Surgical Studies

on

Traumatic Teat Fistula in Lactating Animals
with
Particular Reference to Experimental
Approach in Caprine

Thesis.

submitted to the

Rajendra Agricultural University

in partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE (VETERINARY)

SURGERY 1975

By

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B. V; Sc. & A. H. (R. A. U,),

Junior Research Fellow, R.A.U.,
Post-Graduate Department of Surgery,

BIHAR VETERINARY COLLEGE

PATNA.

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Dated, the 2st May 1975.

This is to certify that the work embodied in this Thesis entitled "SURGICAL STUDIES ON TRAUMATIC TEAT FISTULA IN LACTATING ANIMALS WITH PARTICULAR REFERENCE TO EXPERIMENTAL APPROACH IN CAPRINE" is bonafide work of Dr. Ram Bachan Singh and was carried out under my guidance and supervision.

(A.A.KHAN)

CERTIFICATE

Certified that the research
work incorporated in this Thesis have
not been published in part or in full
in any other journal.

(R. B. SINGH)

DEDICATED

TO

MY LATE MOTHER

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(R. B. SINGH)

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INTRODUCTION

INTRODUCTION

The value of dairy animals depend on their udder and teats. They are useless without teats. Therefore, affection of the bovine teats are of great importance. Surgical interferences of the teats are deemed necessary because of the frequency with which the disease occurs and the necessity to return the defective and damaged teats to normal function. It is well known fact that many mammary quarters are lost due to teat laceration and fistulation during lactation and many valuable animals become useless. These losses may not occur if corrective measures are taken in time. Successful surgery of the bovine and caprine teats can save many valuable animals from being sent to slaughter or from losing one or more teats.

Most of the bungalows, gardens, parks, fields and nearly all farms adjoining towns and cities have barbed wire fencing. Cows, buffaloes and goats when left free for grazing, enter such compounds. The most common injury occurs when these animals try to cross or jump over a barbed fence when they are driven out by the guards or chased by dogs. Thorny bushes and Agricultural equipments also play an important role in fistulation. Injury may also be self inflicted and it is not unknown for a cow or buffalo with rather large pendulas teats to stand on while rising up. Some times it is caused due to treading by other animals tied near by. Whatever be the cause, the traumas of involved teats vary from simple incisions to severe lacerations which may penetrate through

the teat canal resulting into flow of milk from the wound called "milk fistula".

Teat fistula is a common and burning problem for the owners as well as for the veterinarians because it poses a more difficult task, if not treated carefully and properly. If operations are carefessly performed little good is accomplished and some times disastrous results may be the outcome of the operations. Although many methods have been described previously by many authors but a recent and advanced technique for repairing the teat fistulae is greatly needed.

The present work has been designed to study two tier suturing technique i.e. mucosal layer alone, muscle and skin together employing continuous and simple interrupted sutures respectively, using silk and cotton (Kohinoor) threads with or without the use of polythene tube. Radiographical and histopathological studies of the repaired teats have also been made.

Experimental production and surgical correction of the teat fistulae in caprine have been contemplated owing to the paucity of clinical cases during the research period. This would further add to substantiate the proposed correcting procedure in bovine and caprine as well.

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REVIEW OF LITERATURE

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REVIEW OF LITERATURE

ANAESTHESIA OF THE TEAT:

Fowler (1941) obtained anaesthesia of the bovine teat by infiltration of a 2% procaine hydrochloride solution or other anaesthetic solutions using a 1-inch 20-gauge needle. The interior was anaesthetized by injecting 5 ml. of 4% butyn sulphate into the lumen of the teat.

According to Hall (1947) the use of anaesthesia is optional. In some cases, as with nervous, high strung cows, it is necessary while in other individuals a lot of surgery can be done easily with only a bull lead for restraint. The range of anaesthesia is local infiltration, epidural or general.

Dykes (1951) anaesthetised the bovine teat by injecting 10 ml. of Cocaine solution with milk teat syphon canula in situ attached with record type syrine. Although anaesthesia produced by employment of as little as 2 ml.of 1% cocaine injection via the short nozzle of a record type syringe.

Dankes (1953) produced anaesthesia in bovine teat by infiltration of a suitable local anaesthetic on the area immediately adjacent to the fistula, using 2 ml. syringe.

Conner (1955) induced local infiltration anaesthesia around the base of the teat with 2% procaine solution. The agent was injected superficially, then deeply so as to deposit the material into the mucous lining of the teat canal. Nebraska (1955) obtained anaesthesia in bovine teat in dry condition by use of local anaesthetics.

Arnold (1957) recommended a 2% procaine hydrochloride or 1% cyclaine around the base of teat as local infiltration.

Smythe (1959) obtained teat anaesthesia by infiltration of 2.5% solution of procaine hydrochloride around the base of the teat by means of a dental type syringe fitted with interchangeable schimmel's needle, the injection being made in a circle, each being about 1 cm. from the last. The injection was given beneath the skin of the teat, but not into the canal.

Steere et al. (1960) reported that procaine hydrochloride 1% solution can be infiltrated around the base of the teat
as far as mucosa and as high as needed. This circular infiltration anaesthesia anaesthetizes the entire teat without interfedring with normal anatomical relations along the line of
incision in case of open teat surgery.

Berge and Westhues (1961) recommended circular infiltration anaesthesia at the base of the teat using 5-10 ml. of a 2% tutocaine solution in case of teat fistula in cattle.

Write and Hall (1961) opined that aquous solution of cocaine hydrochloride 2% or procaine 4% may be applied topically for the desensitization of a superficial abraded wound of teat. The application is made by soaking a small tampon of absorbent wool or gauge in the solution and holding it in contact with affected area for 5 minutes.

Gudi (1961) did not apply any anaesthesia in the treatment of teat fistula in milking animals.

Kowalczyk (1963) anaesthetized the bovine teat by

injecting 5 to 10 ml. of 1 to 1.5% planocaine with adrenaline in 3 to 4 places at the base of teat.

Moussu (1965) injected a local anaesthetic solution in bovine teat to page away the callus surface of the fistula.

