



EVALUATION OF PHYSIOLOGICAL, HAEMATOLOGICAL AND BIOCHEMICAL PARAMETERS IN DOGS AFTER HERNIOPLASTY USING DECELLULARISED BOVINE PERICARDIUM*

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Abstract

Six dogs with hernia on ventral abdomen were surgically treated by hernioplasty using decellularised bovine pericardium. The dogs were having hernia as congenital condition. The animals and on clinical, hematological and biochemical evaluation, animals were confirmed fit for surgery. Under general anaesthesia surgical correction of the hernia was performed, after reduction of hernial contents, the defect was corrected by hernioplasty using decellularised bovine pericardium as an inlay graft. During an observation period of 60 days the physiological, haematological and biochemical parameters showed variations within the normal range except for C-reactive protein in the immediate post-operative period.

Key words : Hernia, Hernioplasty, Bovine pericardium

Hernia, a defect commonly encountered in dogs as an acquired or congenital condition often requires a tension free correction and hernioplasty utilizing

prosthetic meshes satisfies this requirement. The surgical correction of such body wall defects were revolutionized with the development of biological prosthetics. The biologic meshes were brought to lime light due to their ability to resist infection (Kim *et al.*, 2006), form minimum adhesion with the underlying viscera (Decurtins and Buchmann, 1982) and hasten the remodeling of the host.

Human dermis, porcine dermis, porcine small intestinal sub-mucosa etc. are some of these materials. Decellularised bovine pericardium is one such biological prosthetic that has been developed. Experimental studies in rats shown that following implantation in surgically created hernias, decellularised bovine pericardium could induce the regeneration (Suvaneeth, 2013). Even though the application of these biological prosthetics are diverse, literatures showing a systematic study following the application of biological prosthetics are rare. Hence the study was undertaken to clinically evaluate the physiological, haematological and biochemical status following hernioplasty using decellularised bovine pericardium in dogs.

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Materials and Methods

A total of six clinical cases of dogs presented to the Teaching Veterinary Clinical Complex, Mannuthy and University Veterinary Hospital, Kakkalai with hernia on the ventral abdomen were selected irrespective of breed, sex and age.

The dogs selected for the study were subjected to detailed physical examination to confirm the location and nature of hernia. Blood was collected in EDTA vials and serum samples were collected in serum vials with clot activator for haematological and biochemical investigations to assess the status of patient for undergoing surgery. The surgical correction was done under general anaesthesia. The hernial defect was corrected by hernioplasty using decellularised bovine pericardium as an inlay graft.

Post-operatively the surgical site was protected by applying abdominal bandage. Pre-operatively administered injection ceftriaxone @20mg/kg, intravenously and post-operatively administered cephalexin @ 20mg/kg orally for one week along with multi-vitamins. Observations on physiological, haematological and biochemical parameters were made on 7th, 14th, 30th and 60th day post-surgery. Haematological parameters like Total Erythrocyte count, Total Leucocyte count, Differential Leucocyte count, Haemoglobin concentration and Volume of Packed Red Cells were estimated using automatic haemoanalyser while Erythrocyte sedimentation rate using Wintrobe Tube method. Biochemical

parameters like Blood glucose, Total proteins and C-reactive proteins were analyzed using automatic analyzers. The observations on the physiological, haematological and biochemical parameters were analysed statistically using repeated measures ANOVA (Kaps and Lamberson, 2009).

Results and Discussion

The variations in physiological parameters (Table 1) viz. respiration rate, pulse rate and rectal temperature were in the normal range during the observation period.

The haematological parameters (Table 2) like Total erythrocyte count (TEC), Differential leucocyte count (DLC), Haemoglobin concentration (Hb) and Volume of packed red cells (VPRC) showed variations during the post-operative observation period but they were in the normal range. A significant decrease in the total erythrocyte count, haemoglobin concentration and volume of packed red cells were noticed on 7th day and 14th day post-operative. Although a decrease in the levels were noticed on 14th day post-operative when compared to the pre-operative value, the observations showed an increase in value when compared to the 7th day post-operative which was suggestive that the animals were regaining the normal pre-operative status. By 30th day post-operative, all the animals attained their normal pre-operative status. The decrease in the level of the parameters noticed in the first week might be due to the stress from surgery. Most of the animals were off-fed during the immediate post-operative period which might

Table 1. Observations on physiological parameters

Parameter and unit	Days of observation					p-value
	Pre-operative	Post-operative				
	Day zero	7 th day	14 th day	30 th day	60 th day	
Respiration rate (per min)	22.00 ± 0.73	22.33 ± 0.33	21.667 ± 0.62	21.00 ± 0.68	21.00 ± 0.68	0.515
Pulse rate (per min)	93.17 ± 0.79 ^a	98.50 ± 0.500 ^b	96.00 ± 0.730 ^a	95.50 ± 0.806 ^c	93.33 ± 0.49 ^a	<0.01
Rectal temperature (°F)	101.80 ± 0.89	102.03 ± 0.21	101.87 ± 0.84	101.87± 0.42	101.90 ± 0.45	0.105

Means bearing different letters as superscripts within a row differ significantly ($p > 0.05$)

