Comparative Studies on Utility of Different Types of Suturing Materials for Repairing Peritoneum and Muscles in Laparotomy Incision in Goats (Capra hircus)



THESIS

SUBMITTED TO THE

RAJENDRA AGRICULTURAL UNIVERSITY

PUSA (SAMASTIPUR) BIHAR

(FACULTY OF POST-GRADUATE STUDIES)

In partial fulfilment of the requirement FOR THE DEGREE OF

Master of Veterinary Science

IN

VETERINARY SURGERY AND RADIOLOGY

Bν

Dr. Archana Kumari

Reg. No. - M/VSR/62/2000-2001

DEPARTMENT OF VETERINARY SURGERY AND RADIOLOGY BIHAR VETERINARY COLLEGE

PATNA-800 014

2003

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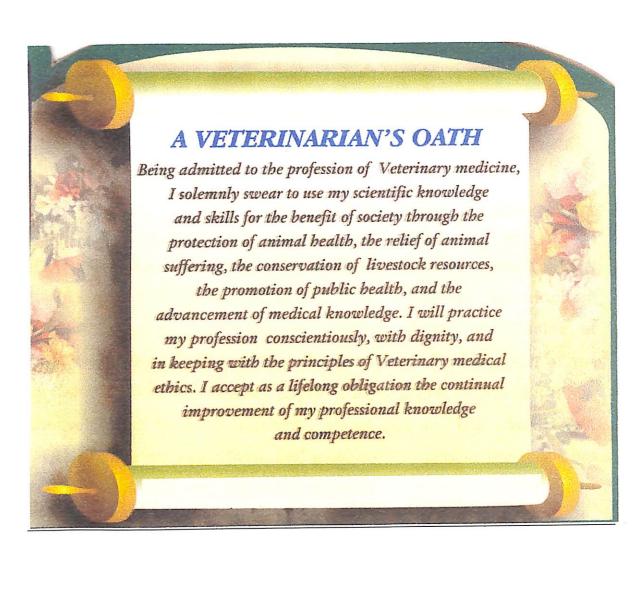
Dedicated to

Benevolent adorable parents

Ram Prakash Das

Smt. Bimla Devi

1.8



DEPARTMENT OF VETERINARY SURGERY AND RADIOLOGY

Bihar Veterinary College, Patna-800014 Rajendra Agricultural University, Pusa, Bihar

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M.V.Sc., Ph.D. Head & Associate Professor Deptt. of Veterinary Surgery & Radiology Bihar Veterinary College, Patna-800014

CERTIFICATE - I

This is to certify that the thesis entitled "COMPARATIVE STUDIES ON UTILITY OF DIFFERENT TYPES OF SUTURING MATERIALS FOR REPAIRING PERITONEUM AND MUSCLES IN LAPAROTOMY INCISION IN GOATS (Capra hircus)" submitted in partial fulfillment of the requirement for the degree of "Master of Veterinary Science (Veterinary Surgery and Radiology)" of the faculty of Post-Graduate Studies, Rajendra Agricultural University, Bihar, is the record of bonafide research carried out by DR. ARCHANA KUMARI, under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

It is further certified that such help or informations received during the course of this investigation and preparation of the thesis have been duly acknowledged.

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CERTIFICATE - II

We, the undersigned, members of the Advisory Committee of DR. ARCHANA KUMARI, a candidate for the degree of Master of Veterinary Science with major in Veterinary Surgery and Radiology, have gone through the manuscript of the thesis and agree that the thesis entitled "COMPARATIVE STUDIES ON UTILITY OF DIFFERENT TYPES OF SUTURING MATERIALS FOR REPAIRING PERITONEUM AND MUSCLES IN LAPAROTOMY INCISION IN GOATS (Capra hircus)" may be submitted by DR. ARCHANA KUMARI in partial fulfillment of the requirements for the degree.

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I GRATEFULLY ACKNOWLEDGE THE FINANCIAL ASSITANCE PROVIDED BY

THE RAJENDRA AGRICULTURAL UNIVERSITY
PUSA

IN THE FORM OF RESEARCH FELLOWSHIP DURING THE PERIOD OF PRESENT STUDY

AUTHOR

ACKNOWLEDGEMENT

I feel privileged in expressing my sincere thanks, gratitude and indebtedness to my major advisor, Dr. Surendra Sharma, M.V.Sc., Ph.D., Associate Professor and Head, Department of Veterinary Surgery and Radiology, Bihar Veterinary College, Patna, for his meticulous planning, inspiring guidance, erudite suggestions, untiring close supervision, constant encouragement, constructive and inspirational criticism and keen interest in the execution of the present work and during the preparation of manuscript.

My feelings are incapable in translating my deep indebtedness to my advisory committee members, Dr. C. Jayachandran, Associate Professor, Department of Veterinary Pharmacology & Toxicology, Dr. Krishna Gopal Mandal, Asst. Professor, Department of Animal Breeding & Genetics and Dr. Basant Kumar Sinha, Associate Professor & Head, Department of Veterinary Microbiology for their painstaking supervision during entire course of investigation which made it possible to transform my endeavour into success.

I am thankful to Dr. M. K. Roy retired Associate Professor, Department of Veterinary Anatomy and Histology, Bihar Veterinary College, Patna for his erudite suggestions and close supervision during research work specially during histological studies. I am also grateful to Dr. L. N. Prasad, retired Associate Professor, Department of Veterinary Pathology, Dr. Damodar Kr. Singh, retired Associate Professor, Dept. of

Veterinary Surgery and Radiology, Bihar Veterinary College, Patna, for his erudite suggestions.

I sincerely acknowledge the selfless help and assistance extended by Sunil jee, Ramu jee, Jagat jee, Ramchandra jee, Rajkumar jee and Surendra jee during the course of research work.

My sincere indebtedness goes to Dean-cum-Principal, Bihar Veterinary College, Patna for providing facilities required for research work. I am indebted to Vice Chancellor, Rajendra Agricultural University, Pusa, who has provided adequate facilities for the research work and above all fellowship granted by R.A.U., Pusa, during the course of study.

I am grateful to Dr. Rajani, Dr. Birendra, Dr. Sushma L. Bauxla, Dr. Milli, Dr. G. C. Arya, Dr. Sushma Kumari and Rinki (2001) for their untiring cooperation, suggestion, exultant and enviable company, selflessness persuasion, firm faith and giving me actual inspiration to do this work are not to be reciprocated in words, but are to be felt in the deepest layers of my heart, with the greatest love and regards, without their help it seems impossible for me to complete this work. I would like to convey my sincere thanks to my colleague Dr. R. K. Diwedi, Dr. Dharmendra, Dr. Lugun, Dr. Avinash, Dr. Raman, Dr. Shasikala, Dr. Mukesh, Dr. Smita and Dr. Archana all other friends for their friendly cooperation throughout the study. I sincerely acknowledge the encouragement and selfless help extended by Dr. Roshan Kamal Topono (MBBS) and Tigga Aunty.

All the words in the lexicon will be futile and less meaningful, if I fail to express my heartfelt sentiments towards my revered father Sri Ram Prakash Das and affectionate mother Smt. Bimla Devi whose lovely inspiration, eternal blessing, affection, benevolence patience and pains who stride hard and encouraged me to achieve this objective even at the cost of their own comfort.

I shall be failing in my duties, if I do not record works of deep reverence, gratitude and affection towards my borthers, Dr. Chandroday Kr. Anand (M.B.B.S) and Suryoday Kr. Anand and sister Arpana Anand whose wishes always proved to be strong feather against all currents.

Thanks are also to Rajeev jee, Anit and Azam of Srishti Computers, Ashok Rajpath, Patna-4, for their ever available assistance and final shaping of this thesis.

In spite of everything, its an unavertable truth that without a God grace even a leaf can't swing; so I extend my eternal gratitude from the bottom of my heart to God for blessing me wit, patience and strength to accomplishment of this endeavour.

Last but not least, I express my gratitude to all who directly or indirectly help me in thins effect.

Date: 6-12-03

Place: PATNA

(Archana Kumari)

CONTENTS

S. No.	Description	Page Nos.
1.	Introduction	1 – 4
2.	Review of Literature	5 – 26
3.	Materials & Methods	27 – 34
4.	Observations and Results	35 – 63
5.	Discussion	64 – 71
6.	Summary and Conclusions	72 – 74
7.	Bibliography	i – xvi

LIST OF FIGURES

Fig.	Description	Page
No.		No.
1.	Photograph showing prepared she goat prior to surgery.	43
2.	Photograph showing dullness in she goat after five minutes induction of general anaesthesia prior to surgery.	43
3.	Photograph showing performed laparotomy in she goat.	44
4.	Photograph showing the starting stage of repairing the peritoneum and muscles after laparotomy.	44
5.	Photograph showing peritoneum and muscles repaired with 2/0 black braided silk.	45
6.	Photograph showing closure of skin and subcutaneous incision in horizontal halsted fashion with 2/0 black braided silk.	45
7.	Photograph showing a protective bondage on the line of repaired incision.	46
8.	Photograph showing normal healing and health of she goat on 30 th post-operative day. (Goat No. 8, 19, 16 sutured with catgut, cotton and silk thread).	46
9.	Photograph showing normal grazing of a she goat on 30 th day, after laparotomy (Goat No. 27 sutured with cotton thread).	47
10.	Photograph showing normal urination and health of operated she goat on 30 th day, after laparotomy (Goat No. 8 sutured with chromic catgut).	47
11.	Photomicrograph showing unabsorbed chromic catgut suturing material surrounded by inflammatory cells and connective tissue fibres on 10 th post-operative day of laparotomy. (H & E; 150X)	48
12.	Photomicrograph showing line of repair with the help of weak collagen network between two margins of cut abdominal muscle repaired with chromic catgut, on 10 th post operative day, after laparotomy (H & E; 150X).	48

13.	Photomicrograph showing regeneration of collagen fibres along with inflammatory cells at the site, repaired with chromic catgut, on 20 th post-operative day, after laparotomy. (V.G.; 150X)	49
14.	Photomicrograph showing replacement of chromic catgut by collagen tissues, on 30 th post-operative day, after laparotomy (H & E; 150X)	49
15.	Photomicrograph showing the repair of the site of operation with help of production of collagen fibres, on 30 th post-operative day, after laparotomy (V.G.; 150 X).	50
16.	Photomicrograph showing the distribution of inflammatory cells surrounded by ring like fibrous tissue around the silk suturing material on 10 th post-operative day, after laparotomy (H & E; 150X).	50
17.	Photomicrograph showing the distribution of inflammatory cells surrounded by ring like fibrous tissue around the silk suturing material on 20 th post-operative day, after laparotomy (H & E; 150X).	51
18.	Photomicrograph showing the collagen fibres around silk thread, 30 th post operative day of laparotomy (V. G.; 150X).	51
19.	Photomicrograph showing inflammatory cells at the site repaired with cotton suture, on 10 th post-operative day of laparotomy (V.G.; 150X).	52
20.	Photomicrograph showing the site of adhesion between the peritoneum and abdominal muscle repaired with cotton sutures on 20 th post-operative day of laparotomy (V.G.; 150X).	52
21.	Photomicrograph showing unabsorbed cotton suturing material separated by a ring like arrangement of collagen fibres, on 20th post-operative day of laparotomy (V.G.; 150X)	53
22.	Photomicrograph showing distribution of inflammatory cells at the site of repair on 30 th post-operative day of laparotomy (H & E; 150X).	53
<u> </u>		

LIST OF TABLES

Table	Description	Page
No.		No.
1.	Design of Experiment	
2.	Mean ± S.E. and C.V.% of body temperature (°F) in female goats in consequence of laparatory wound healing.	55
3.	Analysis of variance for the effect of suture material used in laparotomy on body temperature in female goats.	56
4.	Mean ± S.E. and C.V.% of pulse rate in female goats in consequence of laparotomy wound healing.	58
5.	Analysis of variance for the effect of suture material 59 used in laparotmy on pulse rate in she goats.	
6.	Mean ± S.E. and C.V.% of respiration / minute in female goats in consequence of laparotomy wound healing.	61
7.	Analysis of variance for the effect of suture materials used in lapartomy on respiration rate in she goats	62

LIST OF GRAPHS

Graph No.	Description	
1.	Histogram showing mean body temperature (°F) in female goats in consequence of lapratomy wound healing.	
2.	Histogram showing mean pulse rate (/minute) in female goats in consequence of lapratomy wound healing.	
3.	Histogram showing mean respiration rate (/minute) in female goats in consequence of lapratomy wound healing.	



ABBREVIATION AND SYMBOLS FREQUENTLY USED

@ : At the dose rate

C.D. : Critical Difference

Cm : Centimetre

C.V. : Coefficient of Variation

D.F. : Degree of Freedom

et al. : Any others

⁰F : Degree in Fahrenheit

H.E. : Haematoxylin and Eosin stain.

hrs. : Hours

I.V. : Intravenous

I.M. : Intramuscular

Kg : Kilogramme

Min. : Minute

ml. : Millilitre

M.S. : Mean Square

No. or no. : Number

S.D. : Standard Deviation

S.E. : Standard Error

S.S. : Sum of Square

V.G. : Van Giesson's stain

% : Percent



The best

doctor in the world

is a Veterinarian,

He can't ask his patients

what is the matter

He has got to just know.