Mulling (1966) favoured the use of epidural anaesthesia in bovine for surgical interferences of teat effections. He advocated the use of 60 ml. of 2% xylocaine to obtain about 1½ hours anaesthesia of teats, and for 2½ hours the animal became unable to get up. This is the best combination of restraint and anaesthesia for teat surgery.

Boodkhe (1969) did not use any type of anaesthesia for treating the milk fistula in goats.

Khan et al. (1970) anaesthetized the site of operation in dairy cows by circular infiltration of the base of the teat using 10 ml. novocaine (Hoechst).

Angelo (1971) induced local infiltration anaesthesia with 2% procaine hydrochloride 3-5 ml. in goats. The anaesthetic solution was injected subcutaneously into two lines resembling the arm of invested 'V' meeting at a point above the fistula.

Nigam (1973) produced anaesthesia in caprine teat by field or local infiltration.

TEAT SURGERY:

Fowler (1941) recommended the use of interrupted sutures or metal clips in lacerated teat wounds. After suturing, the orifice was slit open on the medial side for \(\frac{1}{2} \) to \(\frac{3}{4} \) inch for drainage of milk, so that the milk did not leak through

the suture lines. Little trouble was experienced in the healing of the slit of the teat orifice.

Hallgren (1942) has suggested to remove the scar tissue at first around the fistula and thus to make an 'H' shaped incision in the skin with the bar of the 'H' over the fistula. Afterwards, the two skin flaps were brought between the parallel incisions and some times over the fistula and finally sutured the uprights of the 'H'.

Rattray (1943) suggested that the operative treatment was best done during the dry period by scarifying or paring away the scar tissue and closing the orifice with mattress sutures. The suture was begun on the outer surface of the teat, \$\frac{1}{4}\$ inch or more from the wound. The wall of the teat was penetrated and the fistula was crossed in the canal and penetrated the wall of the opposite side of the wound so as to bring the needle point out at the margin of the outer skin. Then the wound was crossed again to inter the same place on the original side allowing the needle and suture to go into the canal and to give a surgeon's twist as it acrossed the wound in side, to exist there like first suture made on the opposite side. Then the free ends of the sutures were taken and tightened so as to bring the wound into proper apposition.

Gold (1943) repaired the fistula with silk worm gut in deep and superficial mattress pattern, excluding the mucous membrane. The sutures were removed after 10-14 days.

McAliff and Johnson (1946) scarified the fistula or the lining was dissected out and then the wound was closed with small michel clips followed by application of adhesive tape to

the entire length of the teat with a provision of cannula for drainage in a lactating cow. In fistula near the teat orifice, the affected part might be removed aseptically to allow the wound to heal and to form a new sphincter.

Hall (1947) pointed out that in aquired fistula, the operation should be done while the cow is dry. A sterile teat tube or gauge should be inserted as a guide and with a thin bladed knief (B.P.) an elliptical cut is made large enough to include the fistula in the center. Then the wound should be sutured with fine silk worm gut in interrupted fashion.

Ferguson (1947) advocated the use of a silver probe to ascertain the direction of the fistula. After determining the direction of the fistula, the applicator was applied twice, always pressing out the excess, so as to run it until it approximated almost the end of the fistula and there would be absorption enough. It was a complete success for small fistula while larger ones were done by the operation.

Moore (1949) treated teat fistulae after dissection of the fistulous tract and then tightly closed it with metal clips.

A milk tube was placed in the teat canal for guidance.

Dankes (1953) preferred to treat teat fistulae when the animal become dry. An elliptical piece of tissue including the fistula in its centre was removed. The wound was closed with perpendicular mattress sutures of a fine non-capillary matterial. A sterile gauge pack was placed over the wound and held in place by application of adhesive tape around the teat. The dressing and sutures were removed in seven days. The udder was infused with penicillin and dihydrostreptomycin. The lactating cows were operated with the same technique after withdrawing the milk from the

quarter with a milk tube, twice daily for 10 days in an aseptic manner. This method gave 100 percent success in dry cows and 50 percent recovery in lactating animals.

Frank (1954) repaired the teat would using no.0 chromic cat gut. The wound was freshened to remove a thin layer of the surface from the margin and closely placed interrupted sutures were applied to approximate the edges of the wound. The suture was inserted through the skin and underlying tissue down to but not through the mucous membrane. In lactating cows a teat tube with a removable cap was inserted.

conner (1955) closed the teat wall with no.34 stainless steel wire by placing mattress sutures through the wall to bring all layers in normal apposition. Metal clip was placed over the incision and the wound was covered with aeroderm dressing. Plastic dressing was also placed around the flange of the teat cannula sealing it in place. Sutures were removed in approximately six or seven days. Teat cannula was left in place, without a cap for 2 or 3 days, then removed.

Nebraska (1955) repaired teat fistulae in dairy cows using two or three horizontal mattress sutures of stainless steel wire after destroying the tissue with the help of electric cautery. The suturing material was left in place for two or three weeks.

Goetze et al. (1956) treated the teat fistulae using mattress tension sutures for suturing the teat wall after dissection of the mucosa. The skin was sutured separately.

Blood (1957) sutured the teat fistulae after excising the edges and mucous membrane. Michel's clips no.14 mm were used for suturing the affected teat. cistern.

Arnold and Webber (1957) operated the teat fistula when the cow was in dry condition. In case of small fistula an elliptical piece of skin which included the opening of the fistula was removed. Then the mucosal layer of the fistula was dissected out. Mattress tension sutures were used for suturing the teat wall and the skin was sutured separately. In few cases purse string sutures were used. In large fistulae edges were debrided to suture the wall.

Gibbons (1958) sutured the membrane of the teat canal by close interrupted sutures with no.0 or 2/0 chromic gut. The skin was closed with no.0 monofilament steel wire.

