

## Medical-Surgical Management of Balanoposthitis of 42 Bulls in Tropical Conditions (2018-2020)

Ronnie de Jesús Arieta-Román<sup>a\*</sup>, Dinora Vázquez-Luna<sup>b</sup>, Daniel Alejandro Lara-Rodríguez<sup>a</sup>

<sup>a</sup> Facultad de Ingeniería en Sistemas de Producción Agropecuaria, Universidad Veracruzana, Carretera Costera del Golfo Km 220., colonia Agrícola y Ganadera Michan, Acayucan, VER 96100 MEX

|q

<sup>b</sup> Facultad de Ingeniería en Sistemas de Producción Agropecuaria, Centro de Estudios Interdisciplinarios en Agrobiodiversidad, Universidad Veracruzana, Carretera Costera del Golfo Km 220., Colonia Agrícola y Ganadera Michan, Acayucan, VER 96100 MEX

\* Corresponding author. Tel.: +52 924 2479122.

E-mail address: roarieta@uv.mx (R. de J. Arieta-Román).

### Abstract

Balanoposthitis is a chronic inflammatory process, in which the preputial mucosa prolapses due to trauma and, consequently, the narrowing of the canal and the non-externalization of the penis (phimosis), which is of main importance in the tropics where extensive cattle ranching becomes frequent. Therefore, the objective was to describe the medical-surgical management of cases of balanoposthitis in bulls from the state of Veracruz, Mexico, under tropical conditions between 2018 and 2020. This study was carried out in bovine production systems in the state of Veracruz, where the diagnosis and monitoring of 42 bulls with acute, chronic, and severe balanoposthitis were carried out, for which they were given medical and/or surgical attention, according to their condition. Their evolution after the surgical intervention, and subsequent return to reproductive life, were analyzed. Of the cases analyzed, 9.5% had acute balanoposthitis, 40.7% had severe balanoposthitis, and 49.8% had chronic balanoposthitis. In 95.2% of the cases presented, surgical management was necessary, and the remaining 4.8% was managed only with medications, 33.3% of the bulls were not re-entered the reproductive programs due to their advanced condition, as they presented preputial stenosis and ventral paraphimosis. Finally, the surgical medical treatment scheme allowed 66.6% of the bulls to re-enter the reproductive programs. Given the relevance of the disease in bovine production systems, the reincorporation of males to their reproductive activities represents the opportunity to extend their useful life in the herd, avoiding possible delays in reproductive calendars.

**Keywords:** Phimosis; Postioplasty; Diagnosis; Animal reproduction; Animal production.

### Introduction

Balanoposthitis is a disease of great relevance in the bovine production systems of southern Mexico and is related to the Nelore, Brahman, Gyr, Guzerat, and Indubrasil breeds, this due to several factors, among which the following stand out: anatomical, when the foreskin it is hanging and long; genetic, predisposing to a weak or failed development of the foreskin muscles, limiting the habitual eversion of the foreskin that induces injuries producing trauma and inflammation (Vadalia et al., 2020); by viral etiology; and due to environmental conditions, where some thorn or pubescence lacerates the tissue, since these types of problems are multifactorial; This pathology is of traumatic origin, and can lead in most cases to prolapse of the preputial mucosa, preventing the penis from externalizing (phimosis), due to the narrowing of the preputial canal (Martínez-Martínez et al., 2017).

The process can start as an acute inflammation of the preputial mucosa, characterized by edema that makes its reintroduction difficult, increasing dehydration and hangover the tissue, later the formation of ulcers can be observed, which can be deep and affect the submucosa, followed by its contamination (Wolfe, 2018). As a pharmacological treatment, as well as prophylactic measures, antibiotics, systemic and topical anti-inflammatories, are used, washes of the foreskin with 20 ml of 10% povidone-iodine reconstituted in 500 ml of normal saline solution and the use of cold showers (Sabarinathan et al., 2020), while the surgical treatment of the disease is intended for animals that present damage to the mucosa or integument (Hopper and Wolfe, 2021), ensuring the reincorporation of bulls to reproductive services with the lowest possible cost (Arieta, 2020). Therefore, the objective of this study was to describe the medical-surgical management and recovery in 42 bulls, which presented cases of balanoposthitis in different locations in the state of Veracruz, Mexico between 2018 and 2020.

