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RECONSTRUCTION OF THE URINARY BLADDER USING APPENDIX AND STOMACH GRAFTS IN DOGS

(With 1 Table & 4 Figs.)

By

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إعادة ترقيع المثانة بإستخدام أنسجة مـــــن
الأعور أو المعدة في الكـــــلاب

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أجرى هذا البحث على عدد ٢٤ كلب من الجنسين حيث قسمت إلى مجموعتين متساويتين وقد أستخدم جزء من نسيج الأعور لترقيع المثانة في حيوانات المجموعة الأولى بينما أستخدم جزء من نسيج المعدة لنفس الغرض في حيوانات المجموعة الثانية . ولقد أجـرى الفحـص الإكلينيكي والراديولوجي وكذلك الصفة التشريحية والهستوباثولوجية لحيوانات المجموعتين بعد إجراء العملية ووجد أن إستخدام جزء من أنسجة المعدة لترقيع المثانة قد أعطت نتائج مرضيـة .

SUMMARY

Twenty-four dogs of both sexes were used in this investigation. The animals were classified into two groups (each of 12 dogs). Animals group (I) received a patch from appendix for bladder reconstruction, while those of group (II) received a patch from stomach for the same purpose after partial cystectomy. Clinical, radiographic, postmortum and histopathological examinations were studied. The best results for reconstruction of a good functioning bladder after partial cystectomy were obtained by using stomach graft.

INTRODUCTION

Traumatic rupture of the bladder in animals with no predisposing abnormalities of the urinary system has been most commonly encountered in dogs. Also traumatic rupture of the urinary bladder may occur with partial or total obstruction of the urethera (OSBORNE, et al. 1980). The repair of defects and reconstruction of the urinary bladder have been attempted by many authors using a varity of tissues. NEUHOF (1917),

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BARET, et al. (1953), DEMUTH (1953) and GERA, et al. (1980) used free fascial graft for bladder reconstruction. The use of terminal ileum with a portion of ascending colon as a substitute for the bladder was reported by CIBERT (1953) and RIEGER (1953). SHOEMAKER and MARUCCI (1955) described a new method for plastic reconstruction of the urinary bladder using seromuscular grafts from the terminal ileum and colon. Experimental use of free grafts of the bladder mucosa in canine bladder was recorded by COLEMAN, et al. (1985).

The aim of this work is to evaluate the efficiency of patch from appendix and stomach in bladder reconstruction. Clinical, radiological, postmortum and histopathological examinations were performed to study the fate of the graft.

MATERIAL and METHODS

The study was carried out on twenty four apparently healthy mongrel dogs of both sexes. The animals weight ranged from ten to sixteen kilograms and ranged between 1-6 years old. The animals were divided into two groups (each of 12 animals).

The dogs were premedicated with intramuscular injection of chlorpromazin hydrochloride (Neurazine) in a dose of 1 mg/kg. body weight. General anaesthesia was induced by intravenous injection of pentothal sodium until the main reflexes were abolished.

Operative technique:

Group (I): For bladder reconstruction using free appendix graft, laparotomy was made from right prepubic paramedian approach. About 2 cm. from th right side of the sheath of the penis, the skin was incised 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.

Appendectomy was made about 3 cm^2 from its end, then by using 3/0 catgut a purse string suture was applied around its base. The dome of th appendix was cut from one side and washed with sterile normal saline for few minutes.

The urinary bladder was exteriorized and evacuated from the urine by gentle pressure. About 3 cm^2 of the dorsal surface of the bladder was resected. The prepared graft patch was then sutured using connel sutures with chromic catgut No. 3/0. The abdominal cavity was insufflated with sterile normal saline before its closure. The animals received antibiotics (streptomycin and penicillin G) for 5 successive days postopertively. The skin sutures were removed after 7 days from operation.

Group (II): Bladder reconstruction using free stomach graft, laparotomy was made in two regions, preumblical for partial gastrectomy and prepubic for partial

cystectomy. Graft implantation as previously mentioned was applied. Cystograns were done under very light anaesthesia of intravenous pentothal sodium for better control in the handling of the dogs. Radiographic evaluation was made using Urographin solution in a dose of 20 ml intravenously. These cystograms were taken at 2, 6 and 12 weeks postoperatively. The animals were sacrified at intervals of 2, 6 and 12 weeks postoperatively to study the macroscopic and microscopic fate of the graft.

