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GASTRORRHAPHY WITH JEJUNUM PEDICLE IN DOGS

(With 8 Figures)

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SUMMARY

In this paper, we would like to clarify the progressing of healing processes of stomach, morphological and histological development of the stomach after using the autogenous vascularized jejunum flap to reconstruct the experimental gastric defect in 10 stray dogs of both sexes. A protocol of anesthesia include atropine sulphate as a premedication followed by Xylazine /Ketamine at the dose of 3, 10 mg /kg B.wt respectively were used successfully in the present trial Clinicopathological and histopathological examination were performed to justify the current hypothesis. The results of the present trial include no characteristic clinical signs except signs of anorexia and vomiting for the first few days which subside after good hygiene and proper management. Grossly the implanted graft difficulty was distinguished from the gastric tissue. There is a circular ulcerative lesion just at the site of operation in one of the operated animals 2 months post-operatively. Histologically, the complete healing occurs at sixty days post-operatively with mature fibrous tissue, collagen fibers and available number of fibroblast cell. In conclusion, the utilization of the pedicle and taper jejunum flap to replace the damaged stomach is considered as an alternative reconstruction procedure. It is an acceptable method after partial gastrectomy in dog.

***Key words**: Stomach reconstruction, jejunum pedicle, dog*

INTRODUCTION

Various attempts have been made to establish blood flow in ischemic or devascularized organs (Renzo *et al.,* 1987). The goal of tissue engineering is to "restore function through the delivery of living elements which become integrated into the patient (Vacanti and Langer, 1999). This goal, which should lead to the fabrication of new, physiologic, functioning tissue, must involve the combined efforts of cell biologists, engineers, material scientists, mathematicians, geneticists, and clinicians to be successful. The three major approaches include guided tissue regeneration using engineered matrices alone, the injection of allogenic or xenogenic cells alone, or the use of cells placed on or within matrices.

In case of extensive damage in the stomach approaching the border of defect after dissection may not be possible, such a situation require the use of a substitute in order to reestablish the continuation of organ. So, in this paper, we would like to clarify the attempts for engineering of stomach tissue by using vascularized autogenous pedicle of jejunum.

Reconstruction with a jejunal pouch as a gastric substitute has been used for more than 50 years (Hunt, 1952 and Lawrence, 1962). This construction of a jejunal pouch has been proposed after both total and proximal gastrectomies and sometimes even after distal gastrectomy. The purpose of reconstruction with a jejunal pouch is to increase the storage capacity for ingested food. When surgeons create a jejunal pouch as a gastric substitute, they should consider the motor, exocrine and endocrine functions of the stomach and small intestine as they relate to the form of gastrectomy undertaken.

The motor function of the stomach differs greatly between the proximal and distal stomach, and upper gastrointestinal motor activity differs between digestive (postprandial) and interdigestive (fasting) states. In the digestive state, food in the stomach is emptied into the duodenum by a very well-organized antro-pyloro-duodenal coordination. As far as we know, few attempts have been undertaken to interpret the clinical results after jejunal pouch reconstruction from the viewpoint of gastrointestinal motor physiology (Chikashi *et al.,* 2009)

Technical progress in the field of tissue engineering and regenerative medicine has led to new possibilities for the repair of gastrointestinal defects and for gastrointestinal tissue regeneration. A promising approach for the repair of gastrointestinal defects is the

substitution of the bowel wall with extracellular matrices. Different materials have been evaluated for anastomotic reinforcement to prevent gastrointestinal anastomotic leakage as "small intestinal submucosa" (SIS). SIS is a biodegradable, commercially available, a cellular, immunologic inert collagen matrix. In recent years, experimental studies have show considerable success for the use of SIS as a tissue graft in blood vessels, bladder (Alkattan, 2008 and Hoeppner *et al.*, 2009), ureter and tendon (Badylak *et al.,* 1989; Allman *et al.,* 2001). Recently intestinal submucosa isolated from colon used successfully for repairing the experimental defect of urinary bladder. The aim of present study was to reconstruct the stomach defect with jejunum pedicle to restore the normal anatomical statement and normal physiological function of stomach in dog.