- Will Rogers.

Ontroduction

?

INTRODUCTION

The history of scientific progress is inextricably linked with progressive specialization. Recent advancement in experimental surgery has given a new enthusiasm to veterinary surgeon and the old concept has practically been changed today after increasing the number and value of the animal in our country as well as research and the clinical application in all aspect of veterinary surgery.

Surgery and suture are inseparable from each other and search for an ideal suture material is as old as the evolution of surgery itself. An old treatise the EDISIN SMITH PAPYRUS written in 1600 B.C. throw light on the use of stripes of linen as suturing material for a wound. Sushruta, better known as father of Indian surgery, and the book written by him "Sushruta Samhita" in 600 B.C. contains an exhaustive list of surgical instrument along with the contemporary suture material such as cotton threads, strips of leather, bark of certain trees, horse hair and threads prepared from animal skin (Rai, 1966). Once upon a time when the leaf cutter ants were used to appose the edge of wound with their powerful jaws by primitive south American Indian Tribes. These ants were made to bite the wound apposing its edges together as it was accomplished by cutting of their trunks at their neck.

Wound healing is the physiological phenomenon. It is the primary duty of a surgeon to attempt the healing of wounds, either accidental, intentional or surgical as quick as possible. One of the important steps to be taken in their healing is to bring the cut ends in close proximity in order to assist nature to proceed with the processes of healing and this is best achieved by use of sutures. As suture hold the skin edges or wound edges together, the process of healing continues; meanwhile, the reunion of anatomical layers take place. Thus, wound regains ability to withstand stress and strain on its own.

In India, goats provide a dependable source of income to 40% of rural population below the poverty line and to many who do not possess any land (ICAR, 2002). According to Indian livestock census, 1987; 99.40 million goats were present (ICAR, 2002), where as it was estimated to 118.7 million goat in 2000 (Prasad, 1997). Goat rearing had provided 59, 741.16 million Rs. to Indian economy in 1992-93 (ICAR, 2002). High productivity and greater resistance to disease and ability to thrive on low quality fodder, bushes, and browsing material and its adaptability to diverse agro climatic conditions of the tropics are some of the important favourable factors for its promotion as compared to other ruminants. Economically, goat is ideally suited for marginal farmers and landless labourers. For that

reason it has been rightly quoted as "POOR MAN'S COW" by MAHATMA GANDHI "The father of Nation". The low cost of maintenance and comparatively high return coupled with low risk capital investment has made goat rearing popular avocation. They contribute in many ways to the agrarian economy through production of meat, milk, fibre, bone, skin, hair and manure In addition to these, some people suffering from chronic infection are advised to take goat's milk by physicians as it has less fat percentage and high level of immunoglobulins (Prasad, 2000).

Like other animals, goat also suffers from various abdominal disorders in which laparotomy is required. Laparotomy is to make an incision on the abdominal wall which is under taken during many surgical interventions like gastrotomy, rumenotomy, abomasotomy, spleenectomy, enterectomy, enterotomy, cystotomy, hysterotomy, exploratory laparotomy and its subsequent repairing after the surgery.

Different types of suturing materials are used internally in veterinary surgery among which chromic catgut (absorbable) is one of them but it is costly and not frequently available in rural areas. Therefore, it is a great need to find out a suitable suture material which is economical and easily available in rural areas for its internal use.

Clinicians and researchers in past have used either absorbable or non absorbable sutures with conflicting reports irrespective of species (Ochsner, 1940; Knowles, 1952; Milne and Horney, 1954; Harrison *et al.*, 1957; Madsen, 1958; and Haxton, 1965).

Criteria for good suture material are cheap and readily available, uniform thickness, smooth surface, good knotting property, good tensile strength, pliable enough, good functional strength, non capillary in action, easily sterilizable and minimal tissue reaction.

Seeing the above facts and information on the utility of different types of suturing threads for internal use in caprine, present research work has been under taken with following objectives:

- (1) To study the suitability of 2/0 black braided silk and 2/0 mercerised cotton thread as a suturing material for internal part of body.
- (2) To make comparative studies among 2/0 chromic catgut, 2/0 black braided silk and 2/0 mercerised cotton threads as suturing materials for internal part of body.

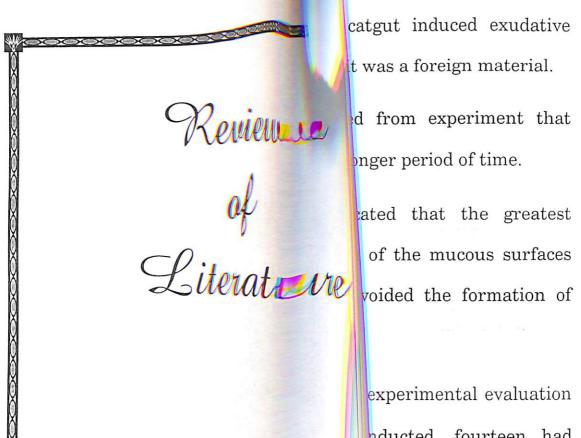


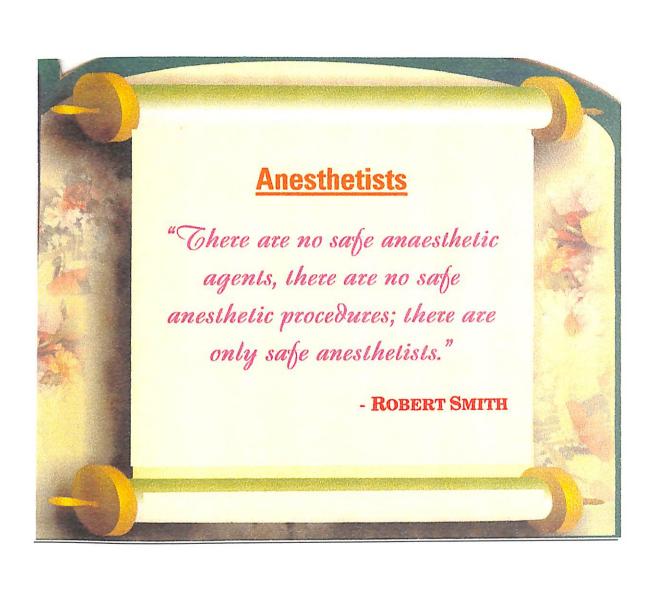
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experimental evaluation nducted, fourteen had o. 7/0 cotton. Inner row re thickness of the wall le the second layer of was placed outside. In ique of suturing in two





Review of Literature

REVIEW OF LITERATURE

Maleny (1927) demonstrated that inadequate sterilization of chromic catgut may lead to post operative wound infection.

Bates (1939) advocated that catgut induced exudative reaction and delayed the wound healing, as it was a foreign material.

Localio et al. (1943) concluded from experiment that catgut suture wound showed oedema for a longer period of time.

Gage and Lyon (1949) advocated that the greatest usefulness of catgut was for the apposition of the mucous surfaces within the gastrointestinal tract. Catgut avoided the formation of pendulous loop in the lumen.

Kleinsassar et al. (1950) in their experimental evaluation of peritoneal grafts in eighteen dogs conducted, fourteen had anastomosis with two rows of sutures using No. 7/0 cotton. Inner row of interrupted suture passed through the entire thickness of the wall with the knots tied within the lumen, while the second layer of interrupted sutures including the muscularis was placed outside. In this study emphasis is laid to follow the technique of suturing in two separate layers.

McLean and Fais (1952) used catgut and cotton threads during urological surgery in canine and emphasized on cotton thread.

Goodwin et al. (1959) adopted "Cup-Patch" technique of ileocystoplasty and "Flat-patch" technique of sigmoid cystoplasty both experimentally and clinically for bladder enlargement or partial substitution of the organ. The bowel continuity was re-established using two layers of sutures. Catgut was used for the inner muscular layer and interrupted silk for the muscularis and serosa. The results were satisfactory in human patients.

Tyagi and Lumb (1961) performed caesarean section in goat. Incisional wound repaired with catgut ligature. They observed peritoneal adhesion with visceral organs.

Schultz et al. (1962) in their study of tissue response to suture material in oesophageal anastomosis in puppies, have shown that it is maximum in chromic catgut, less in silk and cotton, and minimum in Dacron.

Archibald and Reed (1964) have stated that there is no ideal suture material for canine oesophageal surgery. Non-absorbable sutures (wire and cotton) are likely to tear through the tissue or resulting granulomas. Catgut may be absorbed before healing is complete or cause excessive cicatrisation. Marlex, a synthetic suture

material according to the above authors appears though promising, find 5/0 silk for the mucosa and 3/0 or 4/0 chromic catgut for the muscularis as the standard material.

Ojha (1965) evaluated the value of different, suturing materials for oesophageal anastomosis in buffalo calves. He utilised black braided silk, chromic catgut, Cotton, nylon, vetafil and linen on bovine oesophageal resection and anastomosis and a fair degree of success was achieved.

Kumar et al. (1968) studied on comparative evaluation of absorbable and non-absorbable sutures in buffalo calves. They concluded on histological evaluation of suture materials that there is not much difference between absorbable (plain and chromic catgut) and non-absorbable (Vetafil and silk) suture materials. Chromic catgut acted like non-absorbable suture material until chromium concentration suddenly disappeared. Plain catgut produced severe edema upto 72 hours whereas it was moderate in other suture specimens.

Weaver (1968) implanted successfully nylon mesh in a clinical case of inguinal hernia in the ewe. He closed the defect immediately exterior to the peritoneum. The mesh was sutured to the edge of the hernial ring using braided nylon and concluded the nylon

mesh was good to close the small hernial ring because it does not produce reaction during the process of repair.

Dhablania and Tyagi (1970) performed rumenotomy in buffalo calves using chromic catgut. Peritoneal adhesion were observed with visceral organs by them.

Echeveria (1970) compared catgut, silk thread and polyglycolic Acid (P.G.A) suture in abdominal wall closure and end to end gut anastomosis. He found superior handling property and knot security of polyglycolic acid suture with minimal tissue reaction.

Kumar and Singh (1970) used chromic catgut, "Vetafil" and cotton as a suturing materials in rumenotomy in buffaloes and goats. A comparison was made between double row of interrupted Lembert's and double row of continuous Lembert's suture technique. Macroscopic and microscopic examination were conducted at 7, 25 and 45 days after the operation. Chromic catgut produced comparatively more tissue reaction. No appreciable difference could be detected between double row interrupted Lembert's and double row of continuous Lembert's suture technique. These suture materials and techniques showed almost identical effect in buffaloes and goats.

Vig and Tyagi (1970) studied the response of urethral tissue to various suture materials. The tissue reaction was observed

in both urethra and periurethral tissues. Microscopic examination of the biopsy taken on 10th day of surgery, revealed proliferation of epithelium more marked in catgut whereas a very mild proliferation of epithelium could be noticed in case of cotton. Linen and silk revealed moderate proliferation. Severe reaction was marked with catgut which resulted in obliteration by corpus cavernosum urethrae. No obliteration was noticed in cotton thread. Heavy cellular infiltration was observed around catgut suture with abundance of polymorph and zone of reaction was noticed which was represented by preponderance of immature fibroblasts, while less zone of reaction was observed comparatively with cotton by them.

Eilert et al. (1971) conducted a series of experiment regarding wound healing, tensile strength, tissue reaction and stability in the presence of infection in P.G.A. suture versus plain catgut, silk, cotton and Dacron coated silicon sutures. During first week, they observed that there was little difference in the histological picture of wound sutured with different suture materials but in between 10 to 15 post-operative days, the histological picture was markedly different in different groups. Tissue reaction was very little and fragmentation and digestion of suture material were minimal with P.G.A. suture than the other sutures, used. The remnants of P.G.A. suture in between 30 to 60 days was difficult to detect,

whereas those of chromic catgut were able to be identified on 90 days. In their opinion P.G.A. suture had undergone complete hydrolysis and had disappeared, while fragments of chromic catgut were still recovered with low grade of inflammatory reaction.

Frazza and Schmidt (1971) implanted P.G.A. suture and catgut into animal tissues and within 7 to 11 days P.G.A. suture returned a greater percentage of their original tensile strength when compared to catgut. They marked about 60 days time in 75% of cases of P.G.A. suture catgut during which they were completely absorbed. However, fragments of catgut were still found for an appreciably longer period in 25% of cases.

Kudalk and Hattangady (1971) performed intestinal pedicle for correcting defects on the wall of urinary bladder in dogs. They used chromic catgut No. 4-0 to suture serosa of bladder with good result.

Borthwick (1973) performed laparotomy and implant polyglycolic acid in skin, subcutanaeous, rectus abdominis muscle and their sheath, peritoneum, bladder, mucosa and muscle. He found uncomplicated healing in 90% tissues.

