How to use CO_2 laser for paraphimosis

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For The Education Center

Paraphimosis is the inability of the penis to retract completely into the sheath or prepuce.[1] This problem can be caused by etiological factors such as priapism, excessive sexual activity, entanglement of preputial hair, trauma, scarring caused by trauma or surgery, and restricted preputial coverage. Occasionally, suturing after a pre-scrotal castration can damage the retractor penis muscle, causing paraphimosis.

This article describes a case of paraphimosis secondary to castration.

Patient

Yogi, a 4-year-old male neutered Chihuahua, was referred to us after two failed attempts to correct paraphimosis. The patient developed paraphimosis immediately following castration a year before. The first of the unsuccessful surgeries involved placing a purse-string suture in the opening of the sheath. At the second surgery, the sheath opening was narrowed surgically. Both procedures failed, leaving Yogi with a fistulous tract on the ventral surface of the sheath **(Figure 2)**.

Typically, surgical shortening of the muscle yields very good results. In Yogi's case, however, too much time had passed since the original surgery, and his paraphimosis persisted for almost a year. The possibility of the retractor penis muscle atrophying made the isolation of the muscle less likely. It was, therefore, decided to conduct a cranial preputial advancement without muscle shortening. The goal was to correct the penile exposure caused by the lack of preputial coverage. The surgery advances the prepuce cranially, thus allowing the penis to stay within the sheath. It was decided to perform preputial advancement surgery using a carbon dioxide laser.

Yogi was examined two weeks prior to surgery. He had a 2- to 3-centimeter paraphimosis with desiccation and edema of the exposed penis. His owners were instructed to keep the exposed area lubricated to decrease the risk of damage to the unprotected portion of the penis.

When Yogi was presented for surgery, the condition of the penis was improved and the exposed area was reduced to approximately 1.5 cm **(Figure 1)**. Surgical correction was performed using measurements from the day of surgery and from the first visit.

Laser Equipment

The surgeon used a 40-watt Aesculight CO_2 laser with the flexible hollow waveguide and a tipless variable spot size hand piece **(Figures 3, 4, 5, 6 and 12)**.

Anesthesia

Pre-anesthetic blood testing showed normal results. Yogi was given a pre-anesthetic of Torbutrol, acepromazine and atropine, induced with Propofol 28 and maintained on Sevoflurane. Morphine was administered preoperatively, and carprofen was given postoperatively for pain management.

Procedure

Yogi was placed in dorsal recumbency. His penile sheath was flushed with saline. A 20-cc syringe and 5 French red rubber catheter were used to remove accumulated material from the base of the deep preputial area. The planned surgical area was shaved and surgically prepped with chloroxylenol. A marker was used to indicate the point of desired preputial advancement **(Figure 2)**.

The surgical laser was set to 15 watts in the SuperPulse mode for the dissection. The variable handpiece was set to a 0.25-mm focal spot diameter. An incision was made from the lateral aspect of the penile sheath to the previously marked cranial abdominal area **(Figure 3)**.

The incision was continued until a rounded-triangle segment was outlined **(Figures 4 and 5)**. Traction was applied with the tissue forceps to aid cutting, and the tissue was undermined and excised **(Figure 6)**. The sheath was advanced with sutures using 2-0 Monocryl **(Figures 7, 8, 9, 10)**.

At this stage, it is important that the suture be in the muscle fascia (linea) cranially at the advancement point and in the connective tissue of the proximal sheath. This prevents elastic retraction of the sheath and stretching of the skin caudally from the point of advancement.

Because tension was required to advance the sheath, the suture material was passed through the tissue twice in a cruciate pattern before knotting. This allowed for better distribution of the tension force. Then, multiple fascial/sheath sutures are placed. Finally, the cutaneous closure was achieved with a simple interrupted cruciate suture **(Figures 11, 12, 13)**. 2-0 Monocryl was utilized for both subcutaneous and cutaneous closure.

