

Preputial Surgery on the Bull

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Failure of normal extension and retraction of the penis and prepuce in the male bovine animal of breeding age is cause for concern. Injury to the tender preputial tissue is a common occurrence, particularly in the young, sexually aggressive male.

Many promising young herd sires, and many older proven sires, have been removed prematurely from the breeding herd because of trauma to the preputial tissue. Corrective surgery and proper aftercare should reduce this loss. The purpose of the study reported here was to investigate a technique designed to prevent unwanted complications following surgical treatment of preputial injuries.

Review of Literature

In the breeding-age bull, the penis is retracted into the sheath when the bull is quiescent. The internal layer of the prepuce, because it is attached to the penis about 12 cm distal to the glans penis, becomes folded upon itself. Penile extension necessary for breeding comes from the sigmoid flexure of the penis, located just posterior to the scrotum. This flexure is effaced during erection. As the penis is extended past the preputial orifice, the prepuce unfolds until at full extension the tissue covering the erect penis is taut and susceptible to injury. Young, inexperienced bulls pastured together will attempt to mount each other and also engage in masturbation, increasing the possibility of trauma to the preputial tissue. In some bulls the cranial muscles of the prepuce are important in preventing preputial eversion, probably by their sphincteric action on the preputial orifice (Ashdown and Pearson, 1973).

Habitual eversion is common among polled bulls of the British breeds but uncommon among horned bulls (Long and Hignett, 1970). Bulls of the Brahma and Santa Gertrudis breeds as well as the Angus and Polled Hereford are particularly prone to this condition (Larsen, 1971).

The predisposition to preputial prolapse in the Brahma and Santa Gertrudis breeds is due to the loose attachment of the prepuce to the abdomen (Arthur, 1964).

Lagos and Fitzhugh (1970) scored the tendency to prolapse on 113 yearling, second cross (3/4 Santa Gertrudis, 1/4 British) bulls. The length of the everted tissue, rather than the frequency of eversion, was scored. The length of the sheath, internal diameter of the preputial orifice, external circumference of the sheath, and the body weight were

determined. A statistically significant difference was found in the preputial prolapse score among base breeds and sires, indicating that culling bulls with a predisposition to prolapse should decrease that trait in the breeding population.

Long and Hignett (1970) dissected the preputial tissue from 20 horned bulls and 10 polled bulls. Seven of the polled bulls and 19 of the horned bulls had been observed alive; all of the polled bulls, but only one of the horned bulls, everted preputial epithelium. The horned bulls all had well-developed retractor muscles of the prepuce; those muscles were absent in the polled bulls. There were no other anatomical differences.

Perhaps the retractor muscle of the prepuce stabilizes the preputial epithelium during penile movement and prevents eversion. The retractor muscle has an extensive insertion—about 10 cm on each side of the parietal preputial epithelium. The insertion seems to be into the loose connective tissue below the epithelium. In the absence of this muscle, the epithelium will be moved forward by the advancing penis and be pushed out of the orifice. Observations have demonstrated that eversion is related to penile movement (Long and Dubra, 1972).

Chronic prolapse of the parietal layer of the prepuce may lead to preputial injuries and related breeding difficulties. According to Monke¹⁷ that occurs when the exteriorized epithelium of the prepuce becomes traumatized and inflamed to the extent that retraction is impossible.

Contributing to the pathology that develops subsequent to trauma of the parietal layer of the prepuce is the bull's habit of urinating without extending the penis or everting the prepuce, which causes the urine to be deposited in the preputial cavity. Bacterial action on the urea present produces ammonia, which irritates the tissue, causing an increase in the inflammatory process and contributing to the formation of fibrous tissue (Milne, 1954).

Various techniques have been attempted to relieve the strictures and fibrosis that prevent normal penile movement. Walker (1966) used a piece of rigid tubular plastic 2-5 cm in diameter through which holes had been drilled. The tube was inserted into the preputial cavity and attached by sutures, producing a tourniquet-like effect just above the prolapsed mass. The entire prolapsed mass sloughed within one or two weeks. A second soft plastic tube then was sutured around the glans penis to drain the urine from the preputial cavity; that resulted in the loss of equal amounts of the external and

internal lining of prolapsed portion.

Surgical amputation is mentioned by Gibbons (1956), who sutured the preputial lining to the external orifice with interrupted sutures of #2 catgut.

Both Milne (1954) and Lenert (1956), in trying to avoid stricture at the preputial orifice, removed a triangular portion of tissue from the ventral sheath and used interrupted sutures of catgut to attach the internal layer of the prepuce to the external layer.