Gera et al. (1973) successfully treated eight cases of urolithiasis in which post scrotal urethrotomy and laparotomy were

performed. In all the cases, urethral wounds were closed by two layers of continuous sutures using 1-0 chromic catgut thread.

Sharma (1973) performed colocystoplasty and caecocystoplasty on 16 male buffalo calves respectively. He concluded that non-absorbable sutures like black braided silk can be used safely in urological surgery without any pathological lesion.

Hoffman (1974) reported bradycardia in horse after clinical use of xylazine. No other cardiac alterations were detected.

Mitra (1974) conducted surgical intervention for removal of tumour affecting the liver in dog. These structures affecting liver and liver lobe were ligated individually with 3/0 chromic catgut and the affected part was completely removed. An autogenous free omental grafting was done using a thin and vascular area of the omentum being fixed in severed liver surfaces of lobes to cover them completely with 3/0 chromic catgut. The animal had an uneventful recovery.

Klide et al. (1975) detected decreased heart rate and aortic blood flow after I/V administration of xylazine (1.1 mg/Kg) in dog. They also reported an initial increase in arterial pressure and peripheral resistance.

Prey and Walter (1975) included catgut and P.G.A. sutures in normal saline for two weeks and observed that catgut lost 20-30% of its tensile strength, where as P.G.A. sutures remained unaffected. In their opinion catgut suture was definitely less durable in normal tissues in comparison to P.G.A. suture because there was rapid proteolysis of catgut exposed to acidic medium (gastric juice). However, P.G.A. suture under similar condition retained their strength for minimum for 5-7 days.

Urdhal (1975) observed tissue reaction in 12 horses and 12 dogs after the use of P.G.A. and chromic catgut suture and marked that reactions were much milder towards a polyglycolic acid suture material (Daxon) than chromic catgut. Daxon was successfully used for operation on skin, muscle, fascia, peritoneum and urinary bladder in dogs.

Kumar et al. (1976) used xylazine (0.22 mg/Kg) intramuscularly, 8-10 minutes prior to I/V injection of ketamine (11 mg/Kg) to induce anaesthesia in domestic goats.

Brass and Kersjes (1977) made a comparative studies on wound healing after performing laparotomy in horses in which chromic catgut, stainless steel wire and polyglycolic acid were preferable to chromic catgut in suturing the abdominal wall.

Cassia (1977) demonstrated that catgut sutures were irregularly and rapidly degenerated when exposed to gastric juice, whereas P.G.A. suture showed a more slower and regular course of degeneration in vitro and vivo, in human stomach.

Singh et al. (1977) performed laparotomy in three years old bullock suffering from dialatation and torsion of caecum. Caecotomy was performed and black coloured watery content was evacuated after correction of the rotation. The caecum was closed with two rows of Lembert's suture technique using No.2 chromic catgut with good result.

Mantri (1977) successfully treated urethral diverticulum in the region of glans penis in goat. An incision was given on the swelling parallel to the penis and continued further deep until the cavity of the cyst was opened. A polythene catheter was passed into the urinary bladder through the opening and to the outside. He used 3/0 chromic catgut for intramural suturing.

Boucoumont *et al.* (1978) performed 438 caesarean section operation in cows and was in opinion that adhesion were one of the cause of infertility after operation which could be prevented by using polyglycolic acid suture instead of chromic catgut.

Thurmon *et al.* (1978) obtained greatly increased volume of urine for about 5 hours following administration of xylazine in cattle.

Ramakrishna and Joshi (1978) performed laparotomy in left flank during torsion of ileum and jejunal displacement in a bullock. The rumen was sutured with No.-3 chromic catgut by modified Cushing pattern. The peritoneum and abdominal muscles were sutured with No. 3 chromic catgut in Continuous fashion separately. The skin was opposed with thick monofilament nylon in Halsted fashion. There was uneventful recovery after surgery.

Sharma and Khan (1978) used catgut and silk thread for colocystoplasty and caecocystoplasty in 16 buffalo calves. There was not much variation in the level of blood urea nitrogen (BUN) in either of suture materials used. Macroscopically healing was complete with both these sutures. Microscopic studies revealed complete regeneration of the transitional epithelium after cystoplasty and tissue reaction was moderate to and identical in both catgut and silk thread.

Gera and Nigam (1979) performed post scrotal uerthrotomy in case of urolithiasis in bullock with moderate distensions of bladder and repaired the urethral wound with 3-0 chromic catgut using atraumatic needle in two layers with uneventful recovery.

Kumar et al. (1979) performed partial resection of the urinary bladder in buffalo calves. They sutured the cut edges with

continuous Lembert's suture technique using chromic catgut No. 2. A second row of Cushing suture was also placed. During the study, healing in the bladder tissues was observed at 45 days histologically.

Kumar and Thurmon (1979) detected significant reduction in respiratory rate in goat after intramuscular administration of xylazine (0.22 mg/Kg).

Knight (1980) reported bradycardia and second degree AV block after use of xylazine which probably occur from increased vagal activity caused due to its vasopressor effect.

Malinari and Penalb (1980) performed enterotomy in the duodenum of 80 dogs and different types of suturing materials Viz. 2/0 chromic catgut and dexon were used during anastomosis with good result.

Singh et al. (1980) gastrotomy wound was repaired in one layer by closely placed continuous Lembert's suture technique using chromic catgut No. 3/0. Abdominal cavity was closed in routine manner using black braided silk No. 2/0 in rabbits.

Shastry and Rao (1981) used chromic catgut as a suturing material during cystorrhaphy in bovine with good result.

Verma et al. (1981) used different suture materials in infected wound. There were large number of neutrophils indicating

presence of local infection in wound containing plain catgut, chromic catgut, silk and braided dacron, nylon and polyglycolic acid. The number of neutrophils decreased gradually.

Mbiuki (1983) performed jejunal anastomosis with Cushing technique in cattle with monofilament of nylon, chromic catgut and polyglactin 910 and noticed the reaction of all suture materials.

Kanade *et al.* (1984) used silk and stainless steel mesh to repair umbilical hernia in calves. They concluded that reinforcement with stainless steel mesh was found to be more useful in large size ring but in other cases silk suture should be used.

Gupta et al. (1985) performed single layer end to end inverted and everted techniques of entero-anastomosis and evaluated the use of silk and catgut sutures in 16 male buffalo calves.

Kulkarni and Bhokre (1985) studied the reaction by different suturing materials. They observed tissue reaction with chromic catgut, minimum with linen and least with silk after the use of these sutures in the urinary bladder of buffalo calves.

Mohanthy et al. (1985) performed laparotomy to treat a leopard suffering from intestinal obstruction. The opening in the intestine was closed by one layer of Cushing method using chromic

catgut No. 1. Peritoneum and abdominal muscles were sutured with same material and skin was closed with nylon. Satisfactory recovery was observed within 17 days.

Desch and Wagner (1986) marked post-operative adhesions following ventral (20) and dorsal (12) urinary bladder incisions made in canine experimentally. The bladder incisions were sutured with 3-0 polydiaxanone suture. Laparotomy without urinary bladder incision was performed in four days, which served as control. The surgical sites were examined for one and two weeks in 30 and 6 dogs respectively after surgery. Omental adherence to the urinary bladder was a frequent finding.

Singh et al. (1987) repaired thoraco-abdominal wall, using black braided silk No. 3 as a suturing material, with satisfactory result.

Quessada et al. (1987) studied the utility of cotton, nylon catgut and silk after performing gastrotomy in dogs and observed for 20, 30, 40, 60 and 70 day after the surgery. One animal of each group was euthenized for gross and histological studies. Grossly no difference was noticed in the result obtained with the various suture materials and serous and mucous membranes of the stomach wall appeared normal. Microscopically, plain catgut produced a high

degree of inflammatory reaction and its use in gastrorrhaphy of dogs was considered inadvisable. On the other hand, cotton thread produced a very discrete or even no reaction at all, and the authors strongly advocated its use.

Oesterkage et al. (1988) compared the new monofiles absorbable suture material like maxon with chromic catgut in bladder surgery on rabbit. Maxon offered an advantage over chromic catgut in extramucosal suturing. It caused fever, inflammatory reaction and the absence of any complication that might be attributed to it as confirmed histologically. Regarding the calculogenic potential, both were different with each other. In their opinion concretion was formed due to contact of either maxon or chromic catgut.

Lanstedt and Debur (1990) repaired colon in cattle using different types of absorbable and non-absorbable suturing materials.

Tiwari *et al.* (1990) performed urethrotomy in a buffalo bull in which sutured of urethral wound with 3-0 chromic catgut. The operated animal uneventfully and started feeding normally.

Kinjavdekar *et al.* (1992) repaired tracheal ring defects with 3/0 chromic catgut and 3/0 black braided silk thread in healthy male mongrel dogs experimentally and concluded that catgut was superior to silk as a suturing material in a trachea.

Kumar *et al.* (1992) performed cystorrhaphy in calves, incisional wound was repaired with chromic catgut No. 1.

Ravikumar *et al.* (1992) repaired urinary bladder with double row of cushing suture pattern, using chromic catgut No. 1 with uneventful result.

Singh (1993) conducted comparative studies on vicryl, chromic catgut and black braided silk thread as a suture material for repairing oesophagotomy incision in buffalo calves. In his opinion three sutures were worthy for oesophageal surgery in bovine but their superiority was in the gradation of vicryl, chromic catgut and black braided silk respectively.

Ashthurkar (1994) performed post-scrotal urethrotomy in eight bullock in which 3/0 catgut was used as suturing material for closure of urethral incision over the polythene catheter with uneventful recovery.

Sobti et al. (1994) successfully performed perineal herniorrhaphy in buffaloes. They used black braided silk as a suture material in muscles and chromic catgut in perineal fascia.

Gopal *et al.* (1995) performed rumenotomy in which ruminal and abdominal wound were closed using No. 3 chromic catgut and No. 3 black braided silk respectively. The animal started taking feed on 3rd post operative day.

Pandey et al. (1995) treated cases of vesical calculi in canine surgically after performing cystotomy. The bladder incision was closed with double layered simple continuous suture using 3-0 silk while laparotomy wound was suture in the usual manner with uneventful recovery.

Sharma (1995) conducted cystoplasty using formalin preserved urinary bladder grafts in buffalo calves, with silk and chromic catgut as suture material. He concluded that absorbable suture should used in place of silk because persistence of suture material is not desirable in cystoplasty.

Dabas et al. (1996) repaired perineal hernia in kankrej cows. They used nylon mesh for hernioplasty, catgut No. 3 to suture subcutaneous fascia while skin incision was suture with interrupted horizontal mattress sutures using cotton thread.

Ghanawat and Mantri (1996) performed ovariohysterectomy in 36 cats aging between 1-5 years. Muscle and peritoneum were sutured with fine chromic catgut No. 0 and skin wound with silk suture. The results were satisfactory.

Larson (1996) recommended the suturing of urethral wound after performing urethrotomy in bovine. In his opinion the urethral incision could be sutured with 3/0 chromic catgut or 3/0 polyglactin 910 with closely placed interrupted sutures.

Rao and Rao (1996) conducted perineal herniorraphy in canine successfully. During the surgery the hernial content were reduced in abdominal cavity and the pelvic diaphragm was sutured with No.1 chromic catgut. Skin was sutured with monofilament nylon in Halsted fashion following trimming of excessive skin. A steady recovery was reported.

Rochat et al. (1996) performed 72 enteropexies between the jejunum and abdominal wall on 6 dogs. Among all 36 sites were sutured with chromic catgut and 36 with polypropylene. Three dogs were killed after 1 week and 3 were killed after 1 month. Tissues from enteropexy sites were taken for histological examination which did not reveal substantial difference in the degree of inflammation between the two types of sutures. Statistically no significant difference in breaking strength was observed between different sutures at 1 week or 1 month.

Singh and Singh (1996) conducted rumenotomy during diaphragmatic herniorrhaphy in standing position under local anaesthesia in buffaloes. Ring in the diaphragm was sutured by continuous lock stitch sutures using No. 3 silk, pleura and the muscles with catgut No. 3 by simple continuous sutures.

Bennett et al. (1997) used chromic catgut, polyglactin 910, polydixanone, monofilament and monofilament stainless steel

suture materials in the body wall of 54 rock doves by aseptic technique. In his opinion polydixanone caused minimal tissue reaction.

Sharma (1997) performed reconstruction of partially cystectomised urinary bladder experimentally on 9 apparently healthy male buffalo calves. In which anterior half of the organ was resected and remaining bladder stump was sutured on serosa of invaginated caecal apex with 3/0 ethicon black braided silk. All of the operated animals survived well. Gross and histological examination revealed complete regeneration of bladder tissue.

Sharma and Agrawal (1997) performed post scrotal urethrotomy and cystoplasty with intact Caecum in ruptured urinary bladder of a Zebu cattle calf clinically in which they used 2-0 black braided silk to close urethrotomy incision as well as in cystoplasty. The result was very satisfactory.

