

Top Author: **zhuquan Su**

Department of Respiratory Medicine, The First Affiliated Hospital of Guangzhou Medical University

China

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Abstract

Objectives: To establish a novel animal model of tracheal stenosis in beagle dogs by endotracheal intubation and detect the relevant factors associated with postintubation tracheal stenosis.

Methods: 14 specially bred research beagle dogs were divided into three groups. Group A (6 dogs): endotracheal intubation with cuff pressure of 150mmHg, 175mmHg and 200mmHg, respectively, for 24 hours by I.D.8.0 endotracheal tube. Group B (4 dogs): endotracheal intubation by I.D.7.5 and I.D.8.0 endotracheal tube, respectively, with cuff pressure of 200mmHg for 24 hours. Group C (4 dogs): endotracheal intubation for 12 hours and 24 hours, respectively, with cuff pressure of 200mmHg by I.D.8.0 endotracheal tube. The animals were observed and followed up after extubation, the evaluation of stenosis progression was performed by endoscope and histological examinations.

Results: All dogs revived after extubation without any complications related to endotracheal intubation. Tracheal stenosis developed in 6 dogs by 14th-day post extubation by I.D.8.0 tube with cuff pressure up to 200 mmHg for 24 hours, gross and endoscopic examination showed that stenosis had been induced, ranging from 80% to 92% decrease in diameter. Histological examination showed mucosal ulceration, submucosal thickening with formation of granulation tissues and collagen fibers, and collapse of destroyed cartilage. Intubation with cuff pressure of 175mmHg in Group A and I.D.7.5 tube in Group B, ischemic injury resulted in posterior tracheal wall necrosis and repaired by hypertrophic scars, lumen diameter decreasing from 16%~31%. No airway narrowing occurred with cuff pressure of 150mmHg in Group A and intubation time for 12 hours in Group C during the 6 weeks followed up.

Conclusions: The novel animal model of tracheal stenosis induced by endotracheal intubation with cuff overinflation is technically simple, reliable and reproducible. Excessive cuff pressure, prolong intubation and the oversize endotracheal tube are three important factors that lead to overgrowth of granulation tissue and formation of tracheal stenosis.

Key words: Intubation; Tracheal stenosis; Animal model; Granulation tissue; Cartilage