RESULTS

Clinical and gross pathological findings:

The results of the operated dogs in group (I & II) are summarized in table (1). Pulse, respiration and body temperature fluctuated within normal limits except one case of group II suffered from fever. Four cases of group (I) and one case of group (II) showed hematurea for a period of 48 hours postoperatively and the urine became clear afterwards. The anastomatic site at the bladder revealed various degrees of adhesions with the surrounding mesentery or loop of intestine in group (I). In one case of group (II) sacrified at 2 weeks, necrosis of the graft was detected. There was no marked gross demarkation between the graft site and the other parts of the urinary bladder in the animals sacrified at 12 weeks in both groups (Fig. 1).

Radiological findings:

The cystograph showed smooth bladder (Fig. 2 b) in 10 cases of group (I) and somewhat deformed bladder in one case. Irregullar and rough surface bladder was observed in one case (Fig. 2 a). In group (II) the cystograph also showed smooth bladder without any deformity of the wall (Fig. 2 c). Only one case showed area of necrosis and the animal was sacrified after 2 weeks postoperatively (Fig. 2 d).

Histopathological findings:

After 2 weeks no tissue from the appendix could be observed and the healing process occured by granulation tissue with epithelization of transetional type in 2 cases. In the other two cases, the tissues of appendix were found compressed and embedded in the bladder tissue (Fid 3 a). Six weeks postoperatively, one case did not reveal any tissue from appendix in the urinary bladder tissue. The mucosa of the appendix was destroyed and some glands still present but showed cystic dilation. This area was heavly infilterated with macrophage cells. The muscular layer of the appendix was somewhat normal in structure and arrangement (Fig. 3 b). Also the bladder tissue healed by granulation tissue and epithelization by transetional epithelium could be observed. Twelve weeks post-operation in three cases the appendix tissue could not be noticed but the other case only the musculosa of the appendix was found embedded in the urinary bladder tissue (Fig. 3 c). The surgical edges healed by granulation tissue and epithelization was complete (Fig. 3 d).

Group (II): Histological section of the graft 2 weeks from operation revealed necrosis of the graft with heavy inflammatory celleular reaction surrounding it in one case. The other three cases only the mucosa showed necrosis and the other layer were somewhat healthy. The transetional epithelium migrate from the wound margin over the stomach graft (Fig. 4 a). Six weeks post-operatively the bladder epithelium was completely covering the grafts with presence of necrosed mucosa under the transetional epithelium (Fig. 4 b). 12 weeks postoperation two cases showed presence of reminent from necrosed stomach mucosa embeded in healthy tissue and covered by transet-ional epithelium (Fig. 4 c). The bladder of the other two cases showed complete resorbtion of the stomach attached to the bladder musculosa and granulation tissues covered by transetional epithelium (Fig. 4 d).

DISCUSSION

There was no available literature describing the use of appendix or stomach tissues in bladder reconstruction. Only one human case lived 15 years after implantation of the ureters to the isolated caecum with the appendix serving as external fistula was reported by MERRICKS, et al. (1951). Depending on the criteria of the ideal tissue graft for partial repair or complete substitution of the bladder described by SHOEMAKER and MARUCCI (1955) appendix and stomach tissues were used in this expirement. The appendix tissue graft was characterised by its easy availability and its situation nearer to the urinary bladder so the operation can be performed from one surgical incision. The wall of the appendix was thinner than the bladder wall so that it was embeded in the bladder tissue. The appendix graft acts as a template over which the tissue of the bladder defects healed by granulation tissue. Because of the wall thickness of the stomach was nearly similar to the bladder wall, it allow the regeneration and regrowth of the transetional epithelium found in the bladder in the second group.

To prevent contracture at the dome or approximation of the opposing edges of the incision, the detrusor muscle and serosa of the bladder was sutured back on itself. In this way, the diameter of the opening of the bladder was kept relatively constant and open (COLEMAN, et al. 1985).

Criteria of stomach tissue is better than appendix tissue for bladder reconstruction. As long as the grafts are kept moist during the period of retravel and insertion, it appears that they are relatively independent of an identifiable blood supply. Cystogram and postmortum examination indicates the efficiency of stomach tissue graft in bladder reconstruction. Histological examination demonstrated the necrosis of the mucosa of the stomach graft. Overgrowth of the seromuscular graft by transetional epithelium and rich vascularity of the intact viable graft.

