General Session II
"Fine Tuning Surgical Skills for Bovine Practice in the 1990's"

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Ocular Surgery for Squamous Cell Carcinoma

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In treating ocular squamous cell carcinoma in cattle, certainly enucleation or exenteration have been the time honored methods of choice. In many cases they may still be the methods of choice, however, as they leave a unilaterally blind animal, other less radical methods of therapy should be used whenever possible. Less radical therapeutic approaches should include: 1) immunotherapy, 2) cryosurgery, 3) radiofrequency hyperthermia, 4) Beta radiation, and 5) surgical removal of the tumor tissue without complete enucleation.

Anesthesia

When performing surgery of the eye, restraint is essential. In many cases a chute is adequate. However, in more delicate procedures, such as a superficial keratectomy, more complete head restraint (such as a surgical table) is desirable.

The synthetic procaine derivatives, such as lidocaine, xylocaine and carbocaine, are readily absorbed from mucous membrane surfaces. As such they are very useful, for minor ocular procedures, when sprayed on the conjunctival surface. To achieve adequate anesthesia, several consecutive applications are often necessary. This form of anesthesia is usually adequate for cryosurgery or radiofrequency hyperthermia.

The Peterson eye block or retrobulbar block can be used to block the sensory nerves of the eye as they leave the foramen orbitorotundum.

Eye Block

The basic block for most ocular surgery is probably the Peterson eye block.[1] As the classical nerve block of the eye as described by Peterson is often unreliable and occasionally even fatal there are several modifications which I feel are beneficial.

The classical description describes the position of the needle as having the hub higher than the point. Better results are usually achieved if the needle is horizontal or the hub is only slightly higher than the point. A reliable indication of proper position is a severe twitching (almost a spasmodic closing) of the eyelids. Others have advocated moving the needle and watching for movement of the eye. If the point of the needle is within the conus of fibrous tissue behind the eye, medial to lateral movement of the eye can be observed as the needle if moved lateral to medial. Although a good indicator of the approximate correct position, this is not as reliable as the spasmodic twitch of the eyelids.

Once the proper postion is located, 5 cc. of local anesthetic is deposited. The needle is then moved slightly and repositioned before injecting a second 5 cc. The procedure is repeated and a third 5 cc. is injected. As with any injection, one should always aspirate before injecting. If blood is aspirated this probably indicates the internal maxillary artery has been entered and the tip of the needle is too low. Slightly repositioning the needle with the tip slightly higher will correct the problem. Since following this multiple injection technique, I have not observed the occasional fatal result seen when injecting 15 cc. at one site.

It is also extremely helpful to place a subcutaneous line block across (perpendicular) the medial canthus of the eye. Even after a Peterson eye block and the auriculopalpebral block this area is often still sensitive. This is probably a branch of the infratrochlear nerve. Although blocking the bovine eye is still difficult, these modifications are very helpful in achieving successful anesthesia.

Cryosurgery

Cyrosurgery is very useful for small tumors at the limbus of the globe and for small tumors of the eyelids.[2] Cryosurgery is relatively time-consuming on larger tu-

mors unless they are debulked. With cryosurgery rapid cooling and slow thawing are maximally effective in tumor destruction. For adequate cryonecrosis a temperature of -20°C must be reached and a double freeze-thaw cycle is desirable. Although many expensive cryosurgery units are available, a small hand held unit, using liquid nitrogen, is very adequate for most ocular procedures.[3] A thermocouple to monitor temperatures 2-5 mm from the lesion is a very desirable adjunct to cryosurgery.

When using liquid nitrogen, especially around the eye, care must be taken to protect the adjacent tissues from the effect of the cold. This can be done with styrofoam or petrolatum-impregnated gauze placed around the tumor.

Once the thermocouples have been placed and the adjacent tissues protected, the liquid nitrogen is sprayed toward the center of the tumor from a distance of 1-2 cm. A stationary spray gives a more uniform freeze than a waving motion.

When used on small tumor masses, with thermocouple control and a double freeze-thaw cycle, a cure rate of 80-90% can be expected with cryosurgery.

Radiofrequency Hyperthermia

As with cryosurgery, radiofrequency hyperthermia is best suited for small tumors. Larger tumors can be debulked and the remaining portions treated with radiofrequency hyperthermia. Although the technique is easy to master and highly successful (80-90%), the initial investment for equipment must be justified.

With the animal in a squeeze chute, local anesthetic or a Peterson eye block is used. The eye must then be immobolized with the special spoon or a towel forceps. The electrodes of the treatment device are placed directly on the tumor and the device is turned on. High-frequency electric current is passed between the elecrodes and the tissue between the electrodes is heated to treatment temperature.[4] Once treatment temperature is reached (monitored by an electrode within the treatment device) a 30 second treatment is used. As the electrodes are only about 1 cm. apart, tumors larger that 1 cm. in diameter need to be treated by adjacent applications of the electrodes.

Beta Radiation

As with cryosurgery and radiofrequency hyperthermia, beta radiation is best suited for small leasions. Beta radiation is especially well-suited for small lesions on the limbus of the globe. Beta radiation is desirable because of minimal penetration (2-3 mm.) which will not damage the deeper structures of the eye. However, because of this minimal penetration, larger tumors again must be debulked.

