**INTRODUCTION:**

Acquired airway stenosis, chiefly a pediatric problem, can be a vexing area of study in animals. The mechanism leading to this problem in children is usually chronic ventilator dependence, especially that of neonates. The endotracheal tube causes repeated trauma or pressure which can lead to submuosal hemorrhage, necrosis, scar formation, proliferation, fibrosis and ultimately, airway narrowing.

This area is difficult to study in the animal model because the induction of stenosis must mimic those mechanisms which affect humans yet abide by standards of humane animal treatment. In the past, animal studies have been conducted on ex-vivo specimens or in a fashion that modifies the airway significantly in order to reduce the chances of airway compromise in the subject. This causes a skew with respect to therapeutic studies insofar as the airway has undergone additional operative intervention which would otherwise not be present in humans with the condition.

We propose a new method to produce an airway stenosis animal model in the New Zealand White rabbit which is humane and scientifically valid.

**RESULTS:**

All three animals tolerated the induction of stenosis (brushing) procedure well as well as the serial bronchoscopy that followed. At no time did any animal demonstrate distress or discomfort or evidence of airway compromise.

Serial examination initially showed formation of granulation tissue followed by scarring and trauma or pressure which can lead to submuosal hemorrhage, necrosis, scar formation, proliferation, fibrosis and ultimately, airway narrowing. This scarring pattern was generally of a ring or short spiral and was moderate (20-40%).

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**DISCUSSION:**

Several methods of treatment have emerged for the treatment of airway stenosis. Even as these methods continue to be tested in the human population, new advances in tissue engineering and laser reshaping of tissue offer hope for the future. These advances would best be tested in a suitable, humane animal model.

The model we have presented offers a new method to induce airway stenosis in rabbits using bronchoscopic brushing followed by serial bronchoscopic examination. This is well tolerated by the animal, technically less demanding in the hands of the otolaryngologist, and offers the greatest similarity to the way in which this condition is most often acquired.

**MATERIALS AND METHODS:**

All animal work for this study was approved and performed under the aegis of the Institutional Animal Care and Use Committee (IACUC) at University of California, Irvine. We maintained strict adherence to IACUC rules and guidelines throughout the duration of this study.

Surgical Procedure

Three New Zealand White rabbits weighing approximately five kilograms were used in this experiment. At the time of surgery, each was anesthetized using ketamine HCl (4-5 mg/kg) and xylazine (0.2 mg/kg) given intramuscularly. Each rabbit was then placed prone on a heated operating table maintaining at temperature of 39°C. They were also connected to cardiorespiratory monitoring devices and were breathing spontaneously. A 2.5mm diameter neonatal rigid bronchoscope along with a rod telescope was then used to enter the rabbit’s airway. Once beyond the vocal cords, the bronchoscope was connected to an anesthesia circuit delivering 100% oxygen. A firm nylon brush (5mm open diameter) was then advanced through a side port (Figure X) into the airway. Under direct visualization, brushing trauma was induced circumferentially at the proximal trachea. Bleeding was suctioned until it abated. Once there was no further bleeding, the distal airway was briefly examined and suctioned as needed. The animal was then allowed to recover.

Serial Bronchoscopy

Each rabbit was closely observed after the initial brushing. Figure X outlines the schedule for bronchoscopy, which was performed under identical operative conditions, however, only for visualization of the treated area and possible suctioning of secretions. If at any time a rabbit was determined to be in distress by examination or to have critical stenosis on bronchoscopy, the protocol required the animal be sacrificed. In our three animals, however, such an instance did not occur.

Bronchoscopy was performed on postoperative days 2, 9 and 16. We also examined the rabbits daily and could have scheduled an impromptu bronchoscopic evaluation if indicated. Immediately following the third observation, the animals were sacrificed.

**REFERENCES:**