MATERIALS and METHODS

First: experimental animals: Ten adult stray dogs of both sexes. Their age and weight were (1-1.9 y and 15-19 kg), respectively used to conduct the present study. The study protocol was approved by the animal's house of Veterinary Medicine College; University of Mosul. All animals were vaccinated against rabies and other infected pathogens as leptospira and vermifuged with a broad-spectrum anthelminthic agent.

Prior to the surgical procedures, the animals were maintained under alimentary fasting for 12 hours and water deprivation for two hours

Second: experimental design: The experiments include using ten animals that had good healthy condition. All operative animals underwent same manner conditions.

Protocol of anesthesia: Dogs were anaesthetized in random order by premedication with atropine sulphate 0.02 mg S.C and anaesthetized with a protocol of xylazine (3 mg/kg) and ketamin (10 mg/kg) intramuscularly.

Preparations and surgical procedures:

The abdomen from the xyphoid cartilage to the Pelvis prepared with strict sterilization. Med line surgical incision about 20 cm extend from umbilicus to the Xyphoid cartilage include skin and subcutaneous structures, pedicle from jejunum about 6 cm was harvested with mesenteric continuity, then the two ends of resected jejunum re anastomosis. Experimental defect about 5cm length, 1.5 cm width induced just at the great curvature of stomach then at same time the

pedicles of jejunum firmly sutured by absorbable suture material with a simple continuous technique. The repaired site secured to avoid leakage then abdominal muscle closed with one raw of lock stitch (muscle and peritonea together), the skin sutured with horizontal mattress suture technique. The suture material was removed after 14 days.

Biopsies and histological preparations: at the period 15, 45, 60 and 90 animals were scarified to observe the pathological changes and to get biopsies from the treatment site, specimen obtained from the stomach and kept in the 10% formalin solution.

The specimens were dehydrated, clearing with xylol then the specimens were putted in paraffin wax for cutting by rotary microtome to diffuse on the class slide for staining by hematoxylin-eiosin finally the specimen is ready for reading by light microscope.