Smythe (1959) used monofil nylon as suturing material in the treatment of teat fistulae in bovine in dry condition. The edges of the fistulae were trimmed and the needle was inserted inch from the edge of the wound commencing at the upper extremity of the incision. It was then carried parallel with the skin surface, through the substance of the skin itself. without penetrating the milk canal, and then continued straight through the skin of the opposite edge of the wound to emerge again inch from its border. The direction of the needle was now reversed so that it passed through the outer surface of the edge of the skin wound at which the needle emerged. After crossing the lip of the wound and dipping it into the incision, it was introduced through the inner edge of the skin to emerge above the point where the needle was first introduced. All the required sutures were inserted before tying off. Then skin suture was carried out by continuous fashion with fine monofil mylon.

Steere et al. (1960) reported that fistulae with small

openings could be closed sometimes by cauterization using butter of antimony or silver nitrate, but in large fistulae surgical incision of all old scar tissue in elliptical manner was the desirable fashion.

Drewry (1961) mentioned a suturing technique for neglected teat wound. The wound edges were debrided by removing the granulation tissue. The mucosal layer was closed with simple interrupted fine vetafil sutures. Plastic teat tube was then introduced into the teat removing the cap afterwards. The vetafil sutures and teat tubes were removed in 7 to 10 days.

Gudi (1961) treated the teat fistulae in milking animals by applying interrupted deep sutures by lambert's method. Loose skin sutures were given only to support the deep sutures. Then pressure bandage was applied over the wound. The bandage was kept for 7 days and thereafter the bandage as well as the sutures were removed.

Zabolicki (1962) found 93.8 percent healing in perforating teat wound and fistulae in milch cows. After applying antibiotics a bykanula i.e. teat cannula filled with antibiotic was introduced into the teat canal.

Kowalezyk (1963) used a modified Goetze's method employing plastic cannula in treating nine cases of perforating teat wounds. The quarter was infused with antibiotic solution and a plastic cannula was inserted into the teat. The plastic cannulas, used, were called Bykannulas. The result was satisfactory.

Brabant and Mielke (1964) used permanent open catheters in cows teats for therapeutic and diagnostic purpose in udder diseases. In conjuction withantibiotics open plastic catheters

were used with satisfactory result in the treatment of 43 teat wounds. A new catheter was inserted in case of falling out the first, otherwise they were left in the teats until healing took place.

Moussu (1965) mentioned a successful method for treatment of milk fistulae. A halsted suture using fine nylon thread
was inserted through the deep part of the wound, penetrating
the skin only on the side of the wound on which the two ends
of the thread were tied. In the skin simple interrupted sutures
were applied. The wound was sealed with collodian and milk
tube was inserted which was fixed in position by strips of
plaster.

McLintock (1966) described a technique for correction of teat fistula. The fistula was excised completely down to the teat canal extending about 1-5 cm above and below the fistula in elliptical manner. The wound edges were dressed with penicillin and deep sutures were placed a few millimeter from the edge of the wound. The suture then crossed the opposite side of the wound where it again penetrated the mascular wall from within outward and travered the teat wall to the surface, finally emerged on the skin a few millimeter from the wound edge. The suture then looped over piercing the skin only, on the same side from without inward, crossed over and penetrated the skin on the opposite side from deep to superficial surface and tied off. These sutures were placed about 0.5 cm apart and the intervening spaces were occupied by simple interrupted sutures. Intramammary penicillin was introduced daily until sutures were removed.

lacerated teat wound in cows where the teat sinus has been opened. In case of vertical laceration mucosa and submucosa were sutured with 1/8 inch interval continuous stitch of 3/0 cat gut - employing a traumatic needle. It was checked for any leak by infusing 10 ml. of suitable dye such as Neoprontosal. Submucosa was closed over the first suture using same material in continuous mattress sutures with vetafil. For the horizontal laceration, plain interrupted sutures at 1/8 inch interval between the proximal and distal edges, were given. The affected quarter was treated with antibiotic twice daily for 3 days and sutures were removed after 10 days. For simple laceration teat cannula was not used.

cases of milk fistulae in goat and found useful for easy healing. A sterilized cycle valve rubber tube one inch more than the teat was filled with Aureomycin cintment then introduced through the teat canal. The edges of the mucous membrane were sutured with cat gut no.1/0 in continuous fashion.

Halsted suture with nylon thread was applied through the deep part of the wound penetrating the skin only on the side of the wound on which two ends of the thread were tied. The skin was sutured in interrupted fashion. Daily dressing with aureomycin cintment was done and the valve tube was removed after 8 to 10 days. Sutures were removed after 12 to 14 days. Success were 80 percent.

Aehnelt et al. (1970) repaired teat lesions after

debridment of the teat wound carefully. He used cat gut to suture the mucosa in continous mattress pattern while the skin edges were sutured with Michel's clips.

Nair (1970) introduced a teat syphon into the teat canal and the fibrosed mucous membrane was incised and removed by cutting transversely across the open teat canal. Intramural stitches using 3/0 medium chromic cat gut were inserted to unite the proximal and distal edges of the divided mucosa. The sutured edges of the mucous membrane were kept slightly inverted into the lumen without causing any obstruction while the sutures used were completely out side the lumen. The patency of the canal and efficiency of the sutures were tested by gently squeezing the sinus. The skin wound was closed by mattress sutures using nylon. One tube of penicillin one lakh unit i/m was infused into the teat and a polythene tube was inserted into the teat canal and kept in situ by means of adhesive tape to ensure drainage and avoid occlusion.

Khan et al.(1970) repaired traumatic test fistulae in dairy cows by maintaining the patency of test canal after inserting a sterilized polythene tube into the canal. The mucosa and the skin were sutured separately.

Gibbons et al.(1970) preferred to repair traumatic teat fistulae when the cow was not lactating. The use of a self retaining plastic tube with the cap removed was better in lactating animals. The tube eliminated the hydrostatic pressure that would produce a stain on the suture line.

Angelo and Dhar (1971) repaired 30 cases of milk fistulae in goats. They sutured the wounds in two layers without disturbing the mucous membrane of the teat sinus. They were of the opinion that there was no necessity to use milk tube or any other device for milk to dribble constantly from the teat since it was not only hazard to the animal but also a valuable loss of milk to the owner. Milking was done by pressing at the base of repaired teat twice or thrice daily.