## **Materials and methods**

### *Study area*

The study was carried out on farms located in municipalities of the state of Veracruz, Mexico. The state of Veracruz presents in its geography a warm humid climate, with different types that can go from the most humid of the sub-humid, to the driest of the sub-humid (INEGI, 2005), as well as a traditional livestock vocation, which is transmitted from generation to generation (Hernández-Herrera et al., 2018).

A cross-sectional study was carried out where 42 cases of balanoposthitis in bulls were analyzed during the period from January 1, 2018, to December 31, 2020, which met the inclusion criteria as cases by municipality (Fig. 1), race, balanoposthitis (acute, grave, or chronic), medical and/or surgical treatment and re-entry or not to reproductive programs. The study protocol was approved by the Mexican Association of Veterinary Medical Specialists in Bovines (Approval number, 10-037; Approval date, 1 June 2021).

### *Surgical treatment (Postioplasty)*

In order to reduce the chances of scarring phimosis (Gil et al., 2018), an incision was made in the mucocutaneous limbus and not in the skin. Large-caliber vessels were ligated with transfixion sites, using zero-caliber polyglycolic acid absorbable material. Clamping and twisting of the small vessels were necessary to control hemostasis. To achieve detachment of the entire affected tissue, including the damaged preputial mucosa, a 360-degree disclosure was applied. After correctly practicing the hemostasis, it is necessary to hold the mucosa, nylon number 6 was used to avoid retraction, in the same way, three points with monophilic nylon suture were placed in a cardinal way, to expand the mucosa and suture it to the skin, these attachment points were reinforced with a surgeon's point, ending with four points between them (Arieta-Román, 2020). The methodology used is detailed in Fig. 2.

### *Medical treatment*

Once the surgery was concluded, and for a period of four days, dexamethasone 20 mg/kg of body weight was applied, intramuscularly, supplemented with proteolytic enzymes (chymotrypsin). The following five days, and by deep intramuscular route, procaine Penicillin G was applied at a dose of 20,000 IU / kg every 12 hours. Finally, it was necessary to administer intramuscularly for seven days Flunixin meglumine, NSAIDs at a dose of 2.2 mg / Kg of live weight, complementing with local cures, during the same period (Arieta-Román, 2020). Finally, reincorporation to reproductive programs was evaluated by natural mating at 90 postoperative days.

### *Analysis of data*

The descriptive statistical analysis was performed with JASP 0.14.1.0 (JASP, 2021), while chi-square cross-tabulation analysis between categorical variables such as breed and type of balanoposthitis was performed with Dyane V4 (Santesmases, 2009).

### *Ethical aspects*

The present investigation was developed once the authorization of the producers was obtained and the data obtained was handled responsibly.

## **Results**

In the results we can see that the municipality with the highest casuistry of balanoposthitis in bulls were Las Choapas (23.8%), followed by Acayucan and Santiago Tuxtla (11.9%) and those with the lowest casuistry were San Andrés Tuxtla (7.1%), Jesús Carranza and San Juan Evangelista (4.7%) and the municipalities of Sayula de Alemán, Hidalgotitlán, Pajapan, Chinameca, Cuichapa, Tihuatlán, Xalapa, Cuitláhuac, Huatusco, Tlalixcoyan, Juan Rodríguez Clara, Playa Vicente, Jáltipan de Morelos and Ignacio de la Llave (2.3 %), out of a total of 42 cases presented (Table 1). The breeds that most frequently presented balanoposthitis were Brahman (38.0%), Sardo Negro (35.7%), Gyr and Suiz-Bú (7.1%), Brangus (4.7%), Simbrah, Indubrasil and Beefmaster (2.3%), as shown in Table 2. Of the total number of bulls, 9.52% presented acute balanoposthitis (Table 3, Fig. 3), 40.47% presented severe balanoposthitis (Fig. 4) and 50% presented chronic balanoposthitis (Fig. 5). In 95.2% of the cases presented, the management was surgical while in 4.8% it was medical management. Regarding the postoperative evaluation, it was found that 59.5% responded with first intention scarring, 7.1% presented second intention scarring, while 4.7% presented preputial stenosis, 11.9% developed preputial stenosis and ventral paraphimosis, as well as 11.9%, did not respond to treatment, due to advanced tissue damage and 2.3% presented urolithiasis (Table 4). The recovery time was 90 days for 61.9% of the cases and 15 days for 4.7% of the treated animals, while 33.3% did not rejoin the reproductive program, with this, 66.7% of the animals returned to reproductive life.

