COMPARATIVE EFFICACY OF POLYPROPYLENE MESH AND JEJUNAL GRAFT FOR THE REPAIR OF ABDOMINAL WALL DEFECT IN DOGS

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ABSTRACT

Abdomen is a very delicate part of the body. It is prone to trauma and clinical disorders like malignant soft tissues tumors, abdominal hernias are quite common in both young and mature dogs. In massive abdominal wall defects, the use of graft becomes mandatory to achieve desirable results Different techniques have been performed to overcome this challenge. The present study was conducted to find out the efficacy of two different techniques for repair of abdominal wall defects. Ten mongrel dogs of both sexes were divided into two equal groups viz. A and B. In group A, abdominal wall defect was repaired by polypropylene mesh and in group B it was repaired by autogenous jejunal graft with intact blood supply. In group A, all dogs were survived and did not show any herniation through operative site. Contrarily, in group B, several postoperative complications were observed. The results of the study indicated that the polypropylene mesh graft is better choice over the autogenous jejunal graft for repair of abdominal wall defects in dogs.

Key words: Mongrel dogs, abdominal wall defect, polypropylene graft, jejunal graft, postoperative complications.

INTRODUCTION

Abnormal protrusion of soft organs through natural or pathological opening in abdominal muscles or wall in which skin remain intact is called hernia. Hernia can be either reducible or irreducible. The irreducible hernia needs special attention as it cannot be treated by simple methods of reduction. This type of hernia requires surgical procedures to rectify the defect. Abdomen is a very delicate part of the body. It is prone to trauma and clinical disorders like malignant soft tissues tumors, abdominal hernias are quite common in both young and mature dogs (Ladurner *et al*. 2001). In massive abdominal wall defects, the use of graft becomes mandatory to achieve desirable results (Iqbal *et al*.1994).

The concept of tension free herniography is a potential resolution of the controversies that have surrounded the subject of hernia surgery for more than a centaury. Certain hernial cases involve massive loss of abdominal muscles which cannot be repaired by simple suturing the apposing muscles, therefore, grafting is the only option for their repair.

Two methods are being used to repair the abdominal wall defects viz. autograft and synthetic grafts. The abdominal cavity provides a tremendous reservoir of auotgenous vascularised tissue which can be exploited in the reconstruction surgery.

Jejunum is the middle part of small intestine supplied by braches of iliac arteries and nerves. Jejunum and ileum are freely moveable as they are suspended from the 1st and 2nd lumber vertebra by relatively long mesentery. That's why it can be mobilized upwards in the thorax to repair the defects of esophagus, pharynx and trachea and down ward in the abdomen.

Utilization of polypropylene mesh discovered 40 years ago and tested since in abdominal wall hernial surgery has become increasingly popular. The use of synthetic mesh for achieving a tension free repair has resulted in significant reduction in post operative pain, length of recovery period and rate of postoperative reoccurrence. Full thickness implants of expended polypropylene mesh graft are being used in the tension free repair of abdominal hernia.

The present study was designed to compare the efficiency of polypropylene mesh graft and jejunal graft for the repair of abdominal wall defect.

MATERIALS AND METHODS

The study was carried on 10 adult dogs of either sex, weighing between 10-20 kg. They were divided in two groups of five animals each i.e. Group A & Group B. Animals of group A were numbered from 1 to 5, where as animals of group B were numbered from 6 to 10.

A thorough physical examination, fecal examination, deworming with Zentil (Mebendazole 200 mg/kg) and niclosamide tablets (20 mg/kg) and bath with primatox for ticks was done. Dogs were vaccinated against rabies. Velosef (Cephradine 25 mg/kg) was given for antibacterial cover. Sedastress (Acepromazine Maleate) @ 0.1 ml/kg was given as pre-aneasthatic, Pentothal sodium (Thiopenton sodium @ 15 mg/kg body wt.) was given slowly for anaesthesia. All standard surgical protocols were observed.