Sreenu et al. (1997) conducted cystoplasty using chromic sulphate and gluteraldehyde crosslinked allogenic bladder grafts in dogs. They used 3/0 silk in Cushing pattern followed by Lembert's technique of suture successfully.

Pioravanti *et al.* (1998) made skin incision in cattle and sutured with galvanized metal staples and cotton thread. He observed

that cotton caused more damage to the dermis and the metal caused more damage to the epidermis.

Usturge *et al.* (1998) treated surgically the case of urethral calculi in a bullock. They applied Lembert's suture technique using 4/0 chromic catgut on ureter with uneventful recovery.

Durgun et al. (1999) used chromic catgut, vicryl and prolene sutures for suturing cystotomy incision on 18 adult dogs. In their opinion, vicryl, prolene and chromic catgut were all suitable suture materials for bladder surgery but chromic catgut is more commonly used than vicryl and prolene because it was cheaper and readily available. However, although vicryl and prolene were more expensive, they were of superior quality and could be used in many complex operations.

Baily and Love's(2000) said that Moorish surgeon Albucasis is credited for the use of catgut at first and Mathaewis in early 18th century used silk sutures and catgut soaked in wine.

Bharadwaj *et al.* (2000) performed surgery for omasal hernia with fistulation in a crossbred bullock. The omasum was freed from the adhesions and fistulous opening was observed and sutured with double layer of inversion sutures using catgut No. 1. The muscle and skin were closed in routine manner.

Deshmukh (2000) treated a case of ruptured urinary bladder in which the urinary bladder was repaired with double layer of Lembert's suture technique using black braided silk, clinically in a calf.

Gemer *et al.* (2000) performed abdominal surgery in dogs. The peritoneum and muscles were closed with polyglactin and skin was sutured with silk thread.

Kumar (2000) evaluated different suturing materials in urethrotomy wound in male buffalo calves. He found that 3-0 polyglactin 910 is a best suture material compared to 3-0 black braided silk and 3-0 chromic catgut thread.

Syam et al. (2000) operated, case of umbilical hernia complicated with abomasal fistula in a calf. The abomasal defect was closed by Lembert's suture technique using 2/0 chromic catgut and was repositioned. The peritoneum and muscles were sutured with black braided silk. Excess skin at the umbilicus was trimmed and wound was closed with monofilament nylon in vertical mattress fashion. The calf had an uneventful recovery and the sutures were removed on 10th post operative day.

Bhadwal et al. (2001) conducted reticulectomy for the treatment of diaphragmatic hernia in a cow. Sectioned reticulum was

closed by inversion suture using No. 1 chromic catgut. Herniorrhaphy was done with No. 3 black braided silk using continuous lock stitch technique.

Umakhanthan (2001) treated a case of ventro femoral hernia in lamb. The peritoneum and ruptured abdominal muscles were closed separately by chromic catgut No. 1 in usual manners. The skin incision was closed with horizontal mattress pattern using non-absorbable catgut.

Ansari (2002) while studying, on urethroplasty using formalin preserved urinary bladder and caecal grafts in buffalo calves observed that ethicon chromic catgut No. 2-0 (absorbable) and ethicon black braided silk No. 2-0 (non-absorbable) were worthy but there was slight superiority with ethicon chromic catgut No. 2-0 (absorbable) to other non-absorbable suture material.

Makhdoomi and Sheikh (2002) performed surgery to manage urinary bladder abscess in a calf. During surgery the bladder wall was sutured by continuous lock stitch suture using chromic catgut. The laparotomy wound was sutured in the layers by placing simple interrupted suture and the skin was closed with mattress suture.

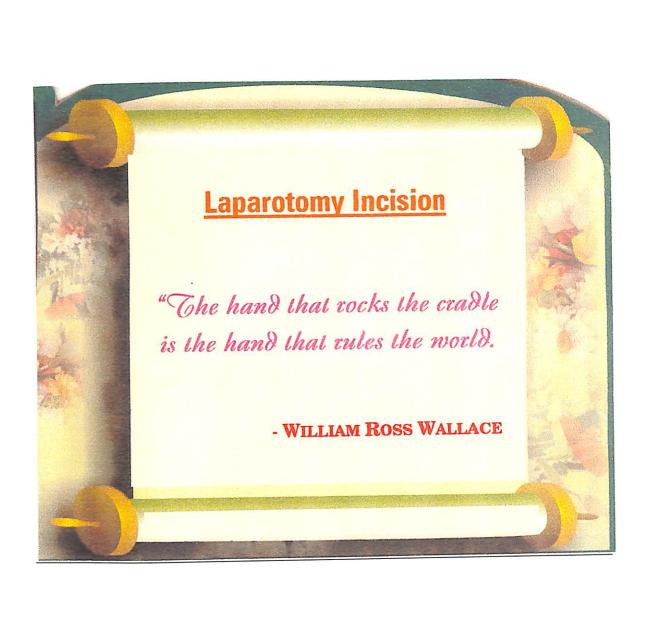
Saini and Anand (2002) performed laparotomy for successful surgical repair of three cases of intestinal obstruction in

Holstein Friesian cows. End to end intestinal anastomosis was done using simple continuous sutures with chromic catgut No. 2-0.

Kempararaja (2003) corrected the complicated ventral abdominal hernia in a bull. The devitalized part of omentum was resected and the border was sutured with continuous suture using chromic catgut 2/0, lavaged with normal saline and pushed into abdominal cavity. Sutures were placed using chromic catgut No.2 in mattress pattern inserted through peritoneum and transverse abdominis muscle. The wound edge and subcutaneous tissues were sutured with chromic catgut No. 2 by continuous manner.

Ravikumar and Shridhar (2003) conducted pelvic urethrotomy through infra anal approach in bullock successfully. They sutured urethra with simple interrupted sutures using chromic catgut No. 2-0.





Materials and Methods

MATERIALS AND METHODS

The present study was conducted on twenty seven clinically healthy female goats aging about 1-2 years and weighing in between 16-20 Kg. All-animals were kept under similar environmental condition and close observation for a period of one week during which a preliminary examination was done to check up their health. Selected animals were dewormed with Albendazole¹ @ 5mg per kg body weight, a fortnight earlier to the start of experiment.

SUTURING MATERIALS

- 1. Chromic catgut 2/0
- 2. Black braided silk 2/0
- 3. Mercerised cotton 2/0

DESCRIPTION OF SUTURE MATERIALS:

Catgut: The surgical catgut is prepared from the submucosa of the first one third of the small intestine of sheep or cow. Chromic catgut is made by treating catgut with chromic acid to effect cross linking, which delays hydrolysis. Absorption is unpredictable particularly in contaminated or infected wounds. Plain catgut is absorbed in a 7 days, whereas chromic catgut lasts for 10-40 days. The catgut is supplied in sealed pouch already sterilized and ready for use. The catgut is available in sizes varying from No. 7/0 (finest) to No. 7 (thickest).

¹ **Albendazole**, Glaxosmithkline, Pharmaceuticals Ltd., Dr. Annie Besant Road, Mumbai-400025, India.

Silk Thread: It is a natural suture material presented as a silicon coated non absorbable thread. It has great strength and can be handled well with secured knot. It is made by cocoon of silk worm. The fibre consists of central core of keratin protein covered with a thin layer of serecin (the silk albumin) which is usually removed. Most surgical silk is braided to give it added strength and better holding qualities. Repeated boiling or autoclaving does not reduce the tensile strength. Available sizes are 0 to 14.

Cotton Thread: It is a vegetable material composed of unicellular hairs from the seed of a plant. It is less irritant. Its sizes vary from 2 to 4/0.

Design of experiment

The selected animals were randomly divided into three groups consisting of nine animals in each groups (Table No.-1).

Group A: In this group of animals, the peritoneum and muscles were repaired with 2/0 chromic catgut after performing laparotomy.

 $Group\ B$: In this group of animals, the peritoneum and muscles were repaired with 2/0 black braided silk after performing laparotomy.

Group C: In this group of animals, the peritoneum and muscles were repaired with 2/0 mercerised cotton after performing laparotomy.

Table No. – 1Design of Experiment

Goat	Group Number	Suture materials	Period of observation
Number		used*	(in days)
1	Α	2/0 Chromic catgut	10 days
2	Α	2/0 Chromic catgut	10 days
3	Α	2/0 Chromic catgut	10 days
4	A	2/0 Chromic catgut	20 days
5	A	2/0 Chromic catgut	20 days
6	Α	2/0 Chromic catgut	20 days
7	A	2/0 Chromic catgut	30 days
8	Α	2/0 Chromic catgut	30 days
9	A	2/0 Chromic catgut	30 days
10	В	2/0 Black braided silk	10 days
11	В	2/0 Black braided silk	10 days
12	В	2/0 Black braided silk	10 days
13	В	2/0 Black braided silk	20 days
14	В	2/0 Black braided silk	20 days
15	В	2/0 Black braided silk	20 days
16	В	2/0 Black braided silk	30 days
17	В	2/0 Black braided silk	30 days
18	В	2/0 Black braided silk	30 days
19	C	2/0 Mercerised cotton	10 days
20	C	2/0 Mercerised cotton	10 days
21	C	2/0 Mercerised cotton	10 days
22	C	2/0 Mercerised cotton	20 days
23	C	2/0 Mercerised cotton	20 days
24	\mathbf{C}	2/0 Mercerised cotton	20 days
25	C	2/0 Mercerised cotton	30 days
26	C	2/0 Mercerised cotton	30 days
27	C	2/0 Mercerised cotton	30 days

Preparation of Animals prior to Surgery

The experimental animals were fasted 24 hrs. prior to surgery. The left flank area was prepared for aseptic surgery. It was saved and scrubbed with soap and water. It was mopped with 70% alcohol and painted with Betadine¹ solution, a day earlier to surgery.

STERILIZATION

Sterilization of instruments, drape, gauge and other necessary appliances including suturing materials like 2/0 black braided silk, 2/0 mercerised cotton threads were sterilized in autoclave as a routine manner.

ANAESTHESIA

Xylazine hydrochloride² @ of 0.5 mg/kg body weight was injected intramuscularly 10 minutes prior to surgery. The prepared animal was kept on right lateral recumbency on the operation table and 10 ml of 2% xylocaine³ was injected locally in linear manner on the middle of the left flank.

¹ **Betadine**, Win-Medicare Pvt. Ltd., 1400, Hemkunt Tower, 98, Nehru Place, New Delhi-110019, India.

² Xylazine hydrochloride, Sarabhai Zydus, Animal Health Limited, Goa.

³ **2% Xylocaine**, Astrazeneca Pharma India Ltd., 12th Mile, Bellary Road, Bangalore.

Anatomy of Paralumbar Fossa in Caprine:

The paralumbar fossa (flank) is a triangular space bounded anteriorly by the last rib, dorsally by the lumbar transverse processes of the lumbar vertebrae and posteriorly by tuber coxae .It is covered from out side in by the skin, subcutaneous tissues and three abdominal muscles namely obliquous abdominis externus, obliquous abdominis internus, transverse abdominis and internally by perietal and visceral peritoneum. The obliquous externus arises from caudal border and lateral surfaces of last eight ribs and fascia over the intercostal muscles. This muscle inserts over tuber coxae, prepubic tendon and linea alba with the help of aponeurosis. The second muscle that is obliquous abdominis internus arises from tuber coxae and deep lumbar fascia of longissimus lumborum and inserts on the caudal border of last rib, prepubic tendon and linea alba. Transverse abdominis that is third muscle arises from first five lumbar transverse processes, medial surface of floating ribs, transverse fascia and caudomedial face of last rib. This muscle inserts on linea alba in close association with peritoneum.

Blood supply: Costoabdominal, lumbar arteries and from the circumflex iliac artery at the tuber coxae.

Nerve supply: Inferior primary branches of costoabdominal nerve and ventral primary branches of cranial group of lumbar spinal nerves.

Operative Technique

A midvertical incision about 12 cm in length was made on the left flank below the lumbar transverse process. Skin and subcutaneous tissues were reflected with the help of Allis tissue forceps. Then abdominal muscles and peritoneum were incised in the same direction. Bleeding vessels were caught with the help of artery forceps and ligated. The operative field was mopped with sterile gauge and Neosporin¹ powder was sprinkled on operative site. Two tier system for closure of laparotomy incision was adopted. Peritoneum and muscles were sutured with 2/0 chromic catgut, 2/0 black braided silk and 2/0 mercerised cotton threads using the simple continuous technique in group A, group B and group C respectively. In each group skin and subcutaneous tissue were sutured with 2/0 black braided silk in horizontal halsted fashion. Then, a protective piece of bandage was applied and sutured on the incisional wound which was moistened with Tincture benzoin Co.2 to prevent secondary bacterial infection.

¹ **Neosporin**, Burroughs Wellcome (India) Limited, 91, LBS Marg, Mumbai-400080.

² **Tincture benzoin co.**, Sonu Chemical India, 24, Srinath Colony, Indore (M.P.)