It is worth mentioning that they found significant differences ( $p = 0.0002$ ) with the Chi-square test, where the type of severe balanoposthitis was reported more frequently in the Sardo Negro breed (52.6%), followed by Brahaman (36, 8%); while the chronic disease was found more frequently in the Brahaman breed (47.3%), followed by Sardo Negro with 3.5%. Acute balanoposthitis disease occurred in 75% in the Gyr breed and the remaining 25% in the Swiss-Bu breed (Table 5).

## Discussion

Balanoposthitis is a disease of great relevance in bovine production units (Desrochers et al., 1995). The percentage of bulls that re-entered reproductive programs after the medical-surgical management used was 66.6%. The results of this research coincide with what was reported in Colombia (Martínez-Martínez et al., 2017), resulting in that surgery proved to be an efficient technique, where 25 bulls were surgically intervened and 22 of them had no complications, finding results like those reported in Jersey bulls, where recovery was successful (Sabarinathan et al., 2020).

In 95.2% of the cases presented, the management was surgical while in 4.8% it was medical management. Under this scheme, the medical treatment used coincides with that reported by other authors in Cuba (Ávila et al., 2015), where 2000000 IU of Penicillin and five ml (250mg) of Gentamicin were applied intramuscularly for seven days (Reyes et al., 2015). Regarding the sedation of the animal with Xylazine at a dose of 0.05 mg/kg of body mass, intramuscularly, it waited until its effects could be appreciated, a situation documented in other studies where 156 male bovines were used (Silva et al., 2002).

## Conclusions

The surgical medical treatment scheme allowed 66.6% of the bulls to re-enter the reproductive programs. Given the relevance of the disease in bovine production systems, the reincorporation of males to their reproductive activities represents the opportunity to extend their useful life, avoiding possible delays in production schedules.

## Conflict of interest statement

The group of authors declares that there are no conflicts of interest in this research.

## Acknowledgements

The authors thank CONACyT, especially the National System of Researchers.

## Supplementary material

The data are available from <Ronnie de Jesús Arieta Román, [roarieta@uv.mx](mailto:roarieta@uv.mx)> upon reasonable request.

