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Haemato biochemical changes in canines with respect to laparotomy wound closure using absorbable suture materials

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Abstract
Comparative evaluation of chromic catgut, Polyglycolic acid (PGA), Polyglactin 910 (PG 910) and Polydioxanone (PDS) absorbable sutures for laparotomy wound closure in canines were studied. Laparotomy was conducted for Ovariohysterectomy. There was non-significant difference in Physiological (Respiratory rate, Heart rate and Rectal temperature) and Haematological parameter (TEC, Hb, PCV, TLC). Group III animal had lesser neutrophil count when compared to group I and group IV animals, at 48 hours interval highest neutrophilia was observed in group IV animal followed by group I, group III and group II animal respectively. However, the neutrophil counts on 14th day fluctuated within normal physiological limit. The group III animal had relative lymphocytopenia when compared to group I and group II animal. On 14th day relative lymphocytopenia revealed only in group IV animal. There was significant (P≤0.01) increase in aspertate aminotransferase level in all the groups of animal on 14th day when compared to 0 hours. The increased level was within the physiological limit in group II and IV animals. Group I and group III animal had higher aspertate aminotransferase level than the normal physiological limit. There was significant (P≤0.05) increase in lactate dehydrogenase level in all the groups of animal when compared to pre-operative level. However, the level of lactate dehydrogenase remained within the normal physiological limit in all the groups of animal. The comparison of creatine phosphokinase (CPK) between the group showed that, group II animals had significantly (P≤0.05) lower CPK level when compared to group I animal. The group I animal had significantly (P≤0.05) lower creatine phosphokinase when compared to group III and group IV animals.

Keywords: Laparotomy, sutures, haematobiochemical, canine

Introduction
Sutures serve to maintain the tissue approximation until a wound attains sufficient tensile strength to prevent dehiscence during normal physiological activity (Wallace *et al*., 1970) [13]. Absorbable sutures are those that undergo degradation and rapid loss of tensile strength within 60 days (Bennett, 1988) [3] Synthetic absorbable sutures are now being widely accepted (Kobayashi *et al*., 1981) [8]. References to available literature revealed that very less systematic work has been carried out to study haemato biochemical changes in canines with respect to laparotomy wound closure using different absorbable suture materials. Therefore the present study was undertaken to compare chromic catgut, polyglycolic acid (PGA), polyglactin 910 (PG 910) and polydioxanone (PDS) sutures for laparotomy wound closure in canines.

Materials and Methods
The present study was conducted in 24 clinical cases of canine which were presented to the Department of Surgery and Radiology, Veterinary College Bidar and Agriculture Product Marketing centre (APMC) Hospital Bidar for ovariohysterectomy. The animals were randomly divided into four groups of six animals each (group I, II, III and IV). Animals were premedicated with atropine sulphate @ 0.045 mg/kg body weight i/m. Xylazine hydrochloride @ 1 mg/kg and ketamine @ 10 mg/kg mixture in a single syringe administered as single induction bolus and anesthesia maintained with incremental doses of xylazine - ketamine anesthesia by i/v route given ‘to effect’. The animals were placed in left lateral recumbency. The surgical site was prepared as per standard procedure. The site of incision was drapped. Oblique incision was made at surgical site (three finger width caudal to the last rib and ventral to lumbar transverse process) the right flank laparotomy was done.

The right uterine horn was located by means of the index finger, through this right ovary, uterine bifurcation and the left ovary were subsequently approached, ligated and removed from the stump using three artery forceps technique as described by (Kumar 1979) [9]. Abdominal wall closed with routine procedure *viz*., peritoneum and transverse abdominus muscle closed by simple continuous suture pattern, obliques abdominus internus and obliques abdominus externus muscle together by interrupted suture pattern, using chromic catgut no 1, PGA no1, PG 910 no 1 and PDS no1 in group I, II, III and IV respectively. Skin wound was approximated by simple interrupted suture using nylon suture material. Post-operatively ceftriaxone sodium was administered @ 25 mg/kg body weight i/v b.i.d, anti-inflammatory meloxicam @ 0.2 mg/kg i/m to all dogs for three days. Surgical wound was dressed on alternative days using povidone iodine ointment till satisfactory wound healing was observed. Obliques abdominus externus muscle biopsy was collected before suturing (zero day) and on 14th day after suturing by using puch biopsy at the site of suture under xylazine – ketamine anesthesia. Using disposable syringes with aseptic measures two ml of blood sample was drawn from cephalic vein and collected in EDTA vials for estimation of haemogram and leukogram. Blood sample were collected on 0 hours and 24 hours, 48 hours, 72 hours and 14th days after the surgery. For biochemical analysis blood samples were collected in serum vacutaner, before surgery and on 14th day after surgery.