PARAMETERS

Clinical examination: The rectal temperature, pulse and rate of respiration were recorded one day earlier to surgery and on 1st, 2nd, 3rd, 4th, 5th, 6th and 7th day after surgery. The experimental animals were also examined clinically for appetite, rumination, urination and defecation from the day of surgery to a week post operatively.

POSTOPERATIVE CARE AND MANAGEMENT

The animals were kept in clean, dry and well ventilated place. 250 ml of 5% Dextrose solution was injected I/V daily for 3 consecutive days. The operated animals were medicated with Cilclox¹ @ 20 mg/kg body weight I/M B.I.D. daily and Nutriliv² @ 2.5 ml I/M on alternate day upto 7th day of surgery. The animals were maintained mainly on rice gruel for the first two days after the surgery and other feeds were completely with held. They were allowed water ad lib and maintained on green grasses from the 3rd post-operative day. They were also allowed to graze green grasses from the third post-operative day. The surgical wound was examined daily for any post-operative complication and cleaned and mopped with Tincture iodine³, Himax⁴ ointment was applied locally to prevent

¹ **Cilclox**, Excell Formulations Pvt. Ltd., 202, Silverline, Opp. Holy Cross High School, Old Mumbai-Pune Road, Thane-400601.

Nutriliv, Vetcare Div., Tetragon White Pvt. Ltd., 1840, KHB Industrial Area, Yelahanka, New Town, Bangalore-500054.

³ Tincture iodine, Sonu Chemical Ind., 24, Srinath Colony, Indore (M.P.)

⁴ Himax, Indian Herbs, Research & Supply Co. Ltd., Darra Shivpuri, Saharanpur (U.P.), India

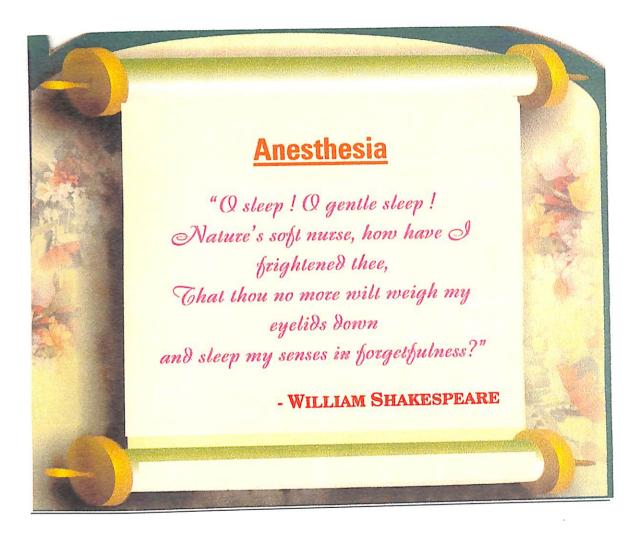
secondary bacterial infection, as well as for its having fly repellent action. Skin sutures were removed on 8th post operative day, while antiseptic treatment was continued further on line of suture. The animals were observed carefully for any complication during whole of the observation period.

Gross and Histopathological studies

The operated animals were examined grossly for proper healing or untoward pathological lesions during the period of observation and at the time of collection of tissues for histopathological examinations. Tissues were collected after injecting xylazine as anesthetic on 10th, 20th and 30th postoperative days. Then laparotomy incision was closed in routine manner as mentioned earlier. Tissues were preserved in 10 percent formaline solution. Tissue section was made and stained with following stains:

- (i) Haemotoxyline and Eosin stain.
- (ii) Van Giesson's stain.





Observations and Results

OBSERVATIONS AND RESULTS

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In the present experiment three types of suturing materials viz. 2/0 chromic catgut (absorbable), 2/0 black braided silk and 2/0 mercerised cotton threads (both non absorbable) were used for closure of laparotomy incisions in a total number of twenty seven healthy female goats. The results were made on the basis of following observations:

- 1. The clinical manifestations exhibited by the animals which included any abnormality in the process of rumination, appetite, defectation, urination, temperature, pulse, respiration and any change in their normal habits after surgery.
- 2. Macroscopic studies included gross examination of the healing wound from outside of peritoneal adhesion with visceral organs and the gross pathological changes on the viscera and repaired tissues at the time of tissue removal for histopathological examinations on 10th, 20th and 30th day after surgery.
- Microscopic studies of tissues from the repaired area on 10th,
 20th and 30th post-operative days.

1. Clinical manifestation

Group-A

All the animals showed normal activity up to last date of observation. They were active and grazing in the field normally after the third day of surgery. The defecation and urination were normal in each operated animal. Temperature, pulse and respiration were slightly increased for the first 3 days after surgery which became normal in due course. Goat No. 6 showed mild oedematous swelling around the operated site while, goat No. 8 of this group suffered from bradycardia just after surgery. It might be due to post anaesthetic effect of Xylazine hydrochloride. Anyhow, the said complication was combated by I/M injections of Nikethamide¹ and Dexamethasone² and I/V infusion of 5% dextrose saline solution. However, this type of post anaesthetic complication could not be detected in rest of the experimental animals and it could be minimized after the use of xylazine-ketamine combination in caprine. There was lack of any marked unusual symptoms. All of them were active with good appetite.

¹ Nikethamide, N-I Pharmaceutical Works(P)Ltd., P-291, C.I.T. Road, Calcutta-700065

² Dexamethasone, Cadilla Health Care Ltd., Ahmedabad-282210

Group-B

On the day of surgery, post anaesthetic complication could not be observed in any animal of this group. All the animals showed normal activity up to last date of observation. They were active and grazing in the field normally after the third day of surgery. The rumination and urination were normal in each operated animal. Temperature, pulse and respiration were slightly increased for first 3 days after surgery which became normal in due course alike group A. There was lack of any marked unusual symptoms. All of them were active with normal rumination and appetite.

Group-C

On the day of surgery, post anaesthetic complication could not be observed in any animal of this group also. All the animals showed normal activity up to last date of observation. They were active and grazing in the field normally after the third day of surgery. The rumination and urination were normal in each operated animal. Temperature, pulse and respiration were slightly increased for the first 3 days after surgery which became normal in due course. There was lack of any marked unusual symptoms. All of them were active with normal rumination and appetite.

2. Macroscopic observation

Group - A

On 10th day there was complete healing of the incisional wound from outside. However, a few nodules were marked on the serosa of rumen in some operated animals (goat No. 4, 6 and 8) when exposed for removal of tissues for microscopic studies.

On 20th day, mild adhesion with peritoneum was detected in two animals (Goat No. 6 and 9) during this stage. Complete healing was marked. Nodule formation or any other gross lesions could not be detected grossly on the visceral organs.

On 30th post-operative day, healing was complete but mild haemorrhage on the muscular tissue could be detected showing the moderate tissue reaction with chromic catgut.

Group - B

On 10th post-operative day, healing was complete. Gross lesions could not be detected. There was lack of peritoneal adhesion. However, pieces of non-absorbable silk thread were also visible grossly.

On 20th post-operative day, healing was complete. No gross lesion could be detected. Peritoneal adhesion was also negligible. However, pieces of non-absorbable silk thread were observed like 10th day grossly.

On 30th post-operative day, complete healing was observed macroscopically without peritoneal adhesion or any nun-towards pathological lesion. The tissue reaction was observed minimal in this group.

Group - C

On 10th post-operative day, mild inflammation and induration in the subcutaneous tissues were detected in the periphery of incised wound showing moderate tissue reaction. Peritoneal adhesion or nodule formation on the visceral organs could not be detected in this group.

On 20th post-operative day, zone of inflammation was minimal and induration in the tissue could not be detected. No other gross pathological lesions could be observed.

On 30th post-operative day, the healing was complete with inflammatory zone showing moderate tissue reaction. Peritoneal adhesion or other pathological lesions could not be detected grossly.

3. Microscopic observation

Group - A

On 10th post-operative day, laparotomy duly repaired by chromic catgut revealed unabsorbed suturing material. Additionally the site of suture was evident by the presence of inflammatory tissue

reaction, formation of the collagen fibres and haemorrhage (Fig - 11). The site appeared to be interwoven by widely spaced collagen fibre network. The repaired site also showed the distribution of numerous inflammatory cells. The collagen fibres network, thus formed was comparatively weaker line of repair between the muscles (Fig-12).

On 20th post-operative day, the catgut suture was almost absorbed with a few residual suturing material at the site. The vacant area thus formed by absorption of catgut suturing material was filled with inflammatory cells alongwith quite a good number of fibroblasts, engaging themself in the production of fine collagen fibres (Fig –13).

On 30th post-operative day, the site of catgut suture was completely filled with collagen fibres alongwith the appearance of isolated striated muscles from the surrounding areas (Fig-14). Microscopically no inflammatory condition was recorded at the site of incision. However, several inflammatory cells were seen occasionally at the site of suture which was eventually fibrosed (Fig-15).

Group - B

On 10th post operative day, the histological studies revealed a thick connective tissue ring around the suturing material and moderate degree of tissue reaction due to presence of inflammatory cells (Fig-16).

On 20th post-operative day, the inflammatory cells distributions were marked lowered at the junctional area around the suturing material (Fig - 17).

On 30th post-operative day, the histological examinations revealed appreciable degree of repair at the site of incision. The area was filled with abundance of collagen fibres with interlocking arrangement of regenerating skeletal muscles fibres. The vascularity was appreciably marked with some vacant areas denoting the site of suturing materials (fig-18).

Group - C

On $10^{\rm th}$ post-operative day, the site of repair revealed intense inflammatory reaction around the line of suture. The inflammatory reaction was marked by the presence of numerous polymorphic leukocytic infiltration at the region. Occasionally several small capillary networks were also seen to appear within the area duly infiltrated by the inflammatory cells. Near the non-sutured area proliferation of collagen fibres were also recorded exhibiting the healing process (fig - 19).

On 20th post operative day, the site of incision did not revealed intense inflammatory tissue reaction. However, in some of

the experimental animals two layers of peritoneum adhered with each other at several points. The parietal peritoneum appeared to have adhered with the muscle fibres of inner most layer of obliquus abdominis internus muscle (Fig-20). The suturing site usually showed ring like encapsulation of collagen fibres around the mercerised cotton suturing materials. (Fig-21).

On 30th post operative day in most of the animals, the site of repaired area in the vicinity of sutures appeared to be thicker due to fibrosis, supported by the presence of greater number of capillaries and a few fibroblast cells. The outer margin of this fibrosed area continued to show the distribution of inflammatory cells near the site of the repair (Fig-22).



Fig. No. 1: Photograph showing prepared she goat prior to surgery.



Fig. No. 2: Photograph showing dullness in she goat after five minutes induction of general anaesthesia prior to surgery.



Fig. No. 1: Photograph showing prepared she goat prior to surgery.



Fig. No. 2: Photograph showing dullness in she goat after five minutes induction of general anaesthesia prior to surgery.

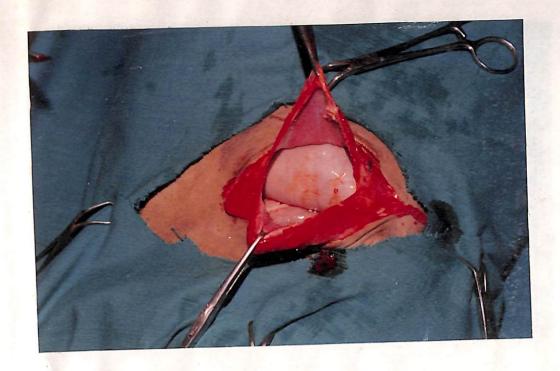


Fig. No. 3: Photograph showing performed laparotomy in she goat.

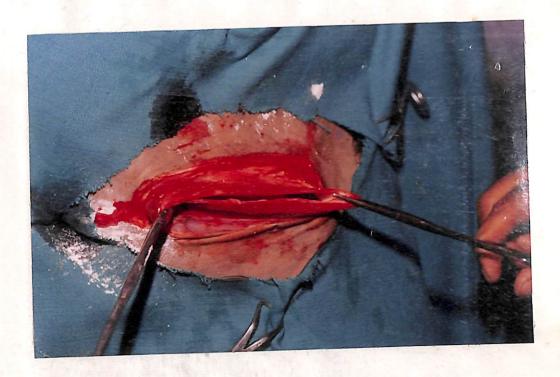


Fig. No. 4: Photograph showing the starting stage of repairing the peritoneum and muscles after laparotomy.



Fig. No. 5: Photograph showing peritoneum and muscles repaired with 2/0 black braided silk.

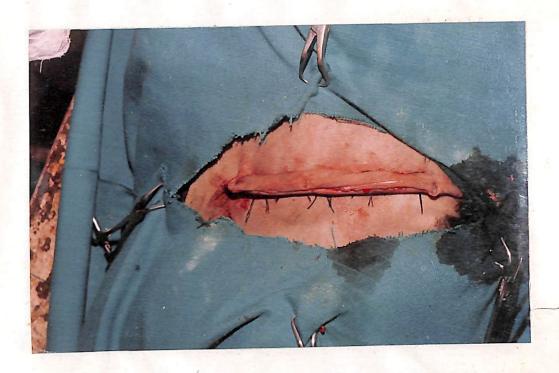


Fig. No. 6: Photograph showing closure of skin and subcutaneous incision in horizontal halsted fashion with 2/0 black braided silk.