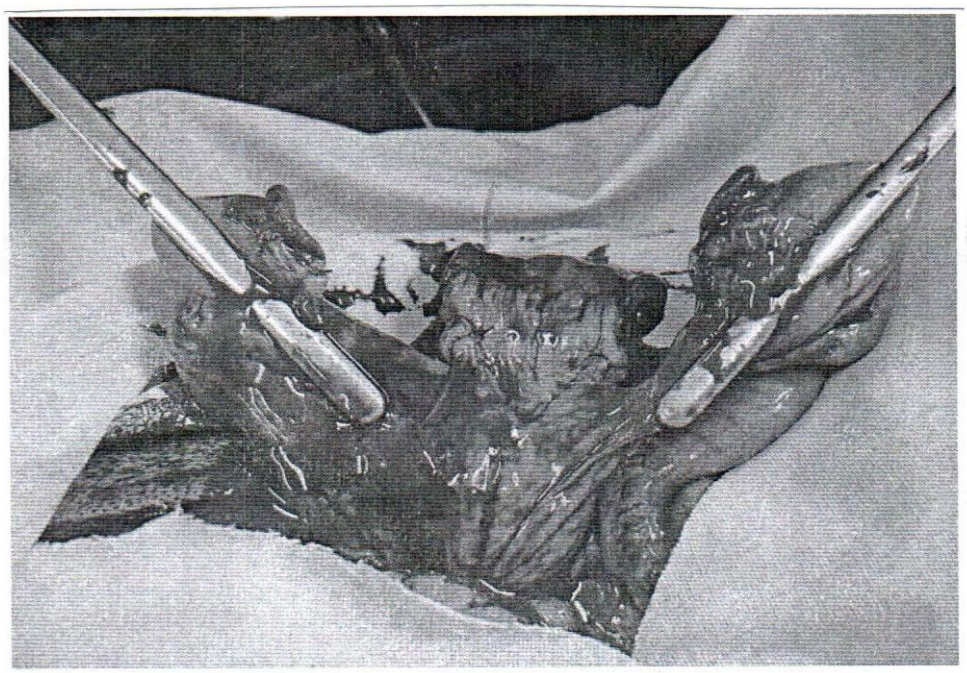

Fig. 1: The jejunum resection and exteriorize the jejunum pedicle for stomach reconstruction.

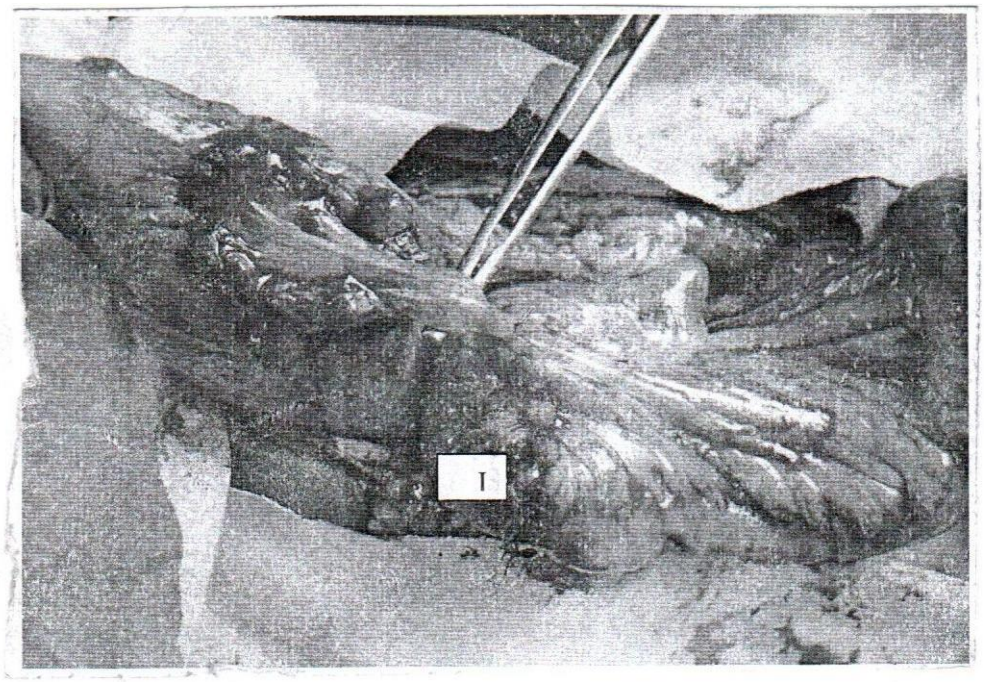

Fig. 2: Intestinal anestomosis (I) pedicle of jejunum reconstructed defective stomach.

RESULTS

Firstly, the results of present study exhibited no development of anastomotic leakage, intra abdominal abscess, or peritonitis as well as the operative animals exhibited no characteristic signs except some changes in habits and behaviors and digestive disturbances (vomiting, profuse salivation and anorexia), there is chronic loss of body weight in one of the operative animals' delirium. So, none of the animals died or developed clinically relevant disease. These changes stay for the first few days and gradually subsided and the animal seems healthy postoperatively. Grossly adhesions were profoundly evident around the whole of abdominal content, and saw in some of operative animals (Figure 3) inspite of the adhesion there is the field of operation grossly seem free from any inflammatory changes along the different period of

examination. The ometum was adherent firmly with the jejunum pedicle and Repaired site of stomach seemed thick and fibrotic, fixed firmly and Strength (Figure 4)