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LEGENDS

Fig. (1): Gross appearance of the urinary blader after reconstruction using appendix tissue (A & B) and stomach tissue (C & D) without any defect in its wall.

Fig. (2): Ventrodorsal radiograph showing smooth bladder after appendix tissue graft (B) and irregular rough surface bladder in one case (A). The bladder appears smooth without any deformity of the wall after stomach tissue graft (C). Radiolucent area indicate necrosis of the graft was appeared in one case(D).

Fig. (3): A: Appendix tissue showed embedded in the bladder tissue. H.E. stain mag. (2.5x12.5). B: Appendix mucosa showed mucinous degeneration. part from the later H.E. stain mag. (25x12.5). C: The embedded appendix tissue was destructed and some gland formed cystic dilation. H.E. stain mag. (2.5x12.5). D: Site of operation showed epithlization covering granulation tissue. H.E. stain mag. (10x12.5).

Fig. (4): A: Stomach graft showed mucosal necrosis and begining of the transetional epithelization H.E. stain mag. (10x12.5). B: Site of operation showed epithelization covering the necrosed mucosal stomach grafts. H.E. stain mag. (25x12.5). C: Reminant of necrosed stomach mucosa with complete epithlization. H.E. stain mag. (25x12.5). D: The transetional epithelium completly covering the graft with complete absence of the necrosed tissue H.E. stain. mag. (25x12.5).

Table (1)

Showing the clinical and gross pathological finding in both groups

GROUP	DOG No.	SEX	TISSUES USED IN BLADDER REC.	INTERVALS	POSTOPERATIVE COMPLICATION	POSTMORTUM EXAMINATION	FATE OF THE GRAFT
I	1	MALE	APPENDIX	2 WEEK	BLOODY URINE	AREA OF INFLAMMATION	APPENDIX TISSUE NOT OBSERVED
	2	"	"	"	" "	ADHESION	EMBEDED IN THE BLADDER
	3	"	"	"	" "	"	"
	4	FEMALE	"	"	" "	INFLAMMATION	NECROSED
	5	"	"	6 WEEK	NORMAL URINE	ADHESION	NOT PRESENT
	6	MALE	"	"	" "	"	REMINANT IN U.B.TISSUE
	7	FEMALE	"	"	" "	NO ADHESION	SOME GLAND SHOWED CYST. DILAT.
	8	"	"	"	" "	ADHESION	MUSCLUSA WAS PRESENT
	9	"	"	12 WEEK	" "	SMOOTH AND COMPL. HEALING	MUSCULOSA WAS EMBEDED
	10	MALE	"	"	" "	" "	GRANULATION TISSUE
	11	"	"	"	" "	" "	NOT PRESENT
	12	FEMALE	"	"	" "	SLIGHT ADHESION	
II	1	FEMALE	STOMACH	2 WEEK	NORMAL URINE	NO ADHESION	NECROSIS OF MUCOSA
	2	MALE	"	"	" "	" "	" "
	3	"	"	"	" "	" "	" "
	4	FEMALE	"	"	SEVER HAEMATOMA	NECROSIS OF GRAFT	" OF THE GRAFT
	5	MALE	"	6 WEEK	NORMAL URINE	NO ADHESION	NECROSIS OF THE MUCOSA
	6	"	"	"	" "	" "	" "
	7	"	"	"	" "	" "	" "
	8	"	"	12 WEEK	" "	" "	COMPLETE RESORBATION
	9	FEMALE	"	"	" "	" "	NECROSED MUCOSA
	10	MALE	"	"	" "	" "	" "
	11	"	"	"	" "	" "	COMPLETE RESORBATION OF NECROSED MUCOSA
	12	FEMALE	"	"	" "	" "	" "