Operative technique: Leparotomy was carried out in both male and female dogs by L-shaped incision in the sub-lumber region mid-way between the last rib and slightly below the level of tuber coxae. The skin, external and internal abdominal and transverse abdominals muscles were transected vertically. The peritoneum and transverse facia were penetrated to expose the abdominal cavity.

In group-B, a loop of mid jejunum was exteriorized through the incision and prepared for graft. In group-A, polypropylene mesh was cut according to the defect created in abdominal wall.

Establishing a Defect: A full thickness (6x3 cm in dimension) incision was established in the right flank. All the muscles in the area were excised. Chromic cat gut suture (No.0) was used to hold the different layers of abdominal wall together.

Preparation of Polypropylene Mesh and Repair in Dogs of Group-A: A large size abdominal wall defect of 6x3 cm was established and covered by polypropylene of same size. (Fig. 1) Mash was sutured using non-absorbable non-irritant prolene suture material, using simple interrupted suture.

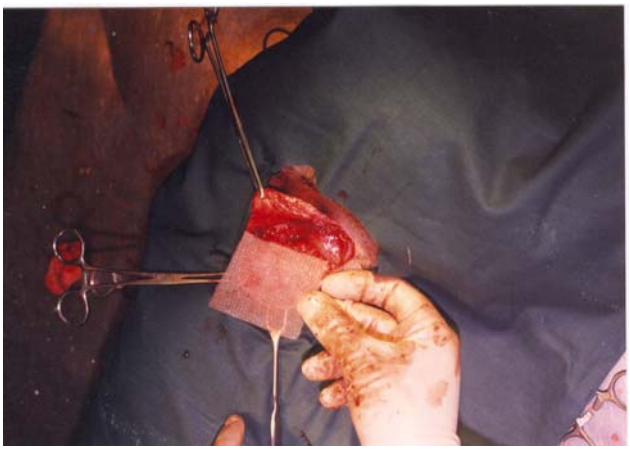

Fig 1: Polypropylene of 6x3 cm.

Preparation of Jejunal Autograft and Repair in Dogs of Group-B: A 10 cm long segment of jejunum was isolated. (Fig. 2) The portion was milked in both peristaltic and anti-peristaltic directions to clear-off the fecal material. The segment of intestine was isolated by two intestinal clamps placed across the intestine. The intestinal wall on each end was transected at 60 degree angle in order to increase the diameter of the cut ends.

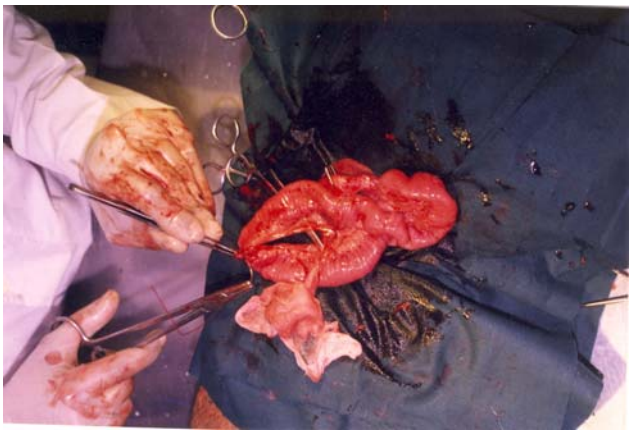

Fig 2: Segment of jejunum was isolated.

The mesenteric walls were carefully excised reserving maximum blood and nerve supply to the isolated segment. A wedge shaped portion of the mesentery wall was released and the gap was closed using simple interrupted sutures. The intestinal continuity was restored by end-to-end anastomosis using 2/0 chromic cat gut simple interrupted crushing sutures. Anastomotic end was checked for any leakage, wrapped in omentum and gently placed in the abdominal cavity.

The jejunal patch was placed over the defect in the abdominal wall with it's mucosal layer which had been scratched with scalpel opposing the external facia. It was then sutured in such a way that inclosing approximated the cut surfaces of the graft and abdominal wall to eliminate the chances of apparent bulking. Simple interrupted suture with No. 2 chromic catgut were used to serve that purpose.