There are no signs of ulceration at the stomach mucosa after jejunum implantation Histologically at fifteen days postoperatively we noticed different stages of newly formed blood vessels formation with intervention of a variable amount of fibrous tissue formation (Figure- 5). At forty five days postoperatively we recognized the healing response which was characterized by the presence newly formed capillaries and intervening fibrous connective tissue seemed as bands of red fibers they fill any space of the tissue. This healing process next following the granulation tissue phase which is seen at fifteen days post operatively (Figure 6). On sixty days post, note variable number of fibroblasts with immature collagen fiber and varity of inflammatory cells (Figure 7) at ninety days post, note variable number of fibroblasts with mature collagen fiber and varity of inflammatory cells (Figure 8)

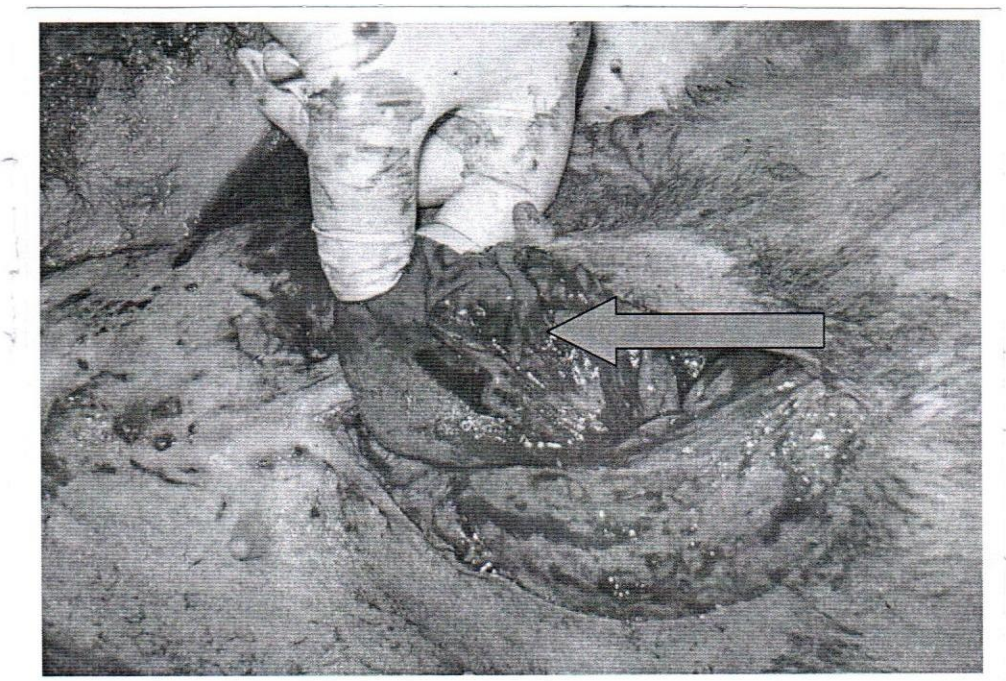

Fig. 3: Grossly the stomach adherent to the viscera.