Results and Discussion

Total erythrocyte count (million cells/micro litre)

Table 1: Mean ± SE., values of Total erythrocyte count (million cells/micro litre) in different groups of animals at different intervals

Groups	0 hours	24 hours	48 hours	72 hours	14th day
I	5.79 ±0.38 ^{a}	5.22 ±0.44 ^{a}	5.09 ±0.39 ^{a}	5.27 ±0.35 ^{a}	6.17 ±0.52 ^{a}
II	6.10 ±0.65 ^{a}	4.92 ±0.43 ^{a}	5.50 ±0.43 ^{a}	5.38 ±0.44 ^{a}	6.81 ±0.61 ^{a}
III	6.57 ±0.51 ^{a}	5.51 ±0.34 ^{a}	5.54 ±0.25 ^{a}	5.71 ±0.33 ^{a}	6.35 ±0.55 ^{a}
IV	6.64 ±0.34 ^{a}	5.84 ±0.30 ^{a}	6.05 ±0.31 ^{a}	6.19 ±0.38 ^{a}	6.85 ±0.40 ^{a}

a= Means bearing superscript a, differs significantly (p≤0.05) between groups I and II and groups III and IV at corresponding intervals.

There was no significant change in total erythrocyte count between pre-operative period to different post-operative intervals in group I, group II, group III and group IV animals.

Haemoglobin (g/dl)

Table 2: Mean ± SE., values of haemoglobin (g/dl) in different groups of animals at different intervals

Groups	0 hours	24 hours	48 hours	72 hours	14th day
I	13.68±1.08 ^{a}	12.31 ±1.26 ^{a}	12.15 ±1.30 ^{a}	12.73 ±1.31 ^{a}	13.59 ±1.40 ^{a}
II	12.46±0.81 ^{a}	9.90 ±0.69* ^{a}	11.05±0.65	10.90 ±0.76 ^{a}	12.15 ±0.62 ^{a}
III	12.86 ±1.03 ^{a}	11.58 ±0.84 ^{a}	11.48 ±0.62 ^{a}	11.61 ±0.67 ^{a}	12.63 ±0.99 ^{a}
IV	12.36 ±0.67 ^{a}	11.65 ±0.72 ^{a}	11.55 ±0.72 ^{a}	11.85 ±0.73 ^{a}	12.33 ±0.56^{a}

*= Means bearing superscript differs significantly (p≤0.05) from 0 hours within the group.
a= Means bearing superscript a, differs significantly (p≤0.05) between groups I and II and groups III and IV at corresponding intervals.

In all the groups of animals there was decreased haemoglobin level at all the post- operative interval of study when compared to pre-operative level. This could be attributed to minor blood loss during surgery or fluid retention and haemodilution post-operatively (Millis *et al*, 1992) [10].

Packed cell volume (%)

Table 3: Mean ± SE., values of Packed cell volume (%) in different groups of animals at different intervals

Groups	0 hours	24 hours	48 hours	72 hours	14th day
I	41.75±1.36 ^{a}	37.65 ±1.77 ^{a}	37.35±1.76 ^{a}	38.01±1.45 ^{a}	40.46 ±1.59 ^{a}
II	41.20 ±3.28 ^{a}	34.48 ±0.31 * ^{a}	36.91 ±2.81 ^{a}	34.50±3.08 ^{a}	39.30 ±2.02 ^{a}
III	42.13 ±3.46 ^{a}	38.63 ±2.32 ^{a}	37.73 ±1.11 ^{a}	39.05 ±1.96 ^{a}	41.63 ±2.44 ^{a}
IV	39.38 ±1.16 ^{a}	37.93 ±0.80 ^{a}	38.26 ±0.74 ^{a}	37.63 ±0.56 ^{a}	38.18 ±0.74 ^{a}

*= Means bearing superscript differs significantly (p≤0.05) from 0 hours within the group.
a= Means bearing superscript a, differs significantly (p≤0.05) between groups I and II and groups III and IV at corresponding intervals.

In all the groups of animals there was decreased Packed cell volume level at all the post-operative interval of study when compared to pre-operative level. This could be attributed to minor blood loss during surgery or fluid retention and haemodilution post- operatively (Millis *et al*, 1992) [10].