Fig. No. 5: Photograph showing peritoneum and muscles repaired with 2/0 black braided silk.

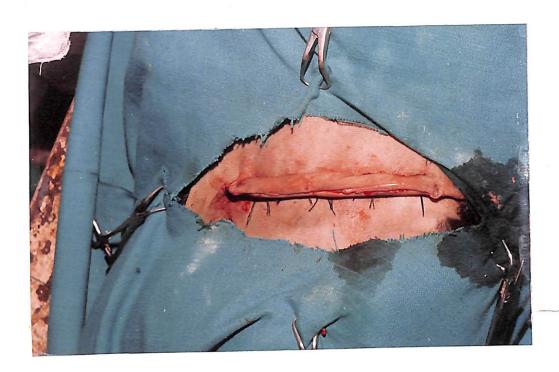


Fig. No. 6: Photograph showing closure of skin and subcutaneous incision in horizontal halsted fashion with 2/0 black braided silk.



Fig. No. 7: Photograph showing a protective bandage on the line of repaired incision.



Fig. No. 8: Photograph showing normal healing and health of she goat on 30th post-operative day. (Goat No. 8, 9, 16 sutured with catgut, cotton and silk thread).



Fig. No. 9: Photograph showing normal grazing of a she goat on 30th day, after laparotomy (Goat No. 27 sutured with cotton thread).



Fig. No. 10: Photograph showing normal urination and health of operated she goat on 30th day, after laparotomy (Goat No. 8 sutured with chromic catgut).

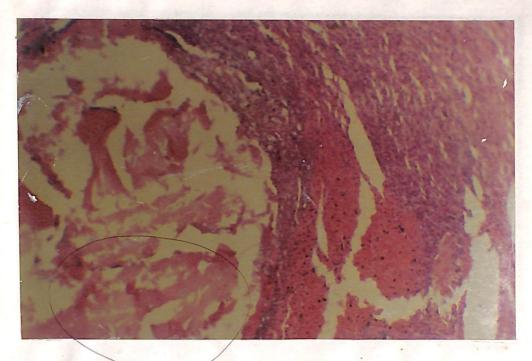


Fig. No. 11: Photomicrograph showing unabsorbed chromic catgut suturing material surrounded by inflammatory cells and connective tissue fibres on 10th post-operative day of laparotomy. (H & E; 150X)

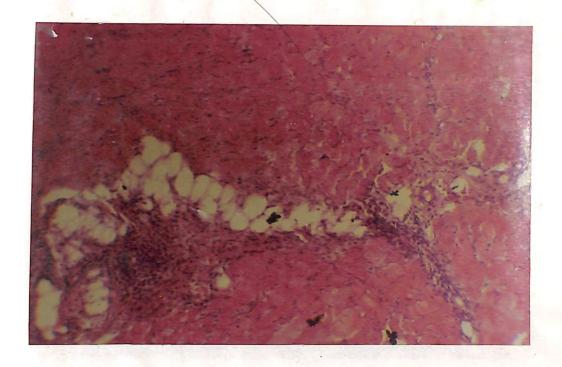


Fig. No. 12: Photomicrograph showing line of repair with the help of weak collagen network between two margins of cut abdominal muscle repaired with chromic catgut, on 10th post operative day, after laparotomy (H & E; 150X).

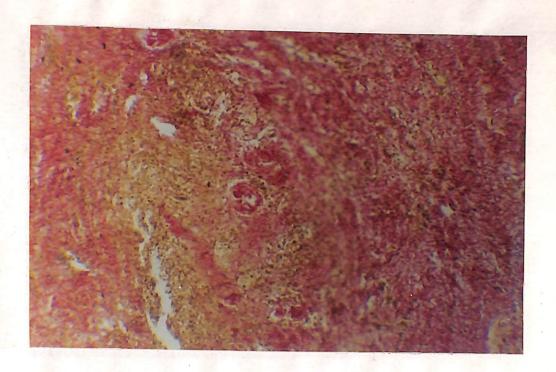


Fig. No. 13: Photomicrograph showing regeneration of collagen fibres along with inflammatory cells at the site, repaired with chromic catgut, on 20th post-operative day, after laparotomy. (V.G.; 150X)

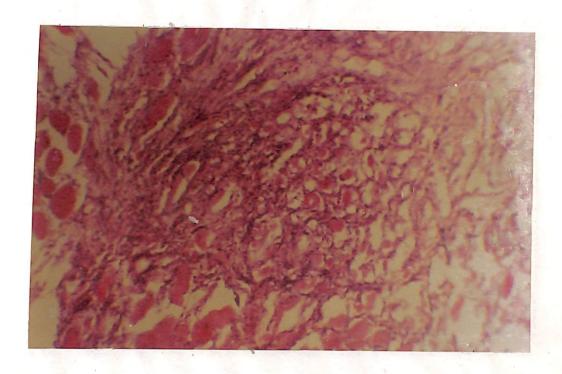


Fig. No. 14: Photomicrograph showing replacement of chromic catgut by collagen tissues, on 30th post-operative day, after laparotomy (H & E; 150X)

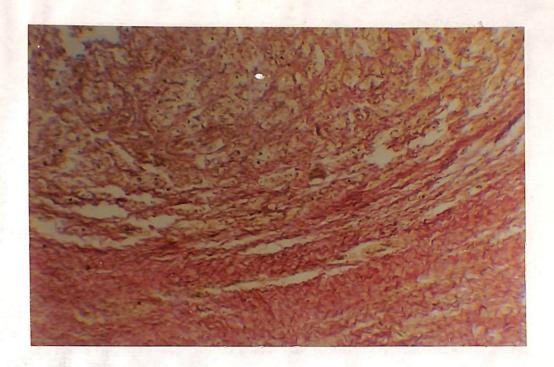


Fig. No. 15: Photomicrograph showing the repair of the site of operation with help of production of collagen fibres, on 30th post-operative day, after laparotomy (V.G.; 150 X).

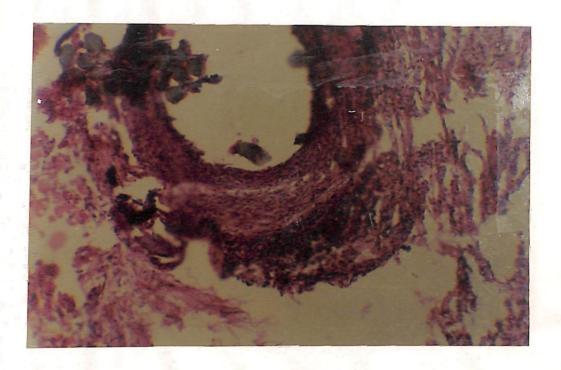


Fig. No. 16: Photomicrograph showing the distribution of inflammatory cells surrounded by ring like fibrous tissue around the silk suturing material on 10th post-operative day, after laparotomy (H & E; 150X).

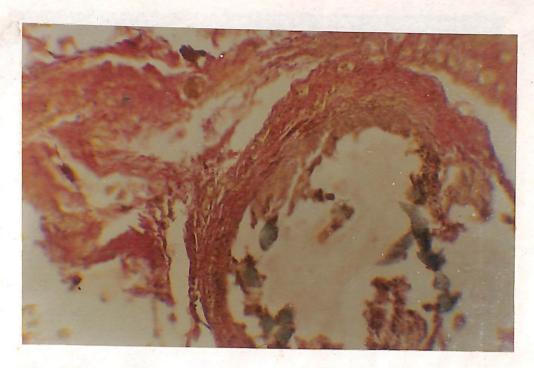


Fig. No. 17: Photomicrograph showing the distribution of inflammatory cells surrounded by ring like fibrous tissue around the silk suturing material on 20th post-operative day, after laparotomy (H & E; 150X).



Fig. No. 18: Photomicrograph showing the collagen fibres round silk thread, 30th post operative day of laparotomy (V. G.; 150X).



Fig. No. 19: Photomicrograph showing inflammatory cells at the site repaired with cotton suture, on 10th post-operative day of laparotomy (V.G.; 150X).

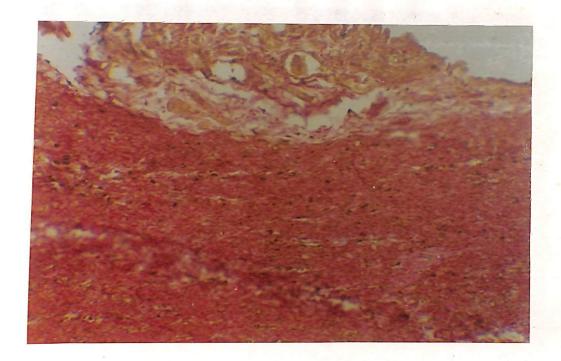


Fig. No. 20: Photomicrograph showing the site of adhesion between the peritoneum and abdominal muscle repaired with cotton sutures on 20th post-operative day of laparotomy (V.G.; 150X).



Fig. No. 19: Photomicrograph showing inflammatory cells at the site repaired with cotton suture, on 10th post-operative day of laparotomy (V.G.; 150X).

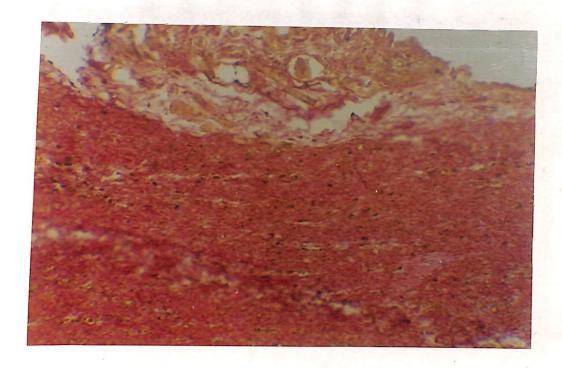


Fig. No. 20: Photomicrograph showing the site of adhesion between the peritoneum and abdominal muscle repaired with cotton sutures on 20th post-operative day of laparotomy (V.G.; 150X).

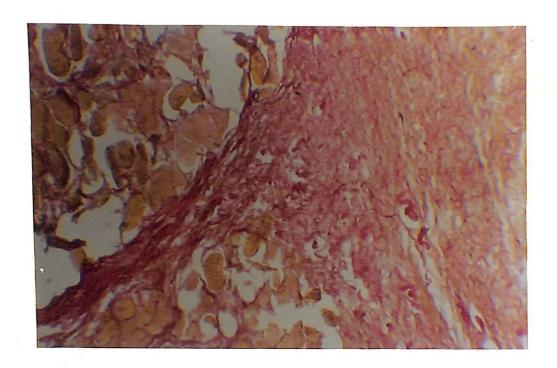


Fig. No. 21: Photomicrograph showing unabsorbed cotton suturing material separated by a ring like arrangement of collagen fibres, on 20th post-operative day of laparotomy (V.G.; 150X)



Fig. No. 22: Photomicrograph showing distribution of inflammatory cells at the site of repair on 30th post-operative day of laparotomy (H & E; 150X).

Temperature

Mean along with standard error (S.E.) and coefficient of variation percentage (C.V.%) of temperature during pre and post-operative days in she goats are presented in table no. 2 and its analysis of variance is shown in table no. 3. On pre operative day, the mean value of temperature were, 102.24 ± 0.073 , 102.43 ± 0.070 and 102.37 ± 0.070 degree Fahrenheit respectively in group A,B, and C. There was no significant difference between temperature in these groups. On post operative day the mean value of temperature of group A were found to be 102.44 ± 0.058 , 102.40 ± 0.060 , 102.34 ± 0.066 , 102.28 ± 0.063 , 102.25 ± 0.068 , 102.25 ± 0.068 and 102.24 ± 0.720 degree Fahrenheit respectively on 1^{st} , 2^{nd} , 3^{rd} , 4^{th} , 5^{th} , 6^{th} and 7^{th} post operative day.

In group B, the mean value of temperature recorded were 102.62 ± 0.066 , 102.57 ± 0.074 , 102.50 ± 0.062 , 102.44 ± 0.072 , 102.43 ± 0.070 , 102.43 ± 0.070 and 104.43 ± 0.070 degree Fahrenheit respectively on 1st, 2nd, 3rd, 4th, 5th, 6th and 7th post operative day and in group C the mean value of temperature recorded were 102.60 ± 0.044 , 102.52 ± 0.049 , 102.45 ± 0.055 , 102.411 ± 0.056 , 102.40 ± 0.066 , 102.40 ± 0.074 and 102.4 ± 0.074 respectively on 1st, 2nd, 3rd, 4th,

Table – 2

Mean \pm S.E. and C.V.% of body temperature (${}^{o}F$) in female goats in consequence of laparatory wound healing.