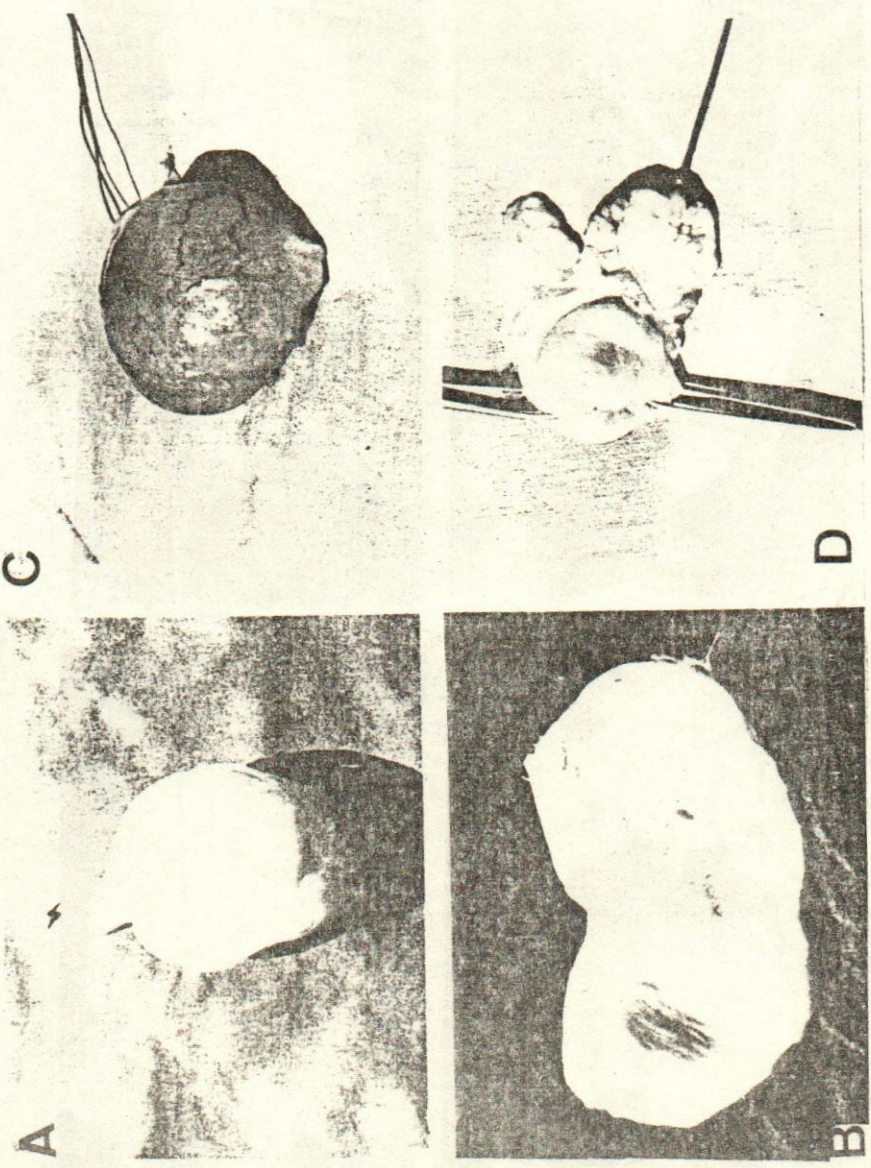

Fig. (1)