Nigam (1973) treated deep laceration and fistulation by suturing in two or three layers. Different types of suturing material such as chromic cat gut 4/0, silk 3/0, monofil nylon and Michel's clips no.16 in different pattern such as simple continuous or inverted continuous were employed. A sterilized polythene tube was passed through the teat orifice into the teat lumen. The teat mucosa, musculovascular wall and the skin were sutured separately. Thereafter 1 ml. of injectable terramycin combined with 9 ml. of distilled water was injected into the teat through polythene tube. The polythene tube was sutured with the teat and kept in position by teat bandage. The polythene tube was removed on the 3rd day. The cutaneous sutures were removed on 8th day. However, Michel's clips were removed on 6th post-operative day. The healing in all cases, except in disrupted wounds, occurred by first intension.

MAMMOGRAPHY:

The mammography was done in the past to study the anatomy of the mammary gland and ramification of milk ducts.

Nigam (1967) used five different contrast media alone or in combination to do the radiographic study in 10 lactating and one clinical case of inflammed teat. Different contrast media used in his studies were:

- . 1. Air about 75 100 ml per quarter.
 - 2. 20 ml of 2% aquous solution of Barium sulphate per quarter.
 - 3. Pyelosil (glaxo) 50% 10 ml diluted with 10 ml distilled water.
- 4. Combination of 50 ml air and 10 ml of 2% aquous solution of Barium sulphate per quarter.
 - 5. Combination of 50 ml air and 8 ml. pyelosil 50%.

The technical factors used were: k.v.p. - 75. M.AS-10, F.F.D. - 30", time 1/4 seconds.

McDonald (1968) injected aquous barium sulphate 0.25 ml. of 50% suspension in and through the teat canal in dairy cows for anatomical study of the teat canal. The film pack was held in correct position by rubber band loosely applied around the teat and film pack. Small piece of card board was placed on the back of the film pack to hold it in flat plane. A steel rod of adjustable tright immobilised each teat during exposure. Radiographs were taken by giving:

Exposure time - 0.6 sec., F.F.D.- 66 cm. k.v.p. - 85, M.A.- 50.

Koike et al. (1969) X-rayed the udder after insufflation of air at 5-120 mm Hg. Use of 5 mm Hg pressure was suitable for demonstrating the cistern, 20 mm Hg for the

lactiferous sinuses and 40 mm Hg for the lactiferous ducts, but there was no difference between pictures obtained at 40-120 mm Hg. The air insufflated into a quarter (about 700-1000 ml.) was absorbed within 72 hrs. No side effects were observed.

Angelo (1971) introduced 5 ml. of 50 % aquous suspension of propyliodone (Dionosil, glaxo) diluted with an equal volume of water into the teat sinus of goat with the help of a teat cannula attached to a syringe. The technical factors used for radiography were: k.v.p.- 40, M.AS- 9, time- 0.4 sec. and F.F.D.- 36".

Kubicek (1972) radiographed the bovine teat after intracisternal instillation of a non-irritant tri-iodinated contrast media in aquous solution.

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MATERIALS AND METHODS

MATERIALS AND METHODS

SELECTION OF EXPERIMENTAL GOATS:

The present study was conducted on twelve teats of six lactating goats ranging in age between 2 to 3 years. The weight of the animals ranged between 18 to 30 kgs. The goats were apparently healthy and in fairly good condition. All the goats were kept under personal care and during the period of study all possible routine examinations were carried out to ensure that they were reasonably healthy.

SUTURING MATERIALS:

The following suturing materials were used in the present study:

- 1. Silk thread 3/01 Ethicon, non-absorbable surgical suture.
- 2. Mercerized cotton thread no.252.

POLYTHENE TUBES:

- i. Polythene tube of 3 mm diameter for cow.
- ii. Polythene tube of 2 mm diameter for experimental goats.

EQUIPMENTS:

The instruments used for surgical repair of the teat fistulae in experimental goats as well as clinical cases have been illustrated and listed in fig.1.

^{1 =} U.S.P., Code - R 822.

EXPERIMENTAL DESIGN:

- (1) Incidence of the cases of teat fistulae treated in last 10 years at Bihar Veterinary College, hospital, was worked out on the basis of available records (table-I).
- (2) The experimental goats were randomly divided into two groups each consisting of three animals and they were maintained on similar feeding and managemental care.

Group I: In this group the teat fistulae were sutured with no.3/0 silk (Ethicon, non-absorbable surgical suture).

Group II: Teat fistulae were repaired by using no. 2/5 mercerized cotton thread (Kohinoor mills co.ltd.) in the animals of this group.

- (3) Polythene tube was used in six of the experimental teat fistulae to maintain the patency while the other six experiments were observed without polythene tube.
- (4) The surgical repair of teat fistulae in clinical cases were accomplished in the similar manner as in the experimental ones.
- (5) Clinical observations in terms of healing and functions were made on all the experimental as well as clinical cases.
- (6) The radiographic studies were done for ascertaining the patency of the teat canals after surgical repair of the experimental cases.
- (7) Histopathological study of the repaired teats were also made.

METHODS

CLINICAL EXAMINATION:

All the goats were clinically examined before conducting the experiments to ensure that they were free from any disease. The temperature, pulse and respiration were also recorded (table-II).

STERILIZATION OF THE INSTRUMENTS:

The instruments, drape, gauge, cotton bandage, and other necessary appliances were sterilized in autoclave under 15 lbs. pressure at a temperature of 120°C for 30 minutes. The B.P. blade and polythene tube were sterilized chemically before use.

PREPARATION OF THE SITE:

First of all milk was drained out completely from the teats in which fistulae were to be created. The teats were shaved with sharp shaving blade and washed thoroughly with soap and water. Thereafter it was dried with sterilized towel and painted with mercurochrome solution.