Drainage: Penrose drainage pipes were used in all the cases of jejunal grafting for drainage purpose so that the complications arising from the secretory behavior of the jejunum at its new site could be handled. Same was done in mesh grafting. The drains were fixed with silk sutures. The subcutaneous tissue was apposed using No. 0 chromic catgut suture and skin with simple interrupted silk sutures.

Post-Opreative Care: The operated dogs were kept in kennels. A 5% dextrose and normal saline solution with 2 ml Neurobion (Merck) were administered intravenously from day 0 till day 3 after surgery in Group-B that underwent end-to-end anastomosis. Where as in Group-A where the mesh graft was used, the liquid therapy was instituted only first day.

Post-operative antibiotic cover with velocef (Cephradine) was given for 7 days. Incision line was dressed twice daily with Pyodine (Brooks Pharma) and CNG spray.

Table 1: Medicines used during experiment

Commercial name of material/drugs and conc.	Manufacturer	GENERIC NAME	DOSE	ACTION
Velocef	Bristol-Myers Squibb Pak. Ltd.	Cephradine	25 mg/kg	Antibiotic
Voldos	Bristol-Myers Squibb Pak. Ltd.	Diclofenic-sodium	03 ml/day	Non-steroidal anti-inflammatory drug.
Surgipro- mesh	------	Monofilament Polypropylene mesh	-------	Synthetic mesh
Prolene	Ethicon	Monofilament Polypropylene suture	-------	Non-absorbable suture material
Chromic catgut	Ethicon	Cat-gut	-------	Absorbable suture material
Sedastress	Farvet Pak. Ltd.	Acepromazine Maleate	-0.03 mg/kg	Sedative
Pentothal Sodium	Abbott Lab.	Thiopentone sodium	15 mg/kg	Anesthetic
Zental	Glaxo-Smith-Kline	Mebendazole	200 mg/kg	Anthelmintic
CNG spray	Farvet Pak. Ltd	Chloramphenicol and Neomycin	Sprayed on wound	Antibiotic spray
Neurobion	Merck	Vit. B1,B2 & B12	Once in two days 2 ml/day	Vitamin additive
Pyodine	Brooks Pharme	Povidone iodine	-----	ASD
Niclosamide	Star Lab.	Niclosamide	20mg/kg once	Anthelmintic
Primatox	Prima Industries Pak.	---------	Once	Against Ectoparasites

RSEULTS

The efficacy of the procedure was studied on the following parameters.

CLINICAL OBSERVATION

Temperature: Abdomen is a very delicate part of the body .It is prone to trauma and clinical disorders like malignant soft tissues tumors, abdominal hernias are quite common in both young and mature dogs (Ladurner *et al*. 2001). In massive abdominal wall defects, the use of graft becomes mandatory to achieve desirable results (Iqbal *et al*.1994). A moderate temperature was observed in all the dogs varying from 1-2 F during 48 hrs post surgery. After that the temperature became normal and remained so through out the experimental period in all but dog No. 7 & 9 of Group-B.

Pulse: Slightly increased in all the dogs for first 2-3 days and then became normal.

Appetite: No noticeable change in appetite was observed during the experiment.

Straining during defecation: None of the dog showed straining during defecation.

Consistency of dejecta: In Group-A, dog No. 3 showed constipation for first 1-2 days before it was given normal feeding. The faeces was dry and in form of balls. In Group-B, dog No. 7 & 10 showed diarrhea and dog No. 8 passed bloody faeces and died three days later. None of the dog of Group-A & B showed problem during micturation.

Healing of skin incision: Healing of skin incision was ideal in all the dogs except dog No. 8 which died on 3rd day due to evisceration of intestine.

Vomiting: All the dogs showed normal digestion.

Abdominal pain: In Group-A, dog No. 3 showed abdominal pain. While in Group-B dog No. 6,9 & 10 showed pain on palpation.

Intra-abdominal leakage: In Group-A, no intra-abdominal leakage was seen. But in Group-B, dog No. 8 & 10 showed intra-abdominal leakage.

Sinus tract: Sinus tract developed in dog No. 6 on fold of flank due to removal of penrose pipe.