Table 2. Observations on haematological parameters

Parameter and unit		Days of observation					p-value
		Pre-operative	Post-operative				
			Day zero	Seventh day	14 th day	30 th day	
Total erythrocyte count (10 ⁹ /cumm)		7.07 ± 0.67 ^a	5.93 ± 0.05 ^b	6.50 ± 0.05 ^c	6.92 ± 0.05 ^a	6.95 ± 0.06 ^a	<0.01
Total leucocyte count (10 ³ /cumm)		9.82 ±104.62 ^a	15.40±81.65 ^b	13.63±314.55 ^c	10.05±91.19 ^a	9.97± 80.28 ^a	<0.01
Differential leucocyte count (%)	N	71.50 ± 0.43 ^a	91.00 ± 0.37 ^b	76.50 ± 0.56 ^c	71.00 ± 0.37 ^a	70.33 ± 0.21 ^a	<0.01
	L	26.17 ± 0.31 ^a	7.83 ± 0.31 ^b	22.00 ± 0.37 ^c	27.00 ± 0.37 ^a	28.00 ±0.37 ^a	<0.01
	E	2.33 ± 0.21 ^a	1.17 ± 0.17 ^b	1.50 ± 0.22 ^b	2.00 ± 0.26 ^a	1.67 ± 0.21 ^a	0.023
Haemoglobin (g)		15.05±0.08 ^a	12.58± 0.24 ^b	13.97± 0.07 ^c	15.08 ± 0.06 ^a	15.02±0.02 ^a	<0.01
Volume of packed red cell (%)		43.33 ± 0.49 ^a	39.00 ± 0.37 ^b	42.67 ±0.49 ^a	43.33 ± 0.42 ^a	43.17 ±0.54 ^a	<0.01
Erythrocyte sedimentation rate (mm/h)		7.67 ± 0.21 ^a	9.67 ± 0.33 ^b	8.33 ± 0.21 ^a	7.67 ± 0.21 ^a	7.50 ± 0.24 ^a	<0.01

Means bearing different letters as superscripts within a row differ significantly ($p > 0.05$)

Table 3. Observations on biochemical parameters

Parameter and unit	Days of observation					p-value
	Pre-operative	Post-operative				
	Day zero	7 th day	14 th day	30 th day	60 th day	
Blood glucose (mg/dl)	82.67 ± 0.62 ^a	83.83 ± 0.48 ^a	85.33 ± 0.42 ^b	88.00 ± 0.68 ^c	86.83 ± 0.65 ^c	<0.01
Serum total proteins (g/L)	6.47 ± 0.14 ^a	6.12 ± 0.07 ^b	6.62 ± 0.15 ^a	6.45 ± 0.09 ^a	6.50 ± 0.09 ^a	<0.01
C-reactive protein (mg/L)	4.11 ± 0.22 ^a	8.67 ± 0.08 ^b	5.65 ± 0.09 ^c	4.32 ± 0.08 ^a	4.23 ± 0.07 ^a	<0.01

Means bearing different letters as superscripts within a row differ significantly ($p > 0.05$)

have deteriorated the general health status of the animals. Once the animals were recovered from the surgical stress they regained the normal appetite that led to the increase in the counts to pre-operative levels.

The decrease in the haemoglobin concentration observed during the post-operative period was in accordance with the observation that was made by Senthilkumar (2000) following hernioplasty using processed oesophageal allografts in pigs. Erythrocyte sedimentation rate (ESR) showed a significant increase during the first post-operative observation on 7th day. The significant increase observed might have been due to the inflammatory response seen during the immediate post-operative period. The cellular reactions which occur as a result of healing

following surgery might have been the possible reason which would have led to the variations that was observed in the haemogram (Parker, 1985).

The total leucocyte count (TLC) was elevated during the first week post-operative. Zardo *et al.* (2011) made a similar observation in human patients who had undergone diaphragmatic hernial repair with bovine pericardium where elevation in the level of the total leucocyte count was noticed between day 4 and day 7 post-operative. The total leucocyte count returned to that of the pre-operative period 30th day post-operative. The neutrophil count was also seen to increase with the total leucocyte count and the neutrophil count returned to the pre-operative level by 30th day post-operative. The sudden increase in the

total leucocyte count with increase in neutrophil might be due to the surgical procedure and subsequent inflammatory response. The reduction in the levels of total leucocyte count to the normal range suggested no systemic infection following the implantation of the bovine pericardial graft.

Blood glucose, serum total proteins and C-reactive proteins were monitored during the observation period (Table 3). C-reactive proteins showed a significant increase in level during the seventh post-operative day. The increase in the level of C-reactive protein was in accordance with the observation of Zardo *et al.* (2011), wherein elevated C-reactive protein values were noticed between day 4 and day 7 of the post-operative period.

The serum total proteins showed a slight decrease in level during the seventh post-operative day. The decrease in level might be due to the stress from surgery. Blood glucose levels were maintained within the normal range during the entire observation period. The results of the study suggested that decellularised bovine pericardium did not bring about any marked variations in physiological, haematological and biochemical parameters when used as a biological tissue substitute for hernioplasty in dogs.

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