ANAESTHESIA OF THE TEATS:

The teats were anaesthetized by giving circular infiltration anaesthesia at the base of the teats employing 5 to 7 ml. of 2% planocaine* by means of a syringe fitted with 18 gauge needle. The injection was made beneath the skin

^{*} May & Baker.

About 5 minutes were allowed for the action of anaesthetic before the operation started.

POSITIONING OF THE ANIMALS:

The goats were restrained on the operation table in lateral recumbency keeping the teats uppermost in which fistulae were to be created and corrected. The teats were finally painted with 1% spt.mercurochrome solution after infiltration of local anaesthetic solution. The goats were draped leaving the teats exposed to be operated upon.

TECHNIQUE OF FISTULA CREATION:

Teat syphon for goat was introduced into the teat canal and then skin incision was made about 2 to 2.5 inches in length by a sharp scarlpel. The small bleeding vessels were crushed by artery forceps while the larger ones were ligated. The mucous layer was cut by a small sharp scissors and fistula was thus created by removing an elliptical piece of mucous layer and muscle with skin from both the cut edges. In different goats fistulae of varying sizes and length were made.

REPAIRING OF THE FISTULAE:

First of all a sterilized polythene tube was introduced into the teat canal after removing the teat syphon . which was introduced at the time of fistulation. Polythene tube was introduced in such a way that about 5 cm of the tube protruded out beyond the teat orifice. Both edges of the

mucous layer, muscle and skin were trimmed by a sharp scissors to bring them in apposition. The mucous layer was held with two allis forceps at lower and upper ends of the fistula. Suturing was started with an atraumatic needle 2 circle in a continuous fashion from upper and to the lower end by slightly inverting the edges of the mucous layer. When the first layer of suturing was finished terramycin liquid* topical was applied locally. Subsequently muscle and skin were sutured together in interrupted fashion with the same thread and needle. When the second layer of suturing was finished terramycin liquid was applied again on the sites of stitches. Thereafter, the protruding portion of the polythene tube was bent upward and fixed with adhesive tape and then the complete teat was bandaged. Polythene tube was introduced only into six teats while the other six teats were repaired without using polythene tube. Six experimental teat fistulae were repaired by using silk no. 3/0 while in the other six cases cotton thread was used.

The same technique of suturing was applied in all clinical cases too. During the period of research, six cases of teat fistulae in lactating animals (table IV) were brought to the College Hospital which were later on referred to Surgery Department. These cases of teat fistulae were repaired in the same manner using polythene tube with silk and cotton thread.

^{*} Pfizer Private Limited, Bombay.

POST-OPERATIVE CARE AND MANAGEMENT:

Temperature, pulse and respiration were noted every morning and evening upto 7 days of operation (table III). Milk was drained out during morning and evening hours after straightening the polythene tube and pressing at the base of the teats. Milk was drained through teat syphon from those teats which were repaired without using polythene tube.

All the operated goats were maintained in clean stall.

They were allowed free grazing and occasionally they were stall fed also. Water was allowed ad-libitum.

POST-OPERATIVE TREATMENT:

- 1. The goats were given dicrysticin* ½ gm. vial intramuscularly daily for three days.
- 2. Polythene tubes were removed after three postoperative days.
 - 3. Stitches were removed on 8th post-operative days.
- 4. The wounds, after removal of stitches, were swabbed with 70% alcohol and dressed with terramycin liquid topical.
- 5. Terramycin skin ointment* was applied on wounds for two to three days.

MAMMOGRAPHY:

First of all milk was removed from the teats. Thereafter the teats were clamped at their base with the help of teat clamp. Five ml. of conray 420*** as contrast media was

^{* =} Squibb.

^{** =} Pfizer Private Ltd., Bombay. *** = May and Baker.

introduced into the teat canaluating a 20 gauge needle and syringe. After five minutes mammographs were taken. The technical factors used for mammography were: k.v.p.- 45, M.AS - 20, Distance- 36", time - 0.4 seconds.

HISTOPATHOLOGY

The tests were amputated from the base of the test
after giving circular infiltration anaesthesia. After being
removed they were preserved in 10% formaline solution for
histopathological examination. Later on, the goats were euthaenised by intravenous administration of saturated solution of
magnesium sulphate.

Paraffin block of the tissues of the healed up area were made by standard technique for histopathological studies. Transverse section of the tissues were cut and the slides were stained by standard technique of Haematoxilin and Eosin stains and then mounted. Thereafter the slides were examined microscopically.

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OBSERVATIONS AND RESULTS

OBSERVATIONS AND RESULTS

Post operative observations were made on all the experimental goats of group I and group II as well as the clinical cases. The temperature, pulse and respiration were recorded daily morning and evening. The clinical symptoms presented by the goats were closely watched during the observation period. Any abnormal change showed by the goats as well as the cows were noted down. The dressings were changed daily and gross examination of the repaired teats were done in order to assess the local reaction. Radiographs were taken after two weeks of operation. This was necessary to ascertain the patency of the repaired teat canal. Group I:

In all the six teats of the goat nos.1,2 and 3 of this group 5 to 7 ml. of 2 % Planocaine was sufficient to produce circular infiltration anaesthesia of the teats for operation. The anaesthesia lasted for about 1/2 an hour. Ten to twelve minutes were sufficient for suturing the teat fistulae in two tier manner. No obstruction of the teat canal was observed in any case either due to inversion of the cut edges of the mucous layer or due to fibrous growth. All the goats of this group showed 1 to 2°F rise in temperature for the two consecutive days after the operation. Pulse rate remained accelerated for 2 to 3 days. Respiration was also increased. But after the 2nd post operative day, the temperature, pulse and respiration became normal in all the cases except in one goat. When the right teat was operated,

the goat no.3 showed an unusual rise of temperature upto 104.5°F. This was accompanied by the increased pulse and respiration. At this time, the appetite was decreased so also the milk yield. The temperature rise continued upto 3rd day and by 4th post operative day the goat became normal but the return of milk yield took about two weeks time. While in the rest of the cases, the milk yield remained affected for few days only and then normalised after a week. A little difficulty was felt during the first insertion of the polythene tube into the teat canal. In some cases slight bleeding resulted due to insertion of the polythene tube. An inflammatory swelling was observed on the 2nd post operative day in one of the repaired teats of the group in which polythene tube was not introduced. But it subsided after 5 days and required no additional treatment. Difficulty was found in milking of those teats which were repaired without the use of the polythene tubes.