Total leukocyte count (thousands cells/ micro litre)

Table 4: Mean ± SE., values of Total Leukocyte Count (thousand cells/micro litre) in different groups of animals at different intervals

Groups	0 hours	24 hours	48 hours	72 hours	14th day
I	14.76 ±2.67 ^{a}	26.38 ±2.81* ^{a}	26.15 ±4.85 ^{a}	21.95 ±3.08 ^{a}	13.48 ±1.97 ^{a}
II	18.90 ±3.16 ^{a}	32.10 ±3.40* ^{a}	26.43 ±3.68 ^{a}	22.25 ±3.22 ^{a}	16.52 ±2.40 ^{a}
III	14.76 ±1.14 ^{a}	36.40 ±3.94** ^{a}	28.71 ±3.82** ^{a}	26.35 ±3.23** ^{a}	14.55 ±1.13 ^{a}
IV	10.61 ±0.89 ^{a}	33.00±2.47* * ^{a}	28.31 ±1.94** ^{a}	21.67±2.19** ^{a}	10.96 ±0.79 ^{a}

*= Means bearing superscript * differs significantly (p≤0.05) from 0 hours within the group
** = Means bearing superscript **differs significantly (p≤0.01) from 0 hours within the group
a= Means bearing superscript a, differs significantly (p≤0.05) between groups I and II and groups III and IV at corresponding intervals

The total leukocyte was statistically significant at 24 hours when compared to 0 hours in group I and group II animals. Whereas, group III and group IV animal showed that there was severe leukocytosis between 24 to 72 hours when compared to pre-operative level. This could be attributed to surgical stress and tissue damage (Coles, 1986; Benjamin, 2001) [4, 2]. These results were in accordance with (Schmidt and Booker 1982) [11]; Dharmaceelan *et al.* (2000) [6] also found significant increase in total leukocyte count on post-operative day.

Neutrophils (%)

Table 5: Mean ± SE., values of Neutrophils (%) in different groups of animals at different intervals

Groups	0 hours	24 hours	48 hours	72 hours	14th day
I	65.33 ±1.38 a	76.00±0.85** a	76.40 ±1.27** a	74.50 ±5.45 b	66.67 ±3.61 b
II	63.43 ±2.34 b	65.38 ±1.74* b	69.43 ±2.53** b	71.36 ±2.58** a	64.23 ±1.78 a
III	64.67 ±4.98 a	67.33 ±0.58* c	71.83 ±0.51** a	77.67 ±2.60* b	69.50 ±4.95 c
IV	67.83 ±1.57 a	74.50 ±2.02* a	81.00 ±1.88** c	84.00 ±1.03** c	72.00 ±1.52 b

*= Means bearing superscript * differs significantly (p≤0.05) from 0 hours within the group.
**= Means bearing superscript **differs significantly (p≤0.01) from 0 hours within the group
Means bearing different superscript, differs significantly (p≤0.05) between the group at different intervals.

There was neutrophilia in the group I, group II, group III and group IV animals between 24 to 72 hours. The neutrophil level by 14th day has reached normal in all the groups of animals. This could be attributed to response of body to surgical trauma, tissue manipulation and inflammation (Coles, 1986)[4];(Benjamin, 2001)[2] (Millis *et al.* 1992)[10] found neutrophilia at 24 hours following ovariohysterectomy in bitches. However, (Dharmaceelan *et al.* 2000)[6] reported no significant change in neutrophil count after operation.

Lymphocyte (%)

Table 6: Mean ± SE., values of Lymphocyte (%) in different groups of animals at different intervals

Groups	0 hours	24 hours	48 hours	72 hours	14th day
I	27.60 ±1.47 a	17.83 ±0.87** a	17.16±0.94** b	21.00 ±3.60 c	29.16 ±3.97 b
II	26.57 ±2.31 a	25.45 ±3.21 b	20.91±2.98** c	16.31 ±2.33** c	29.28 ±3.13** b
III	27.16 ±4.46 a	23.83 ±3.77 a	17.67 ±3.13** b	13.00 ±2.59* b	23.00 ±4.33* b
IV	23.00 ±1.34 a	16.33 ±1.81 a	11.50 ±1.82* a	9.16 ±1.22* a	18.83 ±2.18* a

*= Means bearing superscript * differs significantly (p≤0.05) from 0 hours within the group.
**= Means bearing superscript **differs significantly (p≤0.01) from 0 hours within the group.
Means bearing different superscript, differs significantly (p≤0.05) between the group at different intervals.

There was lymphocytopenia in group I, group II, group III and group IV animals between 24 to 72 hours. This could be attributed to body response to systemic stress (Benjamin 2001)[2]. (Millis *et al.* 1992)[10] found lymphocytopenia at 24 hours after ovariohysterectomy in bitches. (Dharmaceelan *et al.* 2000)[6] observed lymphocytopenia during surgery and lymphocytosis during post-operative day.