Hattangady *et al.* (1968) successfully treated seven of eight cases by preserving the preputial orifice and as much of the internal layer as possible and carefully coapting the incised edges.

Larsen and Bellenger (1971) used a conservative resection technique successfully in 13 of 15 cases. In preserving as much of the internal layer of the prolapse as possible, they emphasized complete removal of all fibrous tissue and careful hemostasis. In all cases they preserved at least half of the internal layer, which they sutured to the skin by using interrupted vertical mattress sutures of #0 silk.

Pearson (1972), in reviewing 121 cases involving the male genital tract, noted these conditions: penile neoplasia in 30 cases; rupture of corpus cavernosum penis in 15; preputial prolapse in 12; ulceration and fibrosis of prepuce in 10; and miscellaneous in 54.

Surgical intervention had been attempted by Pearson on the 10 bulls with fibrosis of the prepuce; four had the scar tissue incised, followed by frequent teasing, and all four developed a further stricture. Using a technique of excising the fibrotic tissue between two annular rings was successful on the remaining six bulls. The incised mucosal borders were coapting with #4 chromic catgut and the bulls teased regularly for 10 days.

Reddy *et al.* (1971) demonstrated the presence of *Bacillus spp.*, *Staphylococcus pyogenes*, *Proteus vulgaris*, *Pseudomonas pyocyanea*, and *Staphylococcus epidermidis* in preputial washings. They found the bacterial count to be higher in older bulls with a pendulous sheath than in bulls with a closely attached sheath and flushing of the prepuce with 1,000,000 units of crystalline penicillin in saline significantly lowered the bacterial count in the prepuce and in the semen for 30 days.

Materials and Methods

Twelve Polled Hereford bulls 18 months old and weighing 800 pounds were obtained from the Department of Animal Science and Industry at Kansas State University. The bulls had been culled from a group of 50 bulls that had been grazed on bluestem pasture during the summer. Their general physical condition was excellent. Each bull was given a physical examination that included the use of an ejaculator* to induce penile extension for examination for

the presence of scar tissue or neoplasms. No pathology was found in any of the bulls examined.

The 12 bulls were randomly divided into two groups: Group A contained bulls #6169, #6084, #6007, #6014, #617, #6162; Group B, bulls #6131, #6165, #6041, #6094, #6088, #6166. (Table one)

TABLE ONE
Surgery Results

| Bull | Induced Trauma | Bandaged Post-Surgically | Adhesions | Fibrosis | Impaired Extension | Unimpaired Extension |
|-------|----------------|--------------------------|-----------|----------|--------------------|----------------------|
| #6169 | + | + | + | + | + | |
| #6084 | + | + | + | + | + | |
| #6166 | | + | | | | + |
| #6007 | + | | | | | + |
| #6162 | + | + | | | | + |
| #6088 | | | | | | + |
| #617 | + | | | | | + |
| #6131 | | + | | | | + |
| #6165 | | | | | | + |
| #6041 | | + | + | + | + | |
| #6014 | + | | | | | + |
| #6094 | | | | | | + |

In Group A the ejaculator was used to extend the penis to its full length. The glans penis was grasped with a towel to assist in maintaining full extension. In an attempt to reproduce a naturally occurring lesion, a jagged tear was made in the parietal tissue of the prepuce just distal to the attachment of the prepuce to the penis. Towel forceps were used to grasp the preputial tissue, resulting in the tear.

Four weeks were allowed for adhesions and/or fibrosis to occur on the injured bulls before corrective surgery was attempted. No effort was made during this period to cause continued irritation or to subject the tissue to bacterial contamination other than that normally encountered.

The bulls were kept in a large pen and fed hay and grain from bunks along one side of the pen. Rainfall was above normal for this time of the year, and the pen at times was muddy but drainage was good.

Five minutes prior to being placed in the surgery chute, each bull was given a sedative dose of 15 mg of xylazine¹ intramuscularly.

Ten milligrams of Acepromazine Maleate² were given intravenously to relax the penis and prepuce, and the hair around the preputial orifice was clipped with a #40 blade for a distance of 15 cm around the orifice.

An assistant inserted his gloved hand into the rectum of the bull and, using gentle digital pressure, massaged the body of the prostate gland and vesicular glands until the glans penis (galea) protruded from the sheath and grasped with a hand towel. In most instances that could be accomplished within 30 seconds.

With the penis fully extended and held in place by an assistant using either a hand towel or forceps through the

¹ Rompun, Bayvet Corporation, Shawnee, Kansas.

² Acepromazine Maleate, Ayerst Laboratories, New York, New York.