The small fistula present from one of the previous unsuccessful surgeries was corrected during the same surgery. The laser was utilized at 10 watts Superpulse with the 0.25-mm spot size to freshen the edges of the fistula, which then was closed with a single 2-0 Monocryl cruciate suture **(Figure 13)**. The fistula had been present for several months; suturing without freshening the margins likely would have resulted in failure for a permanent closure.

Yogi was released the day of surgery. Oral antibiotics and NAIDs were prescribed for one week. The owners were instructed to keep him as quiet as possible and to maintain the

Figure 1. A pre-op view of paraphimosis with about 1.5 centimeters of penis exposed.

Figure 2. Before surgery, the penis was replaced into the sheath. The cranial aspect of planned incision was indicated with a marker.

Figure 3. Placement of initial preputial incision.

Figure 4. An incision was extended to reach the mark of desired preputial advancement.

Figure 5. Completion of the initial incision outlining the rounded-triangle-shaped segment of skin.

Figure 6. The outlined skin segment was excised with the laser.

Figure 7. The prepuce was advanced cranially.

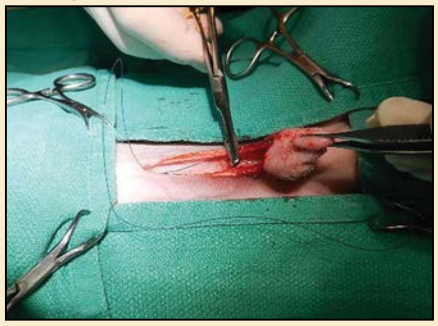

Figure 8. Preputial advancement with sutures in progress.

Figure 9. Suture placed in muscle fascia.

Figure 10. Advancing the sheath to anchor position on muscle fascia.

Figure 11. Cutaneous closure in progress.

Figure 12. After the completion of skin closure, the laser was used to freshen the margins of the fistula before suturing it closed.

Figure 13. Immediately post-op view.

Figure 14. Two weeks post-op after suture removal.

incision clean of scabs. Yogi had to wear an Elizabethan collar for two weeks.

Follow-up Visit

Yogi returned two weeks later for suture removal **(Figure 14)**. No complications were found, and the recovery progressed very well. The owners noted that during the first week the distal 2 to 3 mm of the tip of the glans had been visible, but that at the second week it was no longer visible and Yogi urinated normally.

Conclusion

The CO_2 laser provides control of intraoperative hemorrhage, which preserves good visibility of the operatory field. Although effective control of bleeding is significant in any soft-tissue procedure, it is crucial in urogenital surgery due to the rich vascularization of the area. The ability of the CO_2 laser to coagulate blood vessels helps to assure accurate incision while creating only a tiny zone of thermal tissue change on the surgical margins.

SuperPulse allows tissue to relax, or cool, in between laser pulses, thus reducing the risk of thermal trauma. When the proper parameters are observed (i.e., power, spot size, pulsing, surgeon's hand speed, and so on), the zone of such thermal change can be as narrow as 30 micrometers,[2] or the width of a human hair. Decreased postoperative swelling and pain are among other benefits of carbon dioxide laser surgery. Healing typically progresses without complications. Therefore, the CO_2 laser is the preferred surgical tool in my practice. ●

Dr. William E. Schultz graduated from Michigan State University in 1973, went into private practice and opened his companion animal practice in 1974. He has been a board member on the Synbiotics Reproductive Advisory Panel, The Society for Theriogenology and The Theriogenology Foundation. He has spoken at several veterinary conferences, veterinary associations and national specialties because of his special interest in canine reproduction. He also has lectured and published articles on transcervical and surgical inseminations using fresh, chilled and frozen semen. He is interested in soft tissue and orthopedic surgery, and he has more than 20 years of experience with laser surgery. Schultz uses a 40-watt flexible hollow waveguide CO_2 laser with constant wave and SuperPulse modes.

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This Education Center article was underwritten by Aesculight of Woodinville, Wash., the manufacturer of the only American-made CO_2 laser.