	10.074		10.01		1			-				_					3/0	
			+0.074		+0.066		±0.056		±0.055		±0.049		±0.049		± 0.070		00001	c
	102.4	0.22	102.40	0.20	102.40	0.17	102.41	0.16	102.45	0.14	102.52	0.13	102.60	17.0	102.01	,	2011	
-												3		2	109 97	٥	Mercerised	Carrie
							-										(140. 2/0)	
	±0.070		±0.070		±0.070		±0.072		±0.062		±0.074		±0.066		± 0.070		braided silk	Ж
0	102.43	0.21	102.43	0.21	102.43	0.21	102.44	0.18	102.50	0.22	102.57	0.19	102.62	0.21	102.43	9	Black	Group
									,	_	_						(No. 2/0)	
	±0.720		±0.068		±0.068		±0.063		±0.066		±0.060		±0.058		± 0.073		catgut	A
0	102.24	0.20	102.25	0.20	102.25	0.19	102.28	0.20	102.34	0.18	102.40	0.17	102.44	0.22	102.24	9	Chromic	Group
	+ S.E.		+ S.E.		+ S.E.		.∓ S.∓		+ S.E		I+ S.E		I+ S.E		÷S.E			
C.V	Mean	C.V.%	Mean	C.V.%	Mean	C.V.%	Mean	C.V.%	Mean	C.V.%	Mean	C.V.%	Mean	C.V.%	Mean			
	7		9.		5		4		ယ		2		1		0			
																calves	used	
					,										(day)	buffalo	material	
					ಆ	E (DAYS	POST OPERATIVE (DAYS)	OST OF	ъ						operative	no. of	suture	
															Pre-	Total	Type of	Group

 5^{th} , 6^{th} and 7^{th} post operative day. The data reveal that on 1^{st} post operative day the mean value of temperature in all groups were found to be slightly increased which do not differ significantly (P<0.01). This trend on increase in mean value of temperature were observed upto 3^{rd} post-operative day and then settled at pre-operative temperature. The analysis of variance revealed no significant (P<0.01) difference in mean temperature values between pre and post-operative days.

Pulse

Mean \pm S.E. along with coefficient of variation percentage (C.V.%) of pulse during pre and post operative days in she goats is presented in table no. 4 and its analysis of variance in table no. 5 on pre operative day mean value of pulse rate were 65.00 \pm 0.235, 64.88 \pm 0.260, and 64.88 \pm 0.260 pulse per minute respectively in group A, B and C. For pulse rate, there was no significant difference among these group. On post operative day the mean value of pulse of group A were found to be 65.11 \pm 0.260, 65.22 \pm 0.22, 65.00 \pm 0.288, 65.11 \pm 0.260, 65.00 \pm 0.235 and 65.00 \pm 0.235 pulse per minute respectively on 1st, 2nd, 3rd, 4th, 5th, 6th and 7th post operative day. In group B, the mean value of pulse recorded were

58

material h	suture	Type of	Mean ± 1
buffalo	no. of	Total	S.E. a
(day)	no. of operative	Pre-	nd C.V.
			% of pi
	POST OPERATIVE (DAYS)		Mean \pm S.E. and C.V.% of pulse rate in female goats in consequence of laparotomy wound healing.

Group

used

calves

65.00 1.087 65.11 1.200 65.22	I+ S.E		Mean		0		(day)	operative	Pre-	
1 087			C.V.% Mean							
65.11	H.S.H.	1			-					
1.200			C.V%							
65.22	1 1	1	Mean		22					
1.022			C.V.% Mean							
1.022 65.00 1.332	1- 0	ا ا ا			ω					
1.332			C.V.%					POST		
65.11	1	† 万 王	Mean C.v.%		4			POST OPERATIVE (DAYS)		
1.200			C.V.%					TIVE (D		
65.00		H SE		(OI			AYS)		
1.087			C. V.%							į
65.00		+ -			σ					
1.087			0.4.%	C 11 0						
65.00 1.087	3	1+10	· Program	Moon CV&	7	3				
1.087	1007			CV&						

Group

Mercerised

C

9

 ± 0.260

 ± 0.288

 ± 0.146

 ± 0.146

 ± 0.146 65.22

 ± 0.261

64.88

1.204

65.66

1.318

65.22

0.676

65.22

0.674

0.676

64.88

1.204

65.00 ± 0.235

1.087

1.087

 ± 0.235 65.00

 $(N_0.2/0)$ cotton Group

Black

B

braided silk

9

 ± 0.260

 $\pm .175$

 ± 0.260

± .166

±02.00

 ± 0.235

 ± 0.235 65.00

 ± 0.235 65.00

64.88

1.204

65.55

0.804

65.11

1.200

65.00

0.769

65.11

0.922

65.00

1.087

1.087

1.087

(No. 2/0)

Group

Chromic

Þ

catgut

9

 ± 0.235

 ± 0.260

 ± 0.22

 ± 0.288 65.00

65.00

1.087

65.11

1.200

65.22

65.11 ± 0.260

 ± 0.235

 ± 0.235

 ± 0.235

(No. 2/0)

	2		
	သ		
		POST	
	4	POST OPERATIVE (DAYS)	
		TIVE (D	
	O1)AYS)	
2112			
1	6		
2 4 8			
7	7		
CVE CVE			

Table - 5

Analysis of variance for the effect of suture material used in laparotmy on pulse rate in she goats.

Sources of variation	Degree of freedom	Sum of square	Mean of squre	H
Between group	2	0.259211	0.1296055	0.268535136 ^{NS}
		1 00000	0 761 807857	1 578608506 ^{NS}
Between period	7.	5.333285	0.761897857	1.578608506
Between thread × period	14	1.888937	0.134924071	0.279554909 ^{NS}
Error	192	92.666667	0.48263889	

Non - Non significant

 65.55 ± 0.175 , 65.11 ± 0.260 , 65.00 ± 0.166 , 65.11 ± 0.200 , $65.00 \pm$ 0.235, 65.00 \pm 0.235 and 65.00 \pm 0.235 pulse per minute respectively on 1^{st} , 2^{nd} , 3^{rd} , 4^{th} , 5^{th} , 6^{th} and 7^{th} post operative day. Likewise in group C, the mean value of pulse recorded were 65.66 \pm 0.288, 65.22 \pm $0.146,\ 65.22\ \pm\ 0.146,\ 65.22\ \pm\ 0.146,\ 65.22\ \pm\ 0.146,\ 64.88\ \pm\ 0.261,$ 65.00 ± 0.235 and 65.00 ± 0.235 pulse per minute respectively on 1st, 2^{nd} , 3^{rd} , 4^{th} , 5^{th} , 6^{th} and 7^{th} post operative day. The date reveal that on 1st post operative day the mean value of pulse on all groups were found to be slightly elevated, but do not differ significantly (P<0.01). This trend of increased in mean value of pulse rate were observed upto 3rd post-operative day and then declined to settled at pre operative pulse rate. The analysis of variance revealed no significant (P<0.01) difference in mean pulse rate between pre and postoperative days.

Respiration

Mean \pm S.E. along with coefficient of variation percentage (C.V.%) of respiration during pre and post-operative days in she goats are presented in table No. 6 and its analysis of variance in table No. 7. On pre-operative day, the mean value of respiration were 25.00 ± 0.289 , 24.88 ± 0.200 and 24.88 ± 0.261 , respiration per

Table - 6

Mean ± S.E. and C.V.% of respiration / minute in female goats in consequence of laparotomy wound healing.

Group

Type of suture

material

Total no. of buffalo

operative (day)

POST OPERATIVE (DAYS)

Pre-

	used	calves	0		-		3		သ		`		n		,		
					 -		,		c				٥		!	٥	a
			Mean	C.V.%	Mean	C.V.%	Mean	C.V.%	Mean	C.V.%	Mean	C.V.%	Mean	C.V.%	ایر	Mean	Mean C.V.%
			±S.E.		+ S.E.		+ S.E.		+ S.E.		+ S.E.		± S.E.			±S.E.	ts.e.
Group	Chromic		25.00	3.464	25.556	3.062	25.444	2.071	25.333	2.79	25.222	3.303	25.11	3.113		25.11	25.11 2.393
A	catgut	9	± 0.289		±0.176		±0.175		±0.235		±0.278		±0.261		I †	±0.200	0.200 ±0.235
	(No. 2/0)																
Group	Black		24.88	2.415	25.44	2.07	25.33	1.973	25.222	2.643	25.222	2.643	25.22	3.304	12	25.11	5.11 2.393
æ	braided silk	9	± 0.200		±0.176		±0.167		±0.167		±0.223		±0.278		1+	±0.200	0.200
	(No. 2/0)																
Group	Mercerised		24.88	3.14	25.556	2.842	25.444	2.071	25.333	2.791	25.222	3.303	25.111	3.113	۲.٦	25.00	25.00 2.828
C	cotton	9	± 0.261		±0.242		±0.176	-	± 0.235		±0.278		±0.261		1+	± 0.236	0.236
	(No.2/0)																<u>-</u> -
No.	No. of observation in each group $(n) = 9$	ion in e	ach grou	p (n) =	9												
				•													

Table - 7

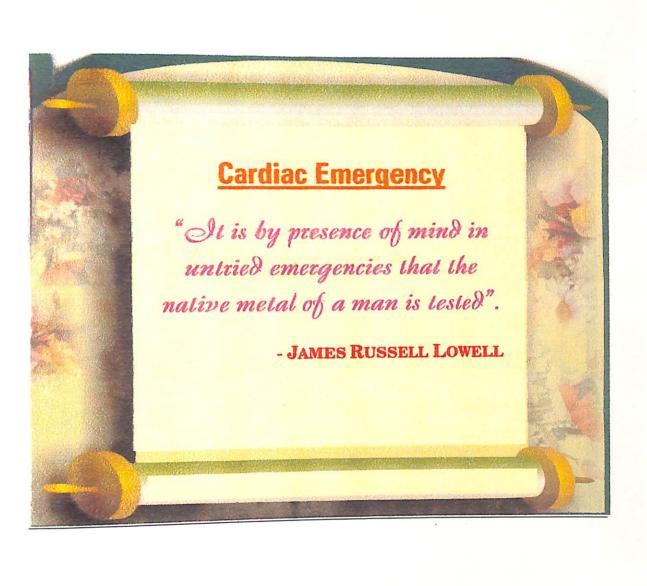
Analysis of variance for the effect of suture materials used in lapartomy on respiration rate in she goats

Sources of variation	Degree of freedom	Sum of square	Mean of squre	Ŧ
Between group	2	0.0833	0.04165	0.085884469 ^{NS}
Between period	7	8.20367	0.171952857	2.416 ^{NS}
Between thread × period	14	0.4352	0.031085714	0.0641 ^{NS}
Error	192	93.1113	0.484953802	

NS:- Non-significant

minute respectively in group A, B and C. There was no significant difference between respiration in these groups. On post operative day the mean value of respiration of group A were found to be 25.556 \pm $0.176,\ 25.44\ \pm\ 0.175,\ 25.333\ \pm\ 0.235,\ 25.222\ \pm\ 0.278,\ 25.11\ \pm\ 0.261,$ 25.11 ± 0.200 and 25.00 ± 0.235 respiration per minute respectively on 1st, 2nd, 3rd, 4th, 5th, 6th and 7th post operative day. In group B, the mean value of respiration recorded were 25.44 ± 0.176, 25.33 ± $0.167, 25.22 \pm 2.643, 25.22 \pm 0.223, 25.22 \pm 0.278, 25.11 \pm 0.200$ and 25.00 ± 0.235 respiration per minute respectively on 1st, 2nd, 3rd, 4th, 5th, 6th and 7th post operative day. Likewise in group C, the mean value of respiration recorded were 25.333 \pm 2.791, 25.222 \pm 0.278, 25.111 \pm 0.261, 25.00 ± 0.236 and 24.88 ± 0.261 , respiration per minute respectively on 1st, 2nd, 3rd, 4th, 5th, 6th and 7th post operative day. The data reveal that on 1st post operative day the mean value of respiration in all groups were found to be slightly elevated, but do not differ significantly (P<0.01). This trend of increase in mean value of respiration were observed upto 3rd post-operative day and then declined to settled at the pre operative respiration rate. The analysis of variance revealed no significant (P<0.01) difference in mean respiration rate between pre and post operative days.





Discussion

DISCUSSION

Varieties of suturing materials both absorbable and non-absorbable like, chromic catgut, P.G.A. Vicryl, Dacron, Maxon, Silk, Cotton, Nylon, horse hair etc. had been used as internal suture for repairing the injuries of abdominal wall, loops of intestine, urinary bladder and other visceral organs since last decades (Maleny, 1927; Bates, 1939; Localio et al., 1943; Mc Lean and Fais, 1952; Weaver, 1968; Eilert et al. 1971; Mbiuki, 1983; Lanstedt and Debur, 1990).

Although, available literatures revealed maximum information regarding the use of chromic catgut for internal use in human beings and animals but there is scanty information regarding the use of non-absorbable suturing materials for internal use in animals as well as in human beings.