* Lane Manufacturing Inc., Denver, Colorado.

fibrous tissue on the dorsum of the penis, the entire penis was prepared for surgery.

A soft, rubber tourniquet was placed around the penis as close to the preputial orifice as possible and tied tightly to control hemorrhage.

Five milliliters of 2% lidocaine³ were injected as a ring block under the parietal layer of the prepuce midway between the tourniquet and the glans penis.

Surgery consisted of an annular incision around the penis through the parietal layer of the prepuce approximately 5 cm caudal to the preputial-penile attachment and behind the area of fibrosis. A second annular incision was made around the penis at the preputial attachment to the penis, and the mucous membrane between the two incisions was carefully dissected—leaving as much of the elastic submucosal tissue as possible but removing all fibrous tissue that had developed as a sequel to the artificially induced lesion. The two edges were brought into apposition by using a horizontal mattress suture of #0 Dexon⁴ spaced every 0.5 cm and applied with moderate tension. Every effort was made to maintain, visually, correct tissue alignment (Fig. 2).

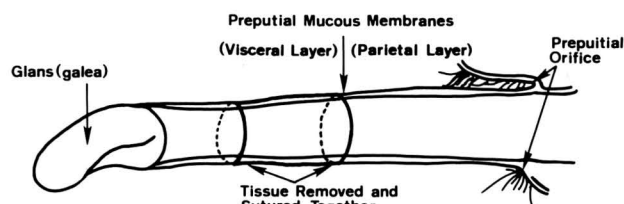


FIG.2 Extended Penis

On bulls #6169, #6084, and #6162 from Group A and bulls #6131, #6166, and #6041 from Group B, a pressure bandage to control swelling was applied to the extended penis for 48 hours. The penis was covered with a furacin⁵ ointment and ointment-impregnated gauze sponge (4 x 4) was wrapped around the incision line. A four-inch gauze bandage was wrapped tightly around the penis in a double layer, taking care to include the glans penis. Two layers of elastic adhesive⁶ bandage were wrapped tightly over the gauze bandage and the penis. The elastic adhesive bandage was anchored in place with a single stay suture of heavy synthetic⁷ at the preputial orifice. In this manner the penis was maintained in an extended position. The tourniquet was removed.

Forty-eight hours later the bandage was removed, the penis and prepuce were cleansed with warm water and surgical soap, and the penis was returned to its normal

position. A purse-string suture of heavy synthetic material was placed in the preputial orifice and the suture tightened until only the forefinger could pass through the preputial orifice. That helped retain the penis in its normal position for 24 hours, at which time the suture was removed.

Post-operative care consisted of daily flushing of the prepuce with 1,000,000 units of crystalline penicillin G⁸ dissolved in 500 ml of saline for 3 days and then daily flushing with saline only for an additional 7 days.

Bulls #617, #6007, and #6041 from Group A and bulls #6165, #6094, and #6088 from Group B had identical surgery performed but the penis was not wrapped. Aftercare consisted of flushing the penis and prepuce with penicillin and saline for 3 days and saline only for an additional 7 days.

Sixty days following surgery on the last bull, all animals were confined and examined. The ejaculator was used to extend the penis of each bull to its maximum length. The surgical site was examined visually and palpated for areas of fibrosis, and the bull's ability to achieve maximum extension was determined.

These bulls were slaughtered commercially, and the penis and preputial tissue were recovered.

Results

Of the 12 bulls that had surgery on the prepuce, three developed post-surgical complications as a result of pressure bandaging of the penis. The epithelial layer of the penis had small areas of necrosis when cleansed with warm saline following removal of the bandage, and it was difficult for the bulls to return the penis to its normal retracted position within the prepuce.

When extension of the penis was attempted at 60 days, adhesions prevented normal penile extension, and one of the bulls had a small abscess on the dorsum of the penis.

The remaining nine bulls could extend the penis normally and could have been returned to a breeding program with no difficulty.

Discussion

Many bulls of the Santa Gertrudis, Brahma, Angus, and Polled Hereford breeds are removed from the breeding herd each year because of injury to the penis and prepuce. Such injury occurs primarily when the penis is erect during the act of breeding; however, the habit of everting the prepuce during micturition or defecation may also expose the delicate tissue to injury.

The bull's habit of urinating without extending the penis causes urine to be deposited in the preputial cavity. Chronic irritation to any preputial lesion results, with fibrosis or ulceration a common sequel.

In that normal penile extension depends on pliable, elastic preputial tissue, the presence of fibrous tissue acts as a deterrent and at times can prevent any penile extension.

