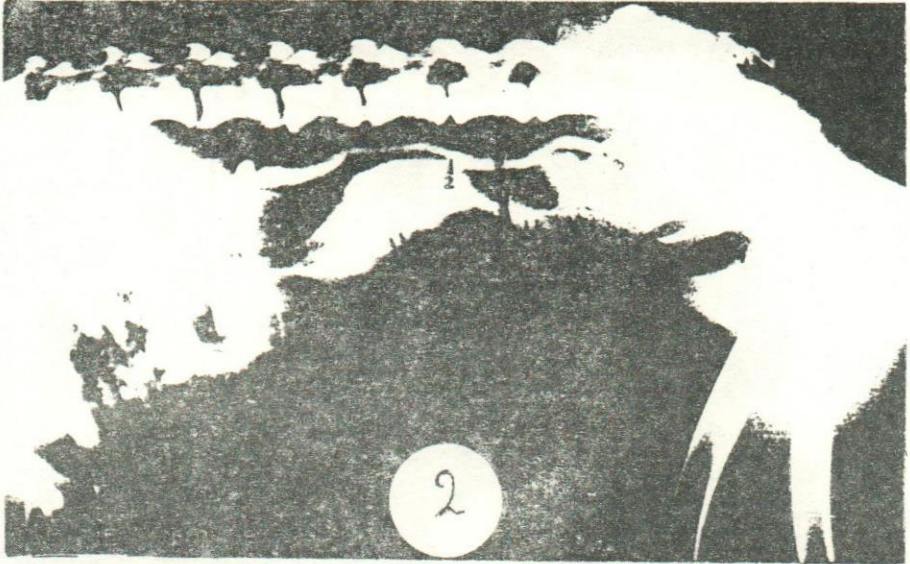
Table, 1: Mean values and standard error of blood serum biochemical parameters in examined dogs pre and post-ureter implantation.

Groups	Days post-operative	Sodium mmol/l	Potassium mmol/l	Chloride mmol/l	Creatinine mg%	blood urea nitrogen mg%	inorganic phosphorus mg%
Group I Colon	7 days	140.0±5.1	3.5±0.9	118.0±3.0	0.5±0.02	70.0±2.2	5.5±1.10
	15 days	140.0±6.6	3.3±0.8	122.0±3.5	0.6±0.04	87.0±1.3	6.6±2.20
	21 days	150.6±5.2	5.2±1.0	128.0±3.9	0.7±0.05	75.0±2.2	7.3±3.10
	over mean	143.5±6.1	4.0±1.4	127.7±5.3*	0.6±0.10	77.3±8.7**	6.4±0.90
Group II Small intestine	7 days	140.5±0.8	4.0±0.7	109.0±3.2	0.6±0.01	32.0±1.3	6.7±0.10
	15 days	162.4±5.4	3.7±0.9	125.0±3.8	0.5±0.02	66.0±3.2	7.2±2.10
	21 days	140.2±0.8	4.5±1.2	121.0±4.1	0.6±0.04	64.0±4.5	5.6±1.80
	over mean	147.7±9.7	4.0±0.5	118.3±8.3	0.5±0.05	54.0±19.	6.5±0.80
Group III Subcutaneous	7 days	158.0±5.5	4.0±0.9	110.0±3.3	0.7±0.01	32.0±2.2	6.8±0.10
	15 days	151.2±5.8	4.2±1.1	102.0±5.1	1.0±0.05	38.9±2.5	5.5±1.40
	21 days	150.0±5.0	6.8±0.5	110.0±1.1	0.8±0.10	40.0±5.5	6.6±1.90
	over mean	153.1±4.3	5.0±1.6	107.0±4.6	0.8±0.20	36.9±4.3	6.3±0.70
Control Pre-opera- tive	7 days	135.0±2.4	3.5±0.5	101.0±1.7	0.7±0.01	7.0±0.9	2.0±0.80
	15 days	140.0±5.1	4.0±0.6	108.0±2.7	0.8±0.02	17.0±1.3	3.5±0.60
	21 days	155.0±4.8	5.5±0.9	115.0±3.3	1.2±0.10	27.0±2.5	5.6±1.70
	over mean	143.3±9.4	4.3±1.9	108.0±7.0	0.9±0.30	17.0±1.0	3.7±1.80