Thus, the present research work was undertaken to know the efficacy of 2/0 black braided silk and 2/0 mercerised cotton threads (both non-absorbable) for suturing the peritoneum and muscles of abdominal wall in caprine.

In group A, laparotomy incision was repaired with 2/0 chromic catgut after the surgery. All animals were marked normal on the day of surgery except goat No. 8, which was

suffered from bradycardia just after surgery. It might be due to post anaesthetic effect of xylazine hydrochloride. Anyhow, the said complication was combated after the use of Nikethamide, Dexamethasone and I/V infusion of 5% Dextrose saline solution.

However, this type of post anaesthetic complication could be minimized after the use of xylazine-ketamine in combination. This type of finding was in agreement with the findings of Hoffman, 1974; Knight, 1980 (in equine); Klide et al. 1975 (in canine). Similar results were also reported in caprine after the use of Xylazine (Kumar and Thurmon, 1979). The operated animals of this group survived well with normal urination, defectation, rumination and appetite. Clinical examination showed an oedematous swelling around the operated site in goat No. 6, which subsided gradually during the period of observation.

Temperature, pulse and respiration were slightly increased for the first three days after surgery, which became normal in due course. These findings were in agreement with the findings of other workers, after repairing of oesophagus (Ojha, 1965 and singh, 1993) and after urethroplasty (Kumar, 2000 and Ansari, 2002) in bovine experimentally. In the present group, complete healing was observed at the time of removal of external stitches on the 8th post operative day. Similar result was observed by Vig and Tyagi (1970)

and Shastry and Rao (1981) after the use of chromic catgut as suturing material during cystorrhaphy in bovine. Few nodules were observed on the serosa of rumen in some goat, which might be due to local reaction or inflammatory changes. Anyhow actual reason for the nodule formation could not be assessed.

Mild haemorrhage on muscular tissue in the vicinity of incisional wound could be detected grossly in few operated animals, was also similar with the findings of Kumar et al. (1968), during repair of incisional wound at the hip region and Ravikumar et al. (1992), at the time of cystorrhaphy in bovine. The peritoneal adhesion which was observed at the time of tissue removal for histopathology similar with the result of Tyagi and Lumb (1961),after hysterotomy in she goat, Dhablania and Tyagi (1970), when they performed rumenotomy in buffalo calves. Kumar and Singh (1970), used chromic catgut and cotton threads as suturing materials during rumenotomy in buffalo calves and observed higher incidence of peritoneal adhesion with catgut than cotton. Thus, the finding of present research work also agreed with the results of Sreenu et al. (1997), after cystoplasty in dogs and Boucoumont et al. (1978), after caesarean section in cows experimentally. Microscopically, presence of inflammatory tissue reaction was observed during the present study. Similar observations was marked by Gage and Lyons (1949), in their opinion persistent inflammatory reaction was observed after the use of catgut. Formation of collagen fibre and haemorrhage in muscular tissues on 10th post-operative day was marked histologically in this group which was also agreeable with the result of Singh (1993) and Ojha (1965), after oesophageal repairing with chromic catgut in bovine experimentally.

The incisional vacant area formed by absorption of catgut had been filled with the good number of fibroblast cells and thus, it confirmed the result of Kudalk and Hattangady (1971), who had performed cystoplasty using the chromic catgut No. 4/0. Severe tissue reaction in the form of excessive cellular zone consisting abundant polymorph, macrophages and fibroblast cells were also visible microscopically by Kulkarni and Bhokre (1985).

On 30th day, the vacated area of catgut suture was completely filled with collagen fibre and thus, the result coincide with the result of Sharma and Khan (1978) after performing cystoplasty using 3/0 chromic catgut in bovine with good result.

In group B, Laparotomy incision was closed with 2/0 black braided silk. Any type of complication on the day of surgery and after the surgery could not be detected. The healing was also complete. Thus the result of present research work is in agreement with the result of Archibald and Reed (1964) who had advocated the use of silk

thread for oesophageal anastomosis in canine, Gupta et al. (1985), after performing intestinal anastmosis with silk ligature in buffalo calves, Gopal et al. (1995) and Pandey et al. (1995) who had used silk threads respectively during rumenotomy and cystotomy in bovine.

An increase in temperature, pulse and respiration for the first 3 days after surgery was marked in this group and it might be due to inflammatory changes. Any type of untowards patholological lesion could not be detected. Complete healing was observed in all operated animals. Thus, the result coincide with the result of Sharma (1995)and Sharma and Agrawal (1997) who had used 3/0 black braided silk during cystectomy and prosthetic bladder replacement in buffalo calves. Good results were obtained by many workers after internal use of silk thread. Bhardwaj et al. (2000) and Desmukh (2000) repaired omasum and urinary bladder successfully in bovine and canine respectively.

However, the result of present research work did not coincide with the result of Schultz et al. (1962) who had used two layer technique during intestinal anastomosis using silk thread in puppies. During their study, there was development of stricture at the site of anastomosis. Any how, moderate tissue reaction was observed by them. In this group, peritoneal adhesion was negligible. Thus, the result corroborated with the result of Kanade et al. (1984) after

repairing of umbilical hernia using silk ligature in bovine. Similar results were marked by Ojha (1965), after oesophageal repairing and by Kumar, (2000) and Ansari, (2002), after urethrosplasty in bovine.

The tissue reaction was minimal in this group as compared to Group B which coincided with the result of others (Ojha, 1965; Sharma, 1973; Kumar, 2000 and Ansari 2002) after the use of silk ligature in bovine experimentally. In the present research work silk thread was visible till the last day of observation and thus, it was agreement with the result of Sharma and Khan (1978), Kumar (2000), Ansari, (2002) after the use of silk threads in urological surgery experimentally in bovine.

Microscopically, on 10th day of laparotomy, a thick connective tissue ring was marked around the suturing material while on 20th day, moderate degree of tissue reaction was noticed which was similar to the result of Sharma and Agrawal (1997) who observed highly vacularized connective tissue after cystectomy and prosthetic bladder replacement in bovine. Similar results were also observed by other workers (Dabas *et al.*, 1996; Gopal *et al.*, 1995 and Sharma., 1995) in canine and bovine experimentally. The operated area was filled with abundance of collagen fibres histolgically which was in agreement with the result of Sharma and Khan (1978) and Singh *et al.* (1980) respectively after bladder surgery in bovine and repair of gastric wound in rabbits.

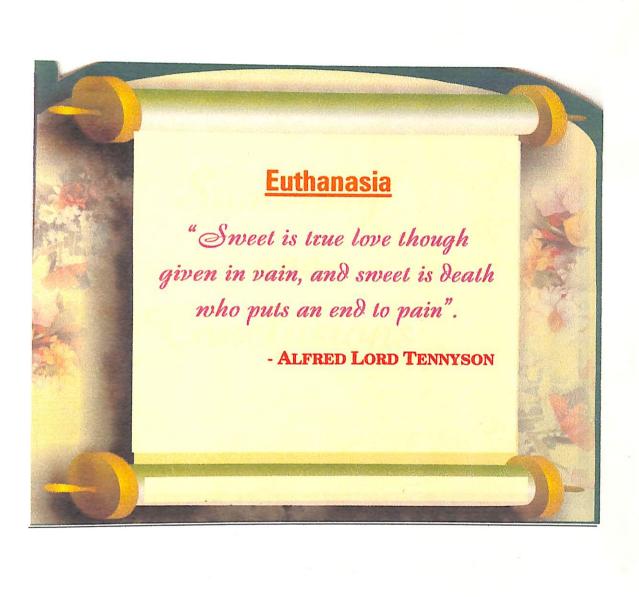
Singh (1993) conducted comparative studies on Vicryl, chromic catgut and black braided silk as suture material in oesophagotomy and preferred black braided silk on economic point of view.

In group C, Laparotomy incision was repaired with 2/0 mercerised cotton thread. Operated animals in this group survived well and showed normal urination, defecation, rumination and appetite. Temperature, pulse and respiration were slightly increased alike group A and B. Peritoneal adhesion and other untowards pathological lesions could not be detected grossly. This result coincide with the result of Ojha (1965) who repaired oesophageal incision with cotton thread experimentally in bovine. Microscopically, on 10th postoperative day, intense inflammatory reaction was marked which was denoted by numerous polymorphic and leukocytic cell infiltration at the operated site. Proliferation of collagen fibres were also recorded. Thus, the present result agreed with the result of Kumar and Singh (1970) who had observed the tissue reaction microscopically by infiltration of mononuclear and polynuclear leukocytes around the suture. Vig and Tyagi (1970) also reported similar findings after urethrotomy in bovine. On 20th day, histopathological study revealed peritoneal adhesion with the inner most layer of obliquus abdominis internus muscle which was similar with the result of Kumar and

Singh (1970) who observed mild adhesion between peritoneum and muscles after rumenotmy in bovine and caprine. The histological study on 20th and 30th day, revealed ring like encapsulation of collagen fibres around the mercerised cotton thread which was in agreement with the result of Kumar and Singh (1970) who observed macrophages and fibroblasts cells encapsulating the cotton thread microscopically. Kleinsassar et al. (1950) used peritoneal grafts during intestinal anastomosis in eighteen dogs experimentally in which No. 7/0 cotton threads were used with unsatisfactory result. Similar result was also obtained by Shultz et al. (1962) when he used two layer technique for oesophageal repair with cotton in bovine. He had marked development of stricture and fistula formation at the site of operation. Thus, the result of present study was somewhat different in caprine as compared to these workers.

On 30th post-operative day, histologically sutured area appeared to be thicker in the present group which might be due to fibrosis which was also in agreement with the result of Ojha (1965) who had observed same type of thickening after repairing of oesophageal incision.





Summary and Conclusions

SUMMARY AND CONCLUSIONS

The present study was conducted on twenty seven clinically healthy female goats aging about 1-2 years and weighing in petween 16-20 kg. The experimental animals were randomly divided intoo three groups; A, B and C. In all the animals laparotomy was made on the middle of the left flank under xylazine hydrochloride anaesthesia intramuscularly and linear infiltration of 2% xylocaine hydrochloride locally. Peritoneum and muscles were repaired with 2/0 chromic catgut, 2/0 black braided silk and 2/0 mercerised cotton threads in animals of group A, B and C respectively. Thus, each group contained nine animals. The observation were made on the basis of clinical manifestations exhibited by the operated animals which includes, rumination, appetite, defecation, urination, temperature, pulse, respiration and any type of change in their normal habitus after the surgery; macroscopic and microscopic studies of the tissues from the repaired area on 10th, 20th and 30th post-operative days.

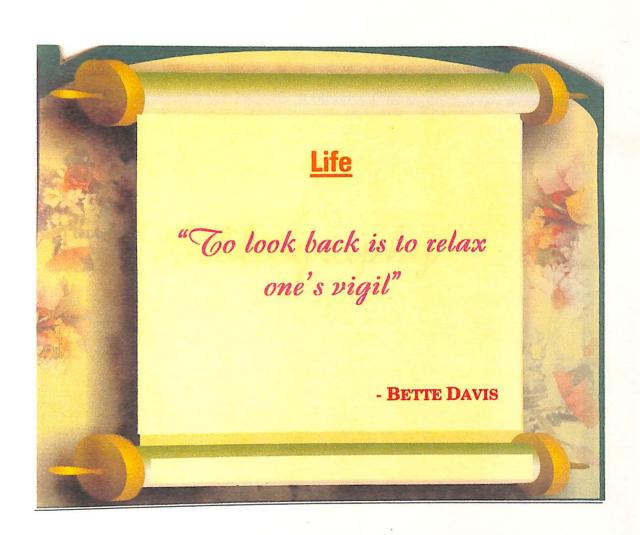
The operated animals in all the groups were active and grazing in the field normally after 3rd day of surgery. All the clinical

signs exhibited by the operated animals were normal. Their rumination was normal with good appetite. Although, the healing was marked normal grossly and histologically with all these sutures, a few nodules and mild adhesions were detected with peritoneum in few animals (goat No. 4, 6 and 8) of group A (repairing with 2/0 chromic catgut). This type of pathological lesions could not be detected grossly and histologically after the use of 2/0 black braided silk and 2/0 mercerised cotton threads in group B and C respectively. There was lack of mortality after the surgery in any group. Though, all these three suturing materials are worthy for internal use in caprine but he superiority may be graded as 2/0 black braided silk, 2/0 nercerised cotton thread and 2/0 chromic catgut respectively. On the asis of observations and results of the present study, following onclusion are drawn:

- (i) Untoward pathological lesions could be detected grossly and histopathologically with 2/0 chromic catgut could not be detected with 2/0 black braided silk and 2/0 mercerised cotton thread.
- (ii) 2/0 chromic catgut is costly and not frequently available in the rural areas as compared to 2/0 black braided silk and

2/0 mercerised cotton threads. Thus, these last two suturing materials may be used clinically in caprine internally wherever needed in goats for the poor persons of the society.





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