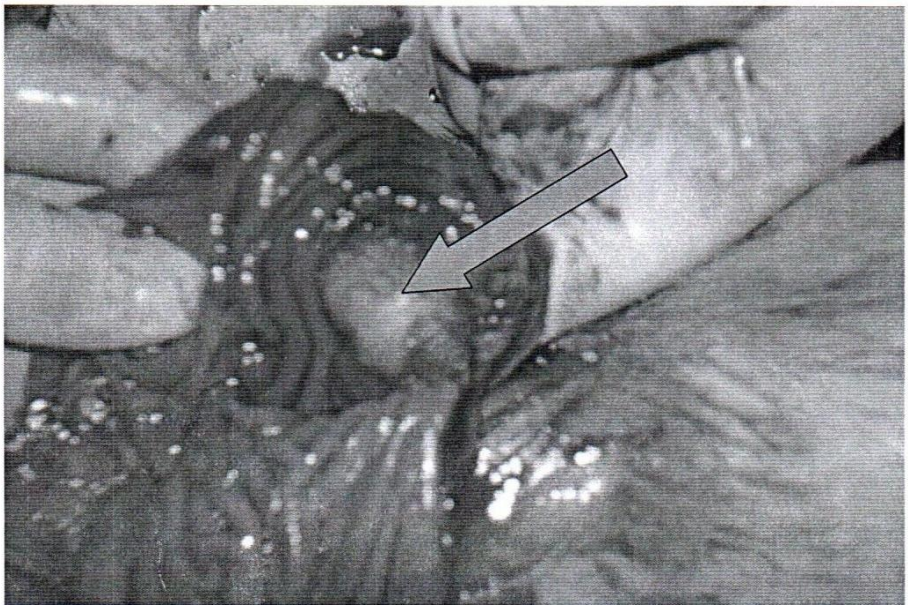

Fig. 4: 75 days post operatively stomach seemed thick and fibrotic, fixed firmly and Strength.

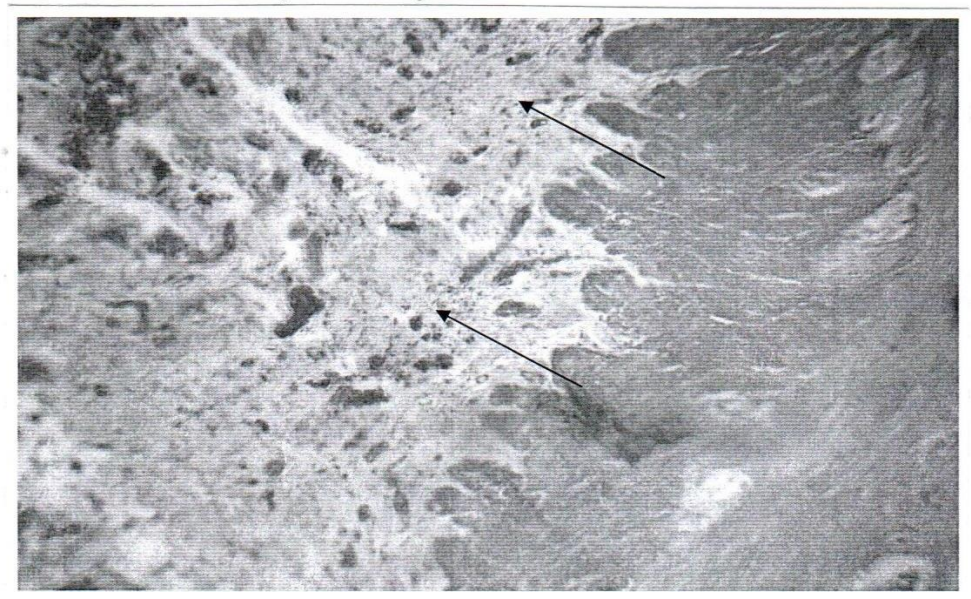

Fig. 5: Photomicrograph of granulation tissue post 15 days, note the new fibroblast (arrows) are arranged perpendicularly to newly formed blood vessels (arrows) H&E.

Fig. 6: Photomicrograph of healing response in gasterojejunem junction, note the abundant of newly formed capillaries (arrows) and intervening bands of red fibers (arrows) H&E.

Fig. 7: Photomicrograph of healing response on sixty days post, note variable number of fibroblasts (arrows) with immature collagen fiber (arrows) and Varity of inflammatory cells (arrows) H&E.