All the six teats of this group showed an uneventful recovery and the wound healed by first intension. Interrupted sutures in the skin resulted in perfect healing with a minimum of scar and fibrous tissue formation.

Group II:

Circular infiltration at the base of the teats using 5 to 7 ml. of 2% planocaine solution was sufficient to produce local anaesthesia and its action lasted upto half an hour in goat nos.4,5 and 6 of this group. All the goats became normal after two post operative days except the goat no.5 which showed subnormal temperature when its right teat was operated upon. The

There was profuse masal and occular discharge. The appetite as well as the milk yield decreased. But after 4th post operative day the goat regained its normal condition after treating with 5% Dextrose saline solution 100 ml. intravenously and masage with turpentine liniment on the chest region. Dicrysticine ½ gm. intramuscularly was given as an usual post operative treatment. The right teat of goat no.6 which was repaired without using polythene tube, yielded milk yellowish in colour and thick in consistency after 5 days of operation. But milk became normal within 7 days when treated with Pendistrin (Squibb) intramammary for three days.

On gross examination of the teats no significant difference between group I and group II was observed during the period of healing. The wound healed by first intension and there was minimum scar formation in the repaired teats of this group.

CLINICAL CASES:

During the period of study only six cases of teat fistulae were brought to the college hospital, out of them four cases were in cows and two in goats. All these cases were encountered in lactating animals. No clinical case was presented in dry cow and goat or in she buffalo during the period of this study. It was observed that in all cases of teat fistulae all the three layers of the teats were affected. They were traumatic in origin. Not even a single case of congenital teat fistula was recorded during the period of study. According to anamnesis, the trauma due to thorny bushes was the etiological factor in both the cases of teat fistulae in goats. There was complete recovery in all the cases

except the case no.4098/23.12.74 of Bihar Veterinary College
Hospital in which mastitis developed but cured after the treatment with Spirodin * intramammary and intramuscularly for 5 days.

It was observed that insertion of polythene tube facilitated the
suturing of the wounds. No adverse effect on milk yield was
noticed, All these cases recovered uneventfully and healing took
place by first intension.

Clinical cases treated during the period of study are shown in table - IV.

RADIOLOGICAL OBSERVATION:

Radiographs of the repaired teats showed insignificant narrowing of the lumen of the teat. It did not reveal any demarcation between group I and group II. There was complete healing of the fistulae without any leakage. A little variation in the shape of the papillary duct was seen. It varied from parallel line to inverted conical shape. Variations were also observed in shape, size and length of the teat cistern. The shape seen on the X-ray plates were bulbous, conical and cylindrical.

Five ml. of conray 420 was sufficient as the contrast medium for radiography of the teats. No untoward complication arose during or after the injection of conray. The milk returned to normal after 24 hours.

HISTOPATHOLOGY:

H. and E. sections of the repaired tissue of the operated test of the experimental animals of both the groups showed rich collagenation and usual epithelial sheets. There were very few lymphocytes in almost matured tissue of the dermis.

DISCUSSION

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DISCUSSION

In the present experimental study, an attempt has been made to undertake repair of the teat fistulae in case of caprine. The endeavour includes evaluation of commonly available suturing materials for the repair of the malady. The present work has been designed to study two tier suturing technique i.e. mucosal layer alone, muscle and skin together, employing continuous and simple interrupted sutures respectively, using silk and cotton with or without the use of polythene tube.

to three years were taken and utilised as experimental animals.

As per scheduled plan of the work fistulae were experimentally created on twelve teats and corrective surgery was accomplished as discribed under 'methods'. Experimental production and surgical correction of the teat fistulae in caprine was contempleted owing to the paucity of clinical cases during the period of research.

The same technique was also tried in six clinical cases employing the same suturing materials and indwelling polythene tube.

ANAESTHESIA:

In the present series of works, circular infiltration anaesthesia was given at the base of the teat employing 2 %

Planocaine.

Many divergent views have been expressed regarding anaesthesia of the teat for doing major teat surgery. Gudi (1961) and Bodkhe (1969) did not use any anaesthesia for treating the cases of milk fistulae in lactating animals whereas Mulling (1966) favoured the use of epidural anaesthesia in bovine for surgical interferences of the teat affections. Dykes (1951) and Wright and Hall (1961) produced anaesthesia of the teat by using cocaine topically in the teat canal, whereas Fowler (1941) used 5 ml.of

Dankes (1953), Nebraska (1955), Moussu (1965), Angelo (1970) and Nigam and Tyagi (1973) also employed local infiltration anaesthesia for achieving successful repair of teat injuries.

Conner (1955), Arnold (1957), Smythe (1959), Steere et al.

(1960), Burges and Westhues (1961), Kowalczyk (1963), Khan et al.

(1970) and Nigam and Tyagi (1973) used the technique of circular infiltration anaesthesia at the base of the teat for accomplishing the effective repair of teat fistulae in different dairy animals.

Thus it revealed that different types of teat injuries were repaired under the influence of topical, local, circular and epidural anaesthesia, and even without employing any type of

anaesthesia.

In author's opinion, anaesthesia of the teat is essential for performing meticulous surgery and at the same time for achieving the objective with ease. With these ends in view, circular infiltration anaesthesia at the base of the teat was used in all the experimental as well as the clinical cases. This particular type of anaesthetic procedure was found quite satisfactory and effective for the repair of teat fistulae under the present study.