PRE-EUTHANASIA ASSESSMENT OF GRAFTS

General appearance of site: The polypropylene mesh was intact with abdominal muscles and it appeared reddish as a part of muscle, ready to become platform for fibrosis. The jejunal graft appeared healthy, reddish pink and had a glossy appearance.

Capillary refill time (CRT): Capillary refill time (CRT) in both the groups is given in Table 2.

Table 2: Capillary refill time (CRT) in dog undergoing Polypropylene Mesh and Jejunal Graft

GROUP-A		GROUP-B	
Dog No.	**Polypropylene Mesh Graft CRT/sec. after 3 weeks**	**Dog No.**	**Jejunal Mesh Graft CRT/sec. after 3 weeks**
01	N.T	06	0.75
02	----	07	0.5
03	----	08	N.T
04	----	09	1.75

N.T = Not tested

Adrenal absorption test: Heart rate of all the dogs of Group-B was recorded before the test. A marked increase in heart rate was noticed after the intra-graft injection of adrenaline which indicated the vasoconstriction and survival of jejunal graft. Marked to mild degree of dryness of oral mucosa and pupillary dilation were also noticed after the injection.

Jejunal auto graft resulted into evisceration in dog No. 8 that died three days postoperative showed severe abdominal pain and passed bloody faeces before death. This failure could be due to disruption of anastomosed site. The failure is in agreement with the results of Iqbal *et al*. (1994). In Group-B, dehiscence did occur in dog No. 7 & 8 and in dog No. 7, healing occurred by second intension. Similar results were also reported by Ladurner et. al. (2001), Dinsmore *et al*. (1999) and Chowbey *et al*. (2000).

Table 3: Adrenaline absorption test

Dog No.	HEART BEAT								Dryness of oral mucosa	Pupillary dilation
	Before Inj. T1	After injection T2 1 min	T3 5 min	T4 10 min	T5 15 min	T6 20 min	T7 30 min	T8 60 min		
06	115	122	150	174	190	170	135	110	+++	++
07	110	120	155	180	200	190	156	115	++	+++
08	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T	N.T
09	116	128	165	185	205	185	165	115	+	++
10	122	130	145	170	195	180	140	118	+++	+++
Mean	115	125	154	177	197	181	149	115		

+ = mild; ++ = moderate; +++ = marked; N.T = not tested

Post-euthansia assessment: All the dogs were euthanized after completion of experimental period of 60 days. In Group-A dogs treated with polypropylene mesh, the site of transplantation reveled perfect union at the muscular and polypropylene junction. Mesh was overcome by reddish fibrous tissue and appeared as a part of muscle.

In the dogs of Group-B, the musculo-jejunal junction was intact with proper mesenteric blood supply to the graft. However omental adhesions were noticed in dog No. 7 & 9, where as in dog No. 6 showed intestinal stricture formation.

DISCUSSION

The purpose for this research was to examine the controversies with special attention to mechanical versus degenerative of hernia, traditional tissue approximation repair (Jejunal graft) versus tension free mesh graft.

Jejunal auto graft has been performed in experimentally created wall defect for the repair of abdominal wall defect. The result indicated that a viable intestinal segment could be used to repair the large defect of abdominal wall (Iqbal *et al*., 1994, Greenawalt *et al*. 2000, Franz *et al*. 2001).

The results of polypropylene mesh graft were compared with success rates of other methods documented in literature and it was concluded that polypropylene mesh grafting has several advantages over other techniques in use.

Analysis of results revealed that mesh hernio-graphy has an edge over jejunal grafting in following respects:

- Mesh hernio-graphy is quite easy technique as compared to complex jejunal grafting which is a complex technique.
- Availability of polypropylene is quite easy and it is a sole method in emergency incisional hernia where risk to animal life is involved.
- If we go for auto grafting then there would be double stress to the animal resulting into fluid loss and animal may go into shock resulting in death of the animal.

- Mesh hernio-graphy is less time consuming and doesn't threaten the life of animal.
- In Group-A, polypropylene mesh graft provided 100% healing of the abdominal wall defect.

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