Again as with radiofrequency hyperthermia, a high initial investment must be considered when purchasing the Strontium[9] source.

With the animal in a squeeze chute, local anesthetic or a Peterson eye block is used. Once the eye is immobolized, the probe (Strontium[9] probe) is applied directly to the lesion and 20,000-25,000 rads are administered. Depending on the Strontium[9] source, this usually is about a 5 minute application. If the lesion being treated is larger than the head of the probe, repeated adjacent applications must be used.

Surgical Intervention

All the previously discussed techniques are most applicable to small tumor masses. In range conditions, squamous cell carcinoma is frequently not detected while the tumor is still small. Therefore, surgical intervention is still necessary in treating many cases of squamous cell carcinoma.

Removal of the Third Eyelid

One of the areas predisposed to squamous cell carcinoma in the bovine is the third eyelid. If on evaluation, the tumor only involves the third eyelid and not the globe, the third eyelid can be removed. This procedure can be performed with restraint in a squeeze chute and 5-10 cc of a local anesthetic solution injected into the third eyelid proximal to the tumor mass. The tumorous portion of the third eyelid is then isolated with hemostats and removed with a scalpel or scissors. Care must be taken to avoid damage to the globe. The hemostats should be left in place for several minutes to control bleeding. If the animal's temperment allows it, local eye ointments should be used for several days after surgery.

With deeper involvement of the third eyelid, it can still be removed, however, a Peterson eye block rather than simply local infiltration is necessary to achieve adequate anesthesia. In this case the leading edge cannot just be clamped with hemostats and a more thorough dissection is necessary. It is still a highly successful technique unless the globe is involved or unless there has been bony orbit invasion. With this deeper dissection the conjunctiva is closed, if possible, after the dissection is complete.

Resection of the Lower Lid

Another area predisposed to squamous cell carcinoma in the bovine is the lower eyelid. Again, if the globe is not involved and the tumor has not invaded the bony orbit, a large portion of the lower lid can be removed without resorting to enucleation or exenteration.

Very cosmetic results can be achieved with "H" plasty and / or sliding skin graft techniques. These techniques, however, are most useful in the valuable show animal, and restraint with a surgical table is desirable if not even a ne-

cessity. Alternatively large portions of the lower lid can be removed with gently curving incisions and a new lid margin created by suturing the skin to the conjunctiva. This does leave a lower lid defect. However, the defect is only cosmetic and increased mobility of the upper lid prevents drying Keratitis.

Removal of the lower lid can be accomplished in a squeeze chute with a local block (crescent shaped) around the involved portion of the lower lid. A skin incision is made leaving about 5 mm of normal skin attached to the tumor. As the dissection is carried into the deeper tissues, care should be taken to protect the globe and frequent digital palpation is necessary to assure complete removal of the tumor mass. The conjunctiva is then carefully dissected, again leaving a 5 mm portion of normal tissue attached to the tumor. A new lower lid margin is created by suturing the skin of the lower lid to the remaining conjunctiva. A continuous pattern of 0 or 00 absorbable suture is very adequate for this closure. Local antibiotic ointments should be used in these cases for 5-7 days after surgery.

Enucleation

In cases of extensive involvement, enucleation is still the preferred technique for treating ocular squamous cell carcinoma. Although the procedure can be performed in a squeeze chute, a Peterson eye block or retrobulbar block is necessary.

In order to prevent contamination, it is usually advisable to close the lids (with sutures or towel clamps) over the tumorous globe. Not only does this seal any necrotic debris into the fornix, it also provides a convenient handle with which to manipulate the lid margins during surgery. The dissection should always progress in a stepwise fashion, and initial dissection should begin with the lower lid. If the upper lid is dissected first, any bleeding from it will tend to obliterate the view of the surgical field when the lower lid is dissected.

The skin should be cut well back from any tumor mass, but at least 1 cm from the lid margins. Once through the skin, the dissection is carried back to the bony orbit being careful not to enter the conjunctival sac. The orbital ligament should not be cut until the dissection is down to the bony orbit around the complete circumference. As dissection through the orbital ligament is accomplished, it should be borne in mind that a large bleeder is often encountered at the medial canthus during this stage of the dissection. It is easier to control this bleeder if the medial canthus is dissected after the rest of the orbital ligament has been severed. After severing the orbital ligament around the complete circumference, the retrobulbar structures are cut. In dissecting the retrobulbar structures, hemorrhage is minimized by dissecting close to the globe. However, this dissection must be deep enough to remove all tumorous tissue.

If the surgery has been clean, the lid margins can be completely closed, allowing first intention healing. A non-absorbable suture is ideal for this. If there has been contamination, the lid margins should partially closed and the defect packed with an iodine pack. This pack should be removed at 48-72 hours and healing allowed to take place by second intention.

Conclusion

Although the primary goal in treatment for squamous cell carcinoma should be the elimination of the tumorous tissue, one should always remember how difficult it is for management to work with a one-eyed cow. Therefore, reasonable efforts should be made to preserve sight whenever possible.

Bibliography

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