Surgery to remove only the fibrous tissue has been only

³ Lidocaine, Vitarin Company, New York, New York.

⁴ Dexon, Davis and Geck, Pearl River, New York.

⁵ Furacin, Eaton Laboratories, Norwich, New York.

⁶ Elastikon, Pittman-Moore Co., Indianapolis, Indiana.

⁷ Vetafil, Bengen Laboratories, Germany.

⁸ Pflizerillin, Pfizer Laboratories, New York, New York.

partially successful, as fibrosis tends to re-form to an even greater extent following its removal.

If the affected tissue is removed between two annular surgical rings and the normal tissue sutured together, healing occurs evenly without stress and elasticity of the preputial tissue that is essential for penile extension is preserved. If that method is used, most bulls with fibrotic lesions at the junction of the penis and prepuce can be returned to service.

The attempt to induce sufficient fibrosis to prevent penile extension was not successful in the six bulls on which it was attempted. Small, raised fibrotic lesions were produced in two of the bulls and two of the others had a small, smooth scar resulting from the induced trauma.

That attempt failed probably because of early wound healing in a normal environment within the prepuce with minimal bacterial contamination. Had the bulls been active sexually, the wound would have been subjected to repeated irritation from the preputial hair and contact with the perineal region of the cow. Chances of bacterial contamination with resulting sepsis of the traumatized tissue would have been greatly increased.

Sedation of the bulls with 15 mg of xylazine¹ was quite satisfactory, as all bulls were able to walk into the chute prior to surgery and were ambulatory when released from all restraints.

The intravenous injection of 10 mg of Acepromazine Maleate² greatly facilitated maintaining the penis in an extended position for the surgical procedure. It did, however, necessitate the placing of a purse string suture in the skin of the preputial orifice to hold the penis in the preputial cavity until the effects of the Acepromazine Maleate had subsided.

At the time of post-surgical evaluation, electrical stimulation to extend the penis was used. The extended penis was examined for evidence of scarring, and breeding capabilities of the bull. Bulls #6041, #6169, and #6084 were unable to extend the penis because of extensive fibrosis of the preputial tissue, but the remaining nine bulls were judged ready to be placed in the breeding herd. (Table one) Each of the bulls had epithelial damage to the penile and preputial tissue from the pressure bandage, so that subsequently they developed fibrous tissue and abscessation.

Trauma to the epithelial tissue of the penis and prepuce effectively removed the barrier to infection provided by the epithelium and predisposed the area to the formation of abscesses in bull #6041. Because the penis was retracted into the prepuce, the irritated preputial tissue was folded upon itself (Fig. 1); with no penile extension being encouraged, the contact inflamed tissue layers resulted in adhesions forming.

¹ Rompun, Bayvet Corporation, Shawnee, Kansas.

² Acepromazine Maleate, Ayerst Laboratories, New York, New York.

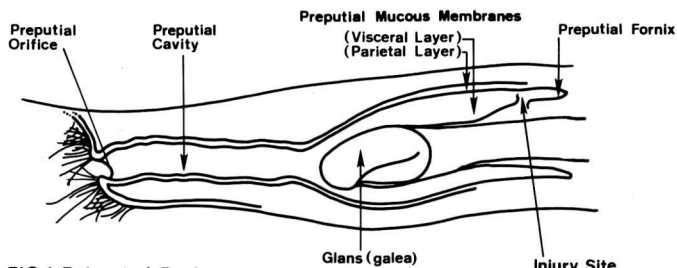


FIG.1 Retracted Penis

The results demonstrated that by removing fibrous tissue between two annular rings a bull can be successfully returned to active service. That observation is consistent with findings reported by Pearson.

The practice of pressure bandaging the penis in an extended position for 48 hours to reduce swelling was deemed unsuccessful, as all major complications following surgery were the direct result of the bandaging.



Figure 3: Bull #6094, unimpaired extension.

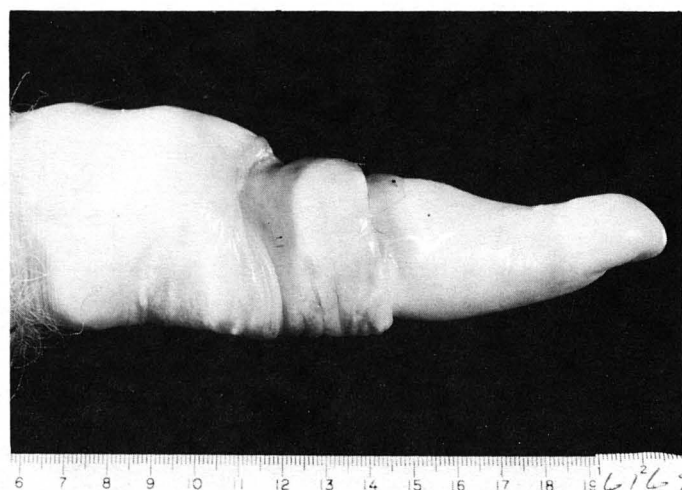


Figure 4: Bull #6169, Induced trauma bandaged post-surgically, adhesions, Fibrosis, impaired extension.