TEAT SURGERY:

Rattray (1943), Hall (1947), Dankes (1955), Smythe (1959) were of the opinion that teat fistulae were repaired best when the animals were dry because in lactating animals milk leaking through the suture line, interfered with the healing. While on the contrary Johnson (1946), Moore (1949), Conner (1955), Blood (1957), Arnold and Webber (1957), Drewry (1961), Gudi (1961), Zabolicki (1962), Kowalczyk (1963), Brabant and Mielke (1964), McLintock (1966), Steere (1968), Bodkhe (1969), Aehnelt et al. (1970), Nair (1970), Khan et al. (1970), Angelo and Dhar (1971) and Nigam and Tyagi (1973) had reported that lacerations and fistulae were treated successfully in lactating animals. The result of the present study are in agreement with the later group of authors, as all the cases of

fistulae repaired in this study were in lactating animals. Though it is true that leakage of milk through the suture line interferes with the wound healing, but the proper arrangement of milk drainage would help in achieving normal healing.

In the past, teat fistulae were repaired using various suturing materials such as silk worm gut, silk 3/0, chromic catgut no.0 to 4/0, monofil nylon, fine nylon, vetafil, stainless steel wire by many authors with satisfactory results. Nebraska (1955) and Conner (1955) used stainless steel wire for suturing the teat wound whereas McAuliff (1946), Blood (1957) and Aehnelt et al. (1970) used Mchel's clips successfully. The suturing materials used in this study, besides being cheap and easily available were found satisfactory. This contention has exclusively been favoured by Angelo (1971) and Nigam and Tyagi (1973). Catgut which was used by Frank (1954), Gibbon (1958), Steere (1968), Bodkhe (1969), Aehnelt et al. (1970) and Nair (1970) to repair mucous membrane, besides being costly has disadvantages too. The use of silk and cotton thread in all the three layers gave most satisfactory result without any complication. The suturing materials used in this study might be employed under field condition because they require no special technique for sterilization.

Suturing of the teat fistulae under present experimental

study was accomplished in two tier and it was observed to have given good result. Angelo (1971) and Nigam and Tyagi (1973) also employed two tier suturing pattern for repair of teat fistulae in lactating animals. The later repaired the teat fistulae in two layer and three layers, but observed no significant difference between the two. The three layers suturing technique will increase the operation time and unnecessary consumption of more suturing materials.

Various devices have been employed by various authors for effective drainage of milk during the process of healing of teat fistulae. Drewry (1961), Kowalczyk (1963) and Gibbon (1970) used plastic cannula whereas Brabant and Mielke (1964) employed plastic catheter for the same. Moore (1949), Dankes (1953), Frank (1954) and Moussu (1965), Nair (1970), Khan et al. (1970) and Nigam and Tyagi (1973) used polythene tube successfully. In the present study it was observed that presence of polythene tube greatly facilitated suturing and at the same time it helped in the drainage of milk and thus prevented its leakage through the suture line. However, no significant difference could be noticed in the pattern as well as the time of healing of fistulae with or without polythene tube. Angelo (1971) was of the view that use of milk tube or any other device for drainage of milk was not only a hazard to the animals

but also a loss of valuable milk to the owner and rather it increased the risk of mastitis by inviting flies. But the findings of this study do not favour this view. In none of the six teats of experimental goats and six clinical cases where polythene tubes were used, resulted no evidence of infection leading to mastitis.

Bodkhe (1969) tried cycle valve rubber tube for the drainage of milk found 80 per cent success although there is more chance of infection in rubber tube.

CLINICAL CASE:

In all the six clinical cases the same technique of suturing as well as suturing materials were used. The results obtained were almost similar to that of experimental group. However, in one case there had been unusual swelling in the affected teat on 5th post-operative day which was combated with spirodin 5 ml. intra-mammary and intramuscularly.

MAMMOGRAPHY:

In the past several contrast media were used for mammography in lactating animals. Of late, Nigam (1967) used air, barium sulphate, pyelosil, combination of air and barium sulphate and combination of air and pyelosil and found air, best among all five contrast media used in his study. McDonald (1968) used aquous Angelo (1971) achieved good result using dionosil as contrast media for mammography. But the author used conray 420 (M & B) as contrast media in the present study and found satisfactory result. No untoward complication arose during or after the injection of conray. Radiographs taken after 15 post-operative days showed insignificant narrowing of the lumen of the repaired teat.

HISTOPATHOLOGY:

There was formation of scar tissue almost free from inflammatory cells. There was formation of epithelial layer and the dermis was rich in collagenous material.

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SUMMARY AND CONCLUSIONS

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SUMMARY AND CONCLUSIONS

In the present experimental study teat fistulae were repaired in two tier suturing technique i.e., mucosal layer alone, muscle and skin together employing simple continuous and interrupted sutures respectively. Two types of suturing materials such as silk 3/0 and mercerised cotton no.25 (Kohinoor Mills Company Ltd.) were used.

Six lactating goats between two to three years of age were taken for the experimental production and correction of teat fistulae. All the twelve teats of the goats were operated upon. Out of twelve teats, in six teats silk 3/0 was used as suturing material whereas, the other six teats were repaired using cotton thread. All the experiments were performed under circular infiltration anaesthesia at the base of the teats.

Suturing materials used in the present study, besides being cheap and easily available, might be effectively employed under field condition because they require no special technique for sterilization.

For prevention of leakage of milk through the suture line, polythene tube of 2 mm diameter was introduced in six experimental teat fistulae and best result was obtained because in all the cases healing occurred by first intention with minimum scar tissue formation. But the fistulae which were repaired without using

polythene tube also healed up by first intention and no significant difference was observed between the two. However, introduction of polythene tube in the teat canal greatly facilitated the suturing as well as it helped in easy drainage of the milk during the process of repair.

Besides experimental cases, six number of clinical cases of traumatic teat fistulae in lactating cows and goats were also repaired employing similar suturing pattern and suturing materials. Polythene tube of 3 mm. diameter was used to repair invall the lactating cows brought for surgical treatment of teat fistulae during the period of research at the Bihar Veterinary College Hospital, Patna.

Based on the findings of present experimental study, the following conclusions were arrived at :

- 1. The technique used was quite suitable in providing effective repair of teat fistulae in lactating animals.
- 2. Suturing materials employed for closure of fistulae were satisfactory in all aspects.
- 3. Introduction of polythene tube greatly facilitated suturing and drainage of milk during the reparative process.
- 4. Presence of polythene tube into the teat canal upto a period of three days had no adverse effect.