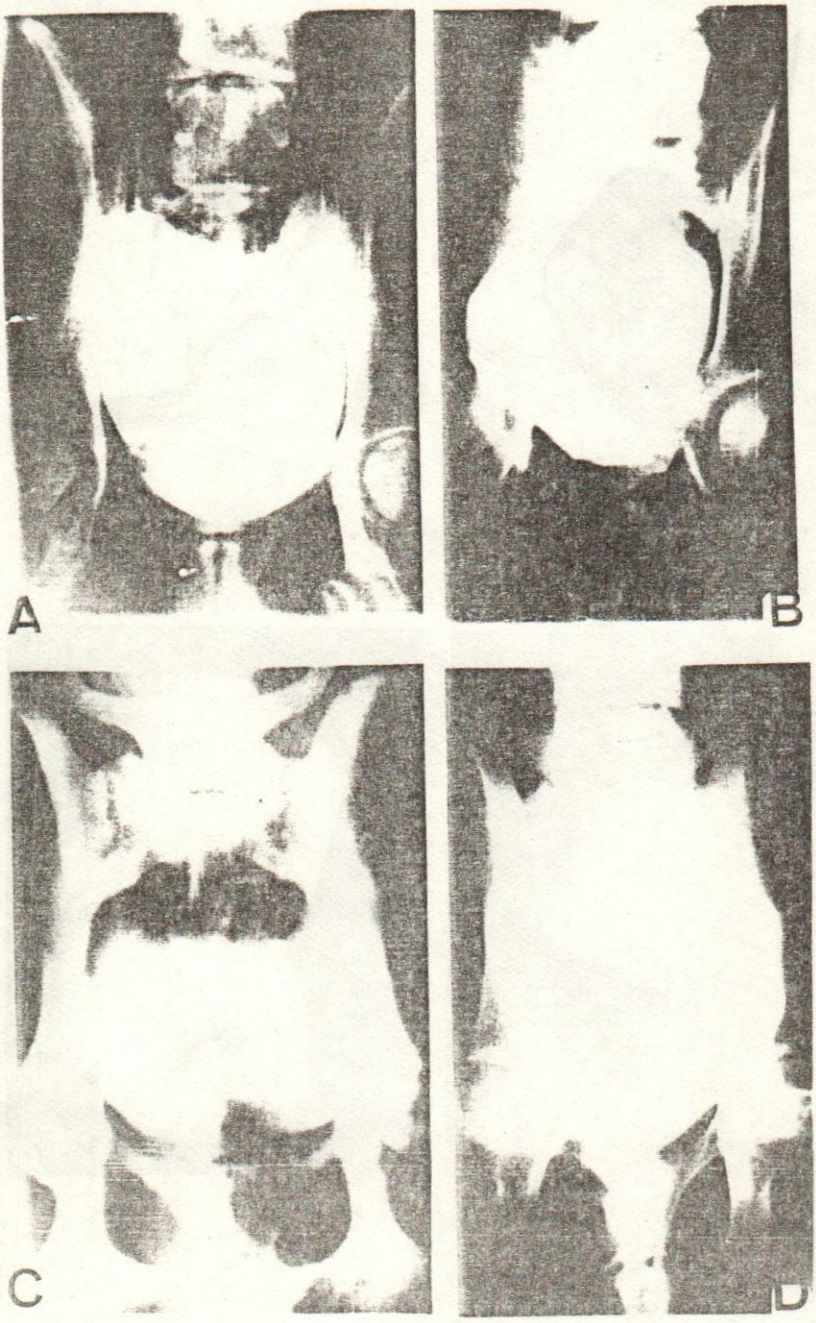

Fig. (2)

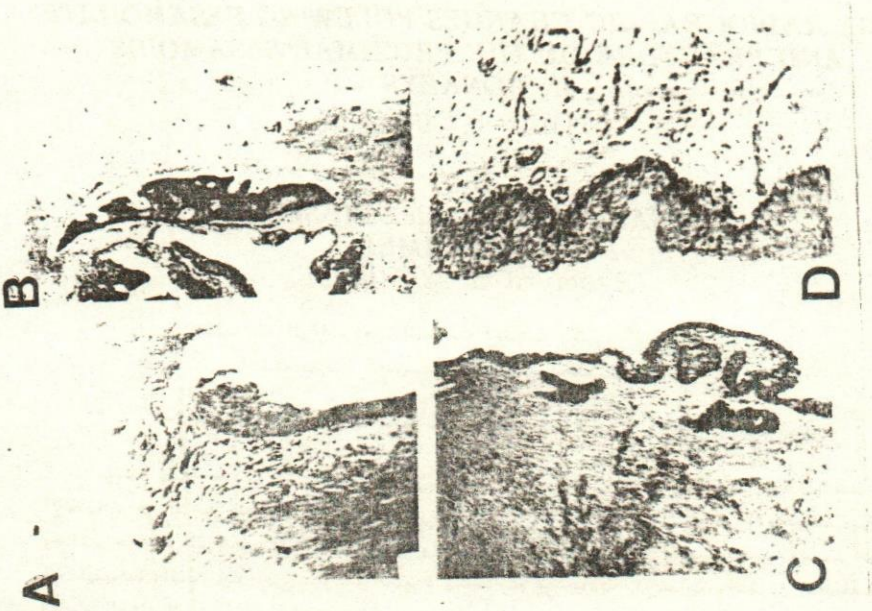

Fig. (4)

Fig. (3)