## References

- [1]. Arieta-Román, R.d.J., 2020. Técnica Arieta-Román de postioplastia en toros Bos Indicus con balanopostitis ulcerativa crónica en empresas bovinas. *Revista Biológico Agropecuaria Tuxpan* 8, 178-185.
- [2]. Arieta, R.R.d.J., 2020. Analisis costo-beneficio de la postioplastia en toros para su reingreso a programas reproductivos en empresas de produccion bovina. *AGROProductividad* 13, 31-36.
- [3]. Ávila, I.R., Pérez, Y.R., Guillén, A.C., Rosete, R.C., Gutiérrez, R.R., Moreno, E.F., 2015. Ablación prepucial y acortamiento de los retractores peneanos en un mestizo cebú afectado por balanopostitis. *REDVET. Revista Electrónica de Veterinaria* 16, 1-5.
- [4]. Desrochers, A., St-Jean, G., Anderson, D.E., 1995. Surgical management of preputial injuries in bulls: 51 cases (1986-1994). *The Canadian Veterinary Journal* 36, 553.
- [5]. Gil, Á.V., de Loyola Oriyés, C.J., Collado, D.P., Pujal, A.R., Pérez, Y.A.P., 2018. Teaser Bull Preparation by Surgically Made Ventral Prepuce Foramen. *Revista de Producción Animal* 30, 40-45.
- [6]. Hernández-Herrera, G., Lara-Rodríguez, D., Vázquez-Luna, D., Ácar-Martínez, N., Fernández-Figueroa, J., Velásquez-Silvestre, M., 2018. BÚFALO DE AGUA (*Bubalus bubalis*): Un acercamiento al manejo sustentable en el sur de veracruz, méxico. *Agroproductividad* 11.
- [7]. Hopper, R.M., Wolfe, D.F., 2021. Restorative Surgery of the Prepuce and Penis, In: *Bovine Reproduction*, pp. 210-229.
- [8]. INEGI, 2005. Guía para la interpretación de cartografía: climatológica. Instituto Nacional de Estadística, Geografía e Informática.
- [9]. Martínez-Martínez, M.M., Cardona-Álvarez, T.A., Pérez-Berrío, D.M., 2017. Postioplastia en toros cebuínos del departamento de Córdoba, Colombia. *Revista de Medicina Veterinaria*, 35-44.
- [10]. Reyes, Á.I., Ramírez, P.Y., Cuesta, G.A., Cruz, R.R., Rico, G.R., Fonseca, M.E., 2015. Ablación prepucial y acortamiento de los retractores peneanos en un mestizo cebú afectado por balanopostitis. *REDVET* 16, 1-5.
- [11]. Santesmases, M. 2009. Dyane versión 4: Diseño y análisis de encuestas. *Pirámide. España*.
- [12]. Sabarinathan, A., Krishnakumar, K., Umamageswari, J., Arunmozhi, N., Rangasamy, S., Kalyaan, U., 2020. Management of Balanoposthitis in a Crossbred Jersey Bull. *Int. J. Curr. Microbiol. App. Sci* 9, 2814-2816.
- [13]. Silva, L.A.F.d., Chaves, S.M., Fioravanti, M.C.S., Eurides, D., Rabelo, R.E., 2002. Complicações decorrentes da utilização da acepromazina associada à xilazina na preparação cirúrgica de rufiões bovinos. *Ciência Rural* 32, 439-444.
- [14]. Vadalía, J., Tank, P., Dodia, V., Talekar, S., Padaliya, N., Bhatt, R., 2020. Clinical Survey on Preputial Prolapse in Gir Bulls. *The Indian Journal of Veterinary Sciences and Biotechnology* 15, 66-68.
- [15]. Wolfe, D., 2018. Abnormalities of the bull-occurrence, diagnosis and treatment of abnormalities of the bull, including structural soundness. *Animal: an International Journal of Animal Bioscience* 12, s148-s157.
- [16]. JASP, Team. 2021. JASP (Version 0.16)[Computer software].

Table 1  
Frequency of balanoposthitis by municipality.

Municipality	Frecuency	Percent (%)	Cumulative percent (%)
Acayucan	5	11.905	11.905
Chinameca	1	2.381	14.286
Choapas	10	23.81	38.095
Cuichapa	1	2.381	40.476
Cuitláhuac	1	2.381	42.857
Hidalgotitlán	1	2.381	45.238
Huatusco	1	2.381	47.619
Ignacio de la Llave	1	2.381	50
Jamapa	1	2.381	52.381
Jesús Carranza	2	4.762	57.143
Juan Rodríguez Clara	1	2.381	59.524
Jáltipan	1	2.381	61.905
Pajápan	1	2.381	64.286
Playa Vicente	1	2.381	66.667
San Andrés Tuxtla	3	7.143	73.81
San Juan Evangelista	2	4.762	78.571
Santiago Tuxtla	5	11.905	90.476
Sayula de Alemán	1	2.381	92.857
Tihuatlán	1	2.381	95.238
Tlalixcoyan	1	2.381	97.619
Xalapa	1	2.381	100
Total	42	100	

Table 2  
Frequency of balanoposthitis by breed.