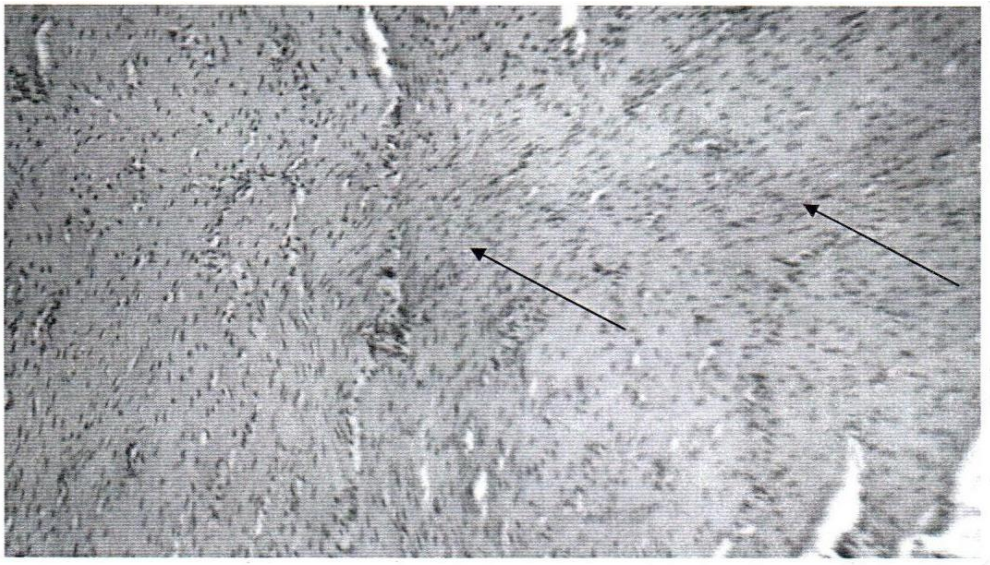

Fig. 8: Photomicrograph at ninety days post, note variable number of fibroblasts (arrows) with mature collagen fiber (arrows) and Varity of inflammatory cells (arrows) H&E.

DISCUSSION

Stomach affections remain the real challenge for some surgical solutions so, in the past, different studies have been published on free or pedicular omental reinforcement of colonic anastomosis. Some studies have reported the beneficial effects of omental reinforcement on rate of leakage (Alkattan, 2008) none of the animals developed anastomotic leakage, intra abdominal abscess, or peritonitis. This was indicated on good suturing pattern with strict sterilization statement this signs is considered with Hoeppner *et al.* (2009). Can withstand the digestive activity of the stomach contents and encourages healing due to its good blood supply of jejunum flap.

In the present study there are some complications in some animals as malnutrition assessed in terms of weight loss and has been regarded as the most frequent complication postoperatively (Adams, 1967), this complication accompanied with gastrectomy when simple

reconstruction procedure as oesophagajejuestomy was employed. The initial conception of mechanism underlying post gastrectomy malnutrition envisaged a deficiency of the digestive enzyme (Lawrence, 1996) workers suggest that the digestion and absorption of nutrition is altered, timing in secretion of bile, gastric reservoir function is lost this accompanied with digestive impairment (Dexter *et al.,* 1966) who said that, operation of jejunal interposition reconstruction after total gastrectomy in dogs accompanied with digestive impairment and anemia.

Grossly in some of operative animals stomach adherent to the viscera is indicated by the acute inflammatory reaction, the adherence process is a complicated event which essential for migrating cells and also its anchoring to extracellular protein (Mcgavin and Zachary, 2007).

At the site of omintum attachment with the operative area there is firm adhesion with no appearance of inflammatory reaction, the unique characters of omentum as capacity, withdrawing ability especially in dog, this befit for filling the defect (Liebermann, 2000), the ability of omentum to reduce the inflammatory response this due to the active lymphatic system with in the omentum that absorb the access fluid and subsequently the edema regress this consider with Alagumuth *et al.* (2006). The jejunum implantation decrease the incidence of ulcer formation in mucosa of the stomach, therefore as ulcer is not evident at the site of implantation at a different period of examination this does not agree with Moore (1956) who pointed that there is ulcer formation at the site of operation due to using nonabsorbable suture material.