Figure 5: Bull #617, induced trauma, unimpaired extension.

References

1. Angela, S. J., Lavania, J. P., Bhatia, Y. S., Malik, F. S.: "Surgical Management of Preputial Prolapse in a Bull — A Case Report". *Harzana Vet.*, Vol. XIII, No. 1:53-57. (1974).
2. Arthur, G. H.: *Wright's Veterinary Obstetrics*. Third edition, Ballier, Tindall and Cox, London, (1964) p. 519. -3.
3. Ashdown, R. R., Pearson, H.: "Preputial Prolapse in Bulls". *Res. Vet. Sci.* (1973), 15, No. 1:13-24.
4. Bellenger, C. R.: "A Comparison of Certain Parameters of the Penis and Prepuce in Various Breeds of Beef Cattle". *Res. Vet. Sci.*, (1971), 12:229-304.
5. Donaldson, L. E., Aubrey, J. N.: "Posthitis and Prolapse of the Prepuce in Cattle". *Aus. Vet. J.*, (1960), 36:380.
6. Frank, E. R.: *Veterinary Surgery Notes*, Burgess Publishing Company, Minneapolis, Minnesota.
7. Gibbons, W. I.: "Genital Diseases of Bulls — Diseases of the Penis and Sheath". *North American Vet.*, (1956), 37:650-655.
8. Hattangady, S. R., Wadia, D. S., George, P. O.: "Prolapse of the Prepuce in Bulls". *Vet. Rec.* (1969), 82:666.
9. Hofmeyr, C. F. B.: "Surgical Treatment of Impotency in Bulls". *J. So. Afr. V. M. A.*, (1967), 38:275-280.
10. Lagos, F., Fitzhugh, H. A. Jr.: "Factors Influencing Preputial Prolapse in Yearling Bulls". *J. Anim. Sci.*, (1970), 30 (6):949-952.
11. Larsen, L. H., Bellenger, C. R.: "Surgery of the Prolapsed Prepuce in the Bull, Its Complications and Dangers". *Aust. Vet. J.*, (1971), Vol. 47:349-357.
12. Lenert, A. A.: "Surgical Conditions Affecting the Reproductive Tract of the Bull". *J. Am. Vet. Med. Assn.*, (1956), 129:506.
13. Long, S. E.: "Eversion of the Preputial Epithelium in Bulls at Artificial Insemination Centers". *Vet. Rec.*, (1969), 84:495.
14. Long, S. E., Dubra, C. A.: "Incidence and Relative Clinical Significance of Preputial Eversion in Bulls". *Vet. Rec.*, (1972), 91:165-169.
15. Long, S. E., Hignett, P. G.: "Preputial Eversion in the Bull — A Comparative Study of Prepuces From Bulls Which Evert and Those Which Do Not". *Vet. Rec.*, (1970), 86 (6): 161-164.
16. Milne, F. J.: "Penile and Preputial Problems in the Bull". *Journal Am. Vet. Med. Assn.*, (1954), 124:6.
17. Monke, Don: "Preputial Eversion". *Vet. Prof. Topics-Cattle*, U.S.D.A. Extension Service, University of Illinois, Urbana, Illinois, (1976).
18. Mosaheb, M. F., Ladds, P. W.: "The Pathology of the External Genitalia of Bulls in Northern Australia". *Aus. Vet. J.*, (1973), 49 (11):512-516.
19. Pearson, H.: "Surgery of the Male Genital Tract in Cattle: A Review of 121 Cases". *Vet. Rec.*, (1972), 91:498-509.
20. Reddy, B. J. C., Krishnamurthy, P. S., Venkataswami, V.: "Bacterial Flora of Prepuce and the Effect of Intra-preputial Treatment on the Bacteriological Quality of Semen". *Indian Vet. Jour.*, (1971), 48 (7):722-727.
21. Supple-Kane, K. W.: "Eversion of Preputial Epithelium in Bulls". *Vet. Rec.*, (1969), 85:103.
22. Walker, D. F.: "A Method of Circumcision in the Bull". *Auburn Vet.*, (1966), 22:56.

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