Eosinophils (%)

Table 6: Mean ± SE., values of Eosinophils (%) in different groups of animals at different intervals

Groups	0 Hours	24 hours	48 hours	72 hours	14 th day
I	2.33±0.42a	2.16±0.30 a	2.33±0.42 a	0.67±0.33 a	2.33±0.42 a
II	3.00±0.57 a	2.50±0.49 a	3.33±0.67 a	3.50±0.49 a	1.16±0.16 a
III	3.30±0.42 a	3.83±0.60 a	4.67±0.42 a	3.83±0.65 a	4.00±0.57 a
IV	4.83±0.60 a	5.00±0.57 a	4.16±0.83 a	4.16±0.60 a	4.83±0.60 a

a= Means bearing superscript a, differs significantly (p≤0.05) between groups I and II and groups III and IV at corresponding intervals

The eosinophil count of group I, group II, group III and group IV animals remained within normal physiological limits

Monocyte (%)

Table 7: Mean ± SE., values of Monocyte (%) in different groups of animals at different intervals

Groups	0 Hours	24 hours	48 hours	72 hours	14th day
I	4.67±0.71a	4.00±0.73 a	4.00±0.73 a	3.83±1.75 a	1.83±0.30 a
II	7.00±1.39 a	6.67±1.08 a	6.33±1.11 a	8.83±1.70 a	5.33±0.88 a
III	4.01±0.67 a	5.00±0.44 a	5.83±0.60 a	5.50±0.56 a	3.50±0.42 a
IV	4.33±0.67 a	4.16±0.60 a	3.33±0.42 a	2.67±0.49 a	4.33±0.71 a

a= Means bearing superscript a, differs significantly (p≤0.05) between groups I and II and groups III and IV at corresponding intervals

The monocyte count in all the groups of animal remained within normal physiological limits.

Biochemical parameters
Aspertate Aminotransferase (IU/L)

Table 8: Mean ± SE., Aspertate Aminotransferase (IU/L) in different groups of animals at different intervals

Groups	0 Hours	14th day
I	28.46±3.21	99.68 ±19.53** b
II	30.70±3.81	59.56 ± 10.47* a
III	42.08±6.76	84.53 ±5.60** b
IV	35.83±3.85	55.96 ±2.70** a

*= Means bearing superscript * differs significantly (p≤0.05) from 0 hours within the group.
**= Means bearing superscript **differs significantly (p≤0.01) from 0 hours within the group.
a, b = Means bearing superscript a, b differs significantly (p≤0.05) between groups I and II and groups III and IV at corresponding intervals.

There was increase in aspertate aminotransferase level in all the groups of animal on 14th day when compared to pre-operative period (0 hours). The increased level was within the physiological limits in group II and group IV animals. Group I and group III animal had higher aspertate aminotransferase level than the normal physiological limit. The increased aspertate aminotransferase lavel might be due to increased in body temperature due to stress in animals as reported by (Deswal and chohan 1981) [5].

Lactate Dehydrogenase (IU/L)

Table 9: Mean ± SE., values of Lactate Dehydrogenase (IU/L) in different groups of animals at different intervals

Groups	0 hours	14th day
I	102.11 ±20.36 a	195.16 ±13.21** a
II	125.92 ±19.62 a	208.13 ±19.23** b
III	112.74 ±9.71 a	148.59 ±8.48* c
IV	108.30 ±7.64 a	155.32 ±16.43* c

*= Means bearing superscript * differs significantly (p≤0.05) from 0 hours within the group.
**= Means bearing superscript **differs significantly (p≤0.01) from 0 hours within the group.
Means bearing different superscript, differs significantly (p≤0.05) between the group at different intervals.

There was increased lactate dehydrogenase level in group I, group II, group III and group IV animals when compared to pre-operative level. However, the level of lactate dehydrogenase remained within normal physiological limits in all the groups of animals. The increased lactate dehydrogenase level might be due to increased body temperature (Spur 1972) [12]. The increased lactate dehydrogenase level was also due to temperature stress in animals (Deswal and Chohan 1981) [5].

Creatine Phosphokinase (IU/L)

Table 10: Mean ± SE., values of Creatine Phosphokinase (IU/L) in different groups of animals at different intervals

Groups	0 hours	14th day
I	70.99±7.65	168.79 ±25.26** b
II	66.35±5.07	160.61 ±24.94** a
III	78.93±2.78	250.51 ±29.59** c
IV	69.92±7.57	172.88 ±5.13** c

**= Means bearing superscript **differs significantly (p≤0.01) from 0 hours within the group.
Means bearing different superscript, differs significantly (p≤0.05) between the group at different intervals.

There was increased Creatine Phosphokinase level in group I, group II, group III and group IV animals when compared to pre-operative level. However, the level of creatine phosphokinase remained within normal physiological limits in all the groups of animals. Cretine Kinase was sensitive and specific indicator of muscle damage in dogs and horse (Gerber 1964) [7]. Creatine kinase was not a predictable indicator of surgical stress (Austain *et al.*, 2003) [1].

Conclusion

From the present study, it can be concluded that suture material alone in laparotomy wound closure not effected on haemato biochemical changes in canine. All the haematobiochemical value fluctuated within normal physiological limits.

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