Histologically in the first few days there is proliferation of granulation tissue, there is hyperplasia of fibroblast this indicate the on initiation of healing process and is considered with Thomson (1984). Angiogenesis is essential for living organism, so this process occur because as wound heals and the new vessels necessary to supply the injured site with oxygen, remove Carbon dioxide and other waste products, drain excess fluid and provide a vascular pathway for cell and stem cell in the wound (Mcgavin and ZAChary, 2007).

In conclusion, the findings of current the study shows that the jejunum pedicle reconstruction defective stomach is an acceptable method after partial gastrectomy with minimum post operative side effect and there is a decrease of post operative weight loss

REFERENCES

Alkattan, L.M. (2008): Urinary bladder defect reconstruction with autogenous colon graft in dogs. Proceeding 13th Assuit University Congress. Assiut. Egypt. 493-497.

Alagumuth, M.; DAS, B.B.; Pattanayak, S.P. and Rasananda, M. (2006): The omentum a unique organ of exceptional versatility. Indian J. Surg. 68(3): 136-141.

allman, A.J.; Mcpherson, T.B.; Bardylak, S.F.; Merrill, L.C.; kallkury, B.; Sheehan, C.; raeder, R.H. Metzger, D.W. (2001): Xenogeneic extracellularmatrix grafts elicit a TH2-restricted immune response. Transplantation. 71(11), 1631–1640.

Adams, J.F. (1967): The clinical and metabolic consequences of total gasterectomy. morbidity. weight and nutrition. Scand J.Gastroenret. 2: 37-149.

Badylak, S.F.; lantz, G.C.; Coffey, A. and Geddes, L.A. (1989): Small intestinal submucosa as a large diameter vascular graft in the dog. J. Surg. Res. 47(1): 74–80.

Chikashi, S.; Tatsuya, U.; Masayuki, K. and Kand, I.S. (2009): Results of Reconstruction with Jejunal Pouch after Gastrectomy: Correlation with Gastrointestinal Motor Activity Dig Surg. 26: 177-186.

Dexter, W.L.; Alfred, J.D.; Bruce, E.B.; gordon, C.V. and James, E.M. (1966): An evaluation of jejunal interposition reconstruction after total gastrectomy in dogs.J of Surgical Research V6(6): 240-246.

Hoeppner, J.; Crnogorac, V.; Marjanovic, E.; Jüttner, E.; Keck, T.; Weiser, H. and Hopt, U. (2009): Small intestinal submucosa for reinforcement of colonic anastomosis. International Journal of Colorectal Disease. 24(5): 543-550.

Hunt, C.J. (1952): Construction of food pouch from segment of jejunum as substitute for stomach in total gastrectomy. AMA Arch Surg. 64: 601-608.

Lawrence, W.J. (1996): Reconstruction after total gastrectomy: What is preferred technique? J Surgery Oncol. 63: 215-220.

Liebermann, M.D. (2000): The greater omentum Anatomy embryology, and surgical applications: Surg. Clin. North. Am.80(1), 275-93.

Mcgavin, M.D. and Zachary, J.F. (2007): Pathologic Basis of Veterinary Disease. 4th ed. Mosby, 111.

Moore, S.W. (1956): Effect of pedicle graft of jejunum in the wall of stomach long term follow up study. Ann. Sur. 144(2), 132-158.

Renzo, H.; Takashi, O.; Shoichiro, I.; Yoichiro, K.; Shinichiro, K. and Yoshio, M. (1987): Vascularizing the ischemic jejunum by Intra-seromuscular implantation of a gastroepiploic vascular pedicle --An application of experimental esophageal reconstruction., Japanese J. of Surgery. 17(3), 162-167.

Thomsone, R.G. (1984): General Veterinary Pathology .2nd ed, 251-255.

Vacanti, J.P. and Langer, R. (1999): Tissue engineering: the design and fabrication of living replacement devices for surgical reconstruction and transplantation. Lancet; 354 (Suppl 1), I32-I34.