Breed	Frecuency	Percent (%)	Cumulative percent (%)
Beefmaster	1	2.381	2.381
Brahman	16	38.095	40.476
Brangus	2	4.762	45.238
Gyr	3	7.143	52.381
Indubrasil	1	2.381	54.762
Sardo Negro	15	35.714	90.476
Simbrah	1	2.381	92.857
Suiz-Bú	3	7.143	100
Total	42	100	

**Table 3**

Frequency of balanoposthitis by type.

Type of Balanoposthitis	Frequency	Percent (%)	Cumulative percent (%)
Acute	4	9.524	9.524
Grave	21	50	59.524
Chronic	17	40.476	100
Total	42	100	

**Table 4**

Post-operative evolution.

Post-operative assessment	Frequency	Percent (%)	Cumulative percent (%)
First intention scarring	25	59.524	59.524
Second intention scarring	3	7.143	66.667
Preputial Stenosis	1	4.762	71.429
Preputial stenosis and ventral paraphimosis	5	11.905	83.334
Death from other factors	1	2.381	85.715
It did not respond to treatment, so the animal was euthanized	5	11.905	97.62
Urolithiasis	1	2.381	100
Total	42	100	

**Table 5**

Cross-tabulation between categorical variables: breed and type of balanoposthitis.

Category	Type of balanoposthitis								
	Total sample			Acute		Grave		Chronic	
	Frequency	% Sample	Frequency	% Sample	Frequency	% Sample	Frequency	% Sample	
Breed									
Brahman	16	38.10	0	0.00	7	36.84	9	47.37	
Sardo Negro	16	38.10	0	0.00	10	52.63	6	31.58	
Gyr	3	7.14	3	75.00	0	0.00	0	0.00	
Simbrah	1	2.38	0	0.00	0	0.00	1	5.26	
Indubrasil	1	2.38	0	0.00	0	0.00	1	5.26	
Suiz-Bú	3	7.14	1	25.00	1	5.26	1	5.26	
Brangus	1	2.38	0	0.00	1	5.26	0	0.00	
Beefmaster	1	2.38	0	0.00	0	0.00	1	5.26	
TOTAL	42	100.00	4	100.00	19	100.00	19	100.00	

Chi square with 14 degrees of freedom = 40.0658 ( $p = 0.0002$ )

### Figure legends

Fig. 1. Location and distribution of treated cases of balanoposthitis in the state of Veracruz, Mexico.

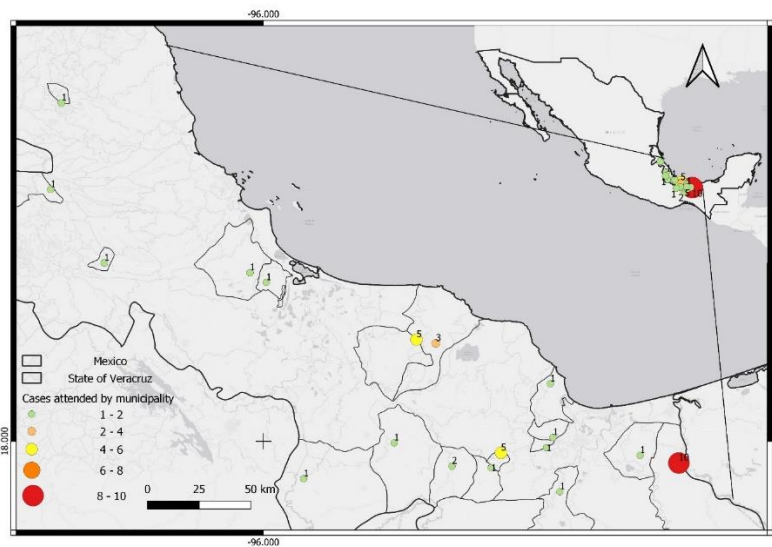


Fig 2. Surgical technique used in the treatment of balanoposthitis in bulls.



Poner descripción



Fig.3. Acute balanoposthitis.



Fig. 4. Grave balanoposthitis.



Fig. 5. Chronic balanoposthitis.