- 5. Radiographical studies after two weeks of repair revealed little or no stenosis of the repaired teat canal.
- 6. Histopathologically there was an evidence of healing free from excessive inflammatory changes.





Table - I

Incidence of cases of teat fistulae treated in last ten years at Bihar Veterinary College, Hospital, on the basis of available records.

Year	Anima. Buffalo	Cow	Goat	Total
1965	1	2	-	3
1966			2	2
1967	1	1		2
1968	-	1		1
1969		3	2	5
1970	•		2	2
1971	•	3	1	4
1972	3.2.5	4. 4	2	2
1973		2	2	4
1974	9-10	1	2	3
1975	-	2	-	2

	Respiration/ minute	18	21	16	18	17	20	18	21	15	17	18	21	19	20	
Grown TT	se/ 0	20	72	77	73	72	75	74	92	75	11	7	73	77	74	
6	Tempera-0	101.5	101.8	101.7	102.0	101.6	101.8	102.0	102.2	102.2	102.5	101.6	101.9	101.8	102.3	AND THE PROPERTY OF THE PROPER
8	Respiration/ 0	16	82	77	17	18	20	19	22	17	20	16	19	15	17	
1	Pulse/ 0	72	73	69	72	72	22	73	75	27	73	73	75	20	73	
	Tempera-0	108.8	102.0	101.6	102.0	101.5	102.2	102.0	102.2	101.8	102.3	102.2	102.5	101.9	102.4	4
g Time	00	M		M	M	M	M	M	H	M	M	M	N	M	H	W
Day		-		N		m		4		30		9		2		

M - morning; E - evening.

erants of the experimental

-	tion/														
	Respiration,	19	22	27	23	17	20	18	20	15	17	15	200	17	20
111	Pulse/	86	88	88	71	888	06	85	87	80	82	92	62	75	22
Group	Temperat	102.8	103.0	103.1	103.4	102.5	102.8	101.8	102.0	101.6	101.9	102.2	102.4	104.7	101.9
	Respiration/	20	22	22	472	18	20	18	21	16	19	17	20	16	18
Group I	Pulse/ minute.	85	88	88	06	. 82	84	92	79	72	73	75	22	73	74
	Tempera-	103.0	103.5	103.5	103.8	102.8	103.0	102.0	102.2	101.5	101.8	101.5	101.6	101.3	101.5
o Time o	00	M	Œ	M	M	M	M	M	M		M	M	M	M	M
Day		-		N		3		4		N		9		2	

M - morning; E - evening.

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	0	VI	4	- u	, ,		no.
	12.4.75	4098/ 23-12-74	27.7.74	16.7.74	21.12.73	3308/	Case no.
	:	Lactating		Lactating	=	Lactating None-	Type of animal
	Non-descri-	Crossed of Hariana & Tharparkar	None- descript	Jahuna- pari.	3	None- descript	Breed
	- Right teat of hind quarter	Left teat of hind quarter	Left teat	Right teat	Left test of hind quarter	Left teat of fore quarter	Teat affected
	Traumatic lateral side.	Traumatic medial side.		Traumatic anterior side.	Traumatic lateral side.	Traumatic lateral side.	Etiology & site of Ofistula.
	3rd day after fistulation	4th day after fistulation	2nd day after fistulation	3rd day after fistulation	On the day of fistulation	2 day after fistulation	Day of treat- Suturing ment after material fistulation. Oused.
	Cotton		S11k 3/0	Cotton	2	S11k 3/0	
	:	=		=	:	Heali first	Result.
	=	=		=		Healing by first intenti	

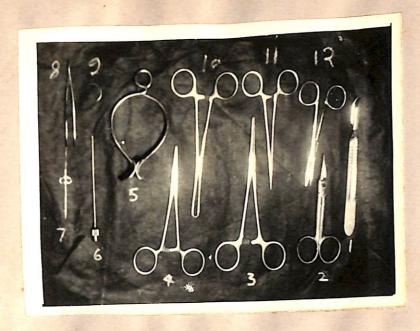


Fig.1. Instruments used in present experiment.



Fig.2. Experimentally created teat fistula with teat syphon in situ.



Fig.). Photograph showing half submind monoral layer.



was story of second layer.



Fig.3. Photograph showing half sutured mucosal layer.



Fig. 4. Photograph after complete suturing of mucosal layer.



Fig.5. Photograph showing half sutured muscle and skin.



Fig.6. Muscle and skin after complete suturing .



Photograph showing indwelled polythene tube after complete repair of fistula.



Fig.8. Fistula repaired teats collected for histopathological examination.



Fig.9. Radiograph taken on 15 post operative day showing completely healed mucosal layer repaired with silk.

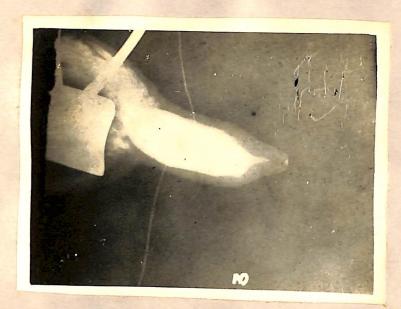
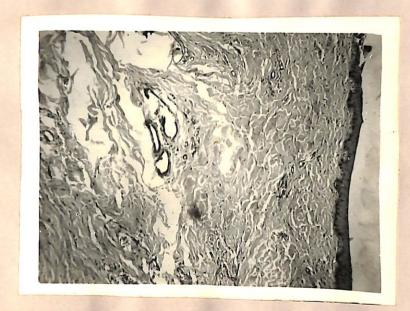


Fig. 10. Radiograph taken on 15 post operative day showing completely healed mucosal layer repaired with cotton.



Fig. 11.& 12. Microphotograph of transverse section of the repaired teat showing epithelial sheets and dermis rich in collagenous material. H. & E. x 100.



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