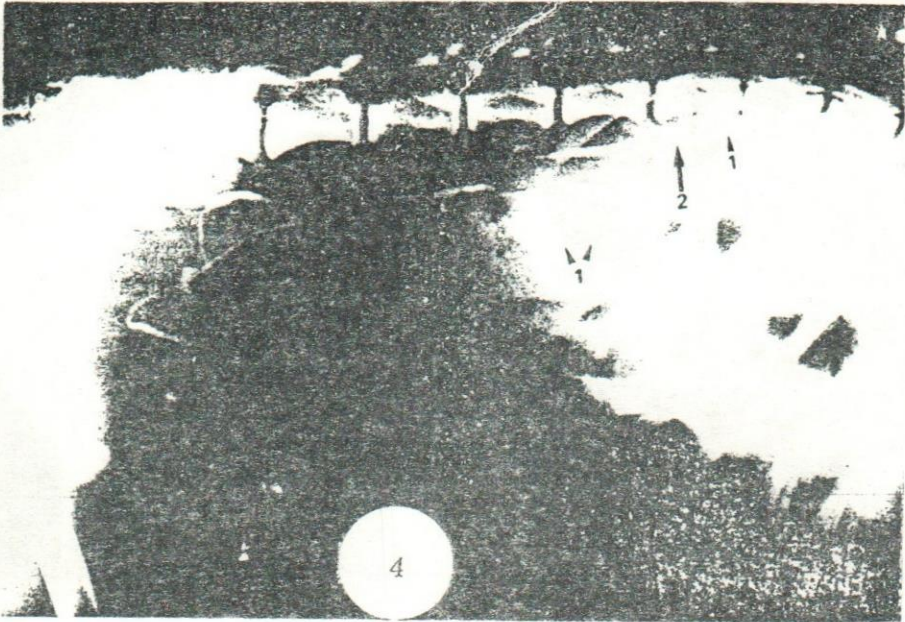
** = Highly significant (p<0.01)

* = Significant (p<0.05).





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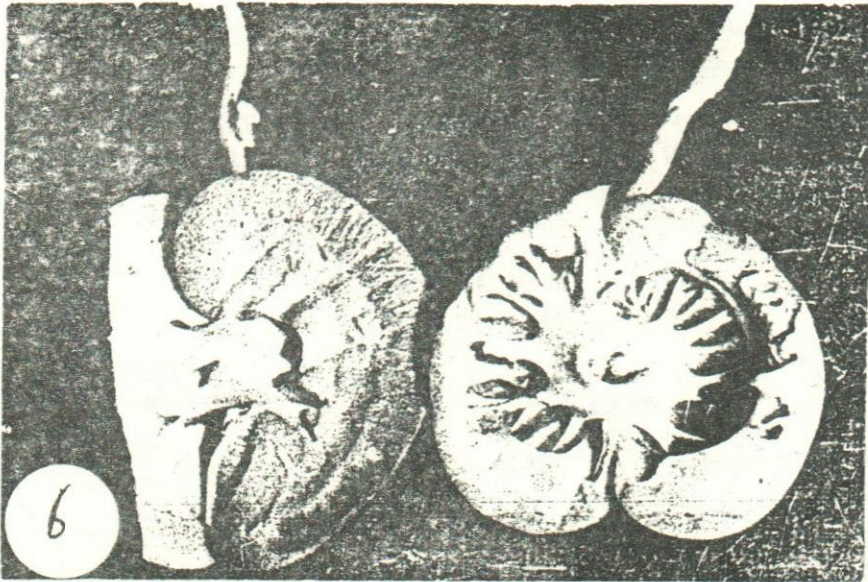


Fig.7a: Mean values of blood serum sodium levels (nmol/L) pre- & post-operative technique in dog.

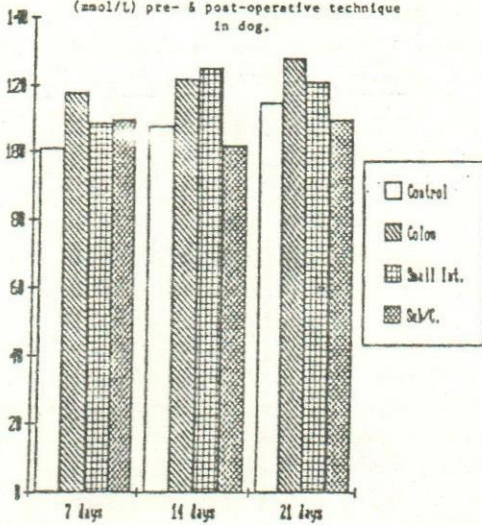


Fig.7b: Mean values of blood urea nitrogen levels (mg%) pre- & post-operative technique in dogs.

