

Title : DIFFERENTIAL PULMONARY TOXICITY OF ANTACIDS

Authors : T.D. Bogard, M.D., R.G. Fennell, M.D., B.B. Gutsche, M.D., B.E. Marshall, M.D.

Affiliation: Department of Anesthesia, University of Pennsylvania
Philadelphia, Pennsylvania 19104

Introduction. Treatment with antacids as prophylaxis against acid aspiration, particularly in the parturient, has become routine in many centers. Subsequently, the changes associated with aspiration of antacids themselves have begun to be appreciated. Particulate matter with giant cell formation has been demonstrated in the lungs of dogs subjected to aspiration of emulsified antacids.¹ More recent evidence suggests that antacid aspiration may be considerably less hazardous if the aspirate is devoid of particulate matter.² The present study examines the effects of aspiration of both soluble (sodium citrate) and emulsified (Maalox and Kolantyl) antacids.

Methods. Male New Zealand white rabbits, 3-4 kg. each, were allotted to 4 groups. Each animal was given a single treatment with a particular aspirate, either sodium citrate, Maalox, Kolantyl, or saline. All aspirates, previously adjusted to physiologic osmolality (300 mOsm) and neutral pH (7.00), were delivered in the amount of 4 cc/Kg, a volume previously determined to insure even pulmonary distribution without lethal complications.³ 18 animals were randomly assigned to each of the 4 groups. They were sacrificed in evenly divided groups at 6, 24, and 48 hours. Arterial blood gas analysis was done at each of these periods. Lung water content was obtained by weighing samples of lungs before and after drying. A double-isotope dilution technique utilizing Cr⁵¹ - tagged RBC's and I¹³¹ labeled serum albumin, was employed to determine pulmonary blood volumes. Lung extravascular water volume (EVW) was then calculated. A group of 6 rabbits not subjected to aspiration was examined in the same fashion as the others. Their data served as baseline for the whole group.

Results. There were no essential differences in preaspiration PaO₂ values among groups. Following aspiration, regardless of the aspirate, a significant decrease (P < .05) in arterial oxygen tension was seen in all groups. Aspiration of antacid was associated with a progressive decrease in PaO₂ with time. This was not seen with saline (Fig.1). Similarly, all aspirates were associated with an accumulation of lung EVW, displayed in Fig.2. These changes, except for saline, were most pronounced at 6 hr.

Discussion. The decrease in arterial oxygen tension associated with aspiration has been well documented^{1,2,3}, and is corroborated here. Decreasing PaO₂ with time following aspiration of antacids suggests progressive pulmonary change with little or no resolution by 48 hours. Determination of lung extravascular water is a quantitative measure of the damage that had occurred with aspiration. Values above baseline are thought to represent accumulation of interstitial edema fluid. Thus we have shown in rabbits that the aspiration of both soluble antacids and antacid suspensions is associated with pulmonary pathophysiology. There

do not appear to be significant differences in pulmonary dysfunction caused by soluble or emulsified antacids within the first 48 hours.

References.

1. Gibbs CP, et al: Proceedings of the Society of Obstetric Anesthesia and Perinatology (Abstr), 1978, p.26.
2. Wynne JW, et al: Proceedings at the Society of Obstetric Anesthesia and Perinatology (Abstr), 1979, p.304.
3. Geer RT, et al: Effects of albumin and/or furosemide therapy on pulmonary edema in rabbits induced by hydrochloric acid aspiration. J. Trauma 16: 303-307, 1976.

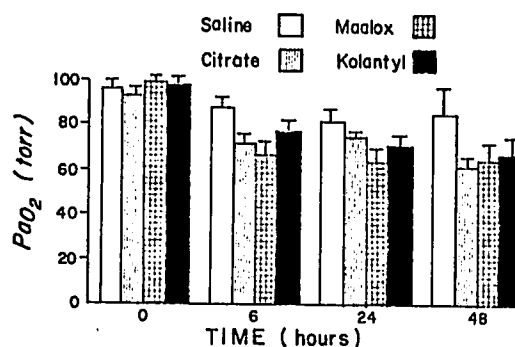


Figure 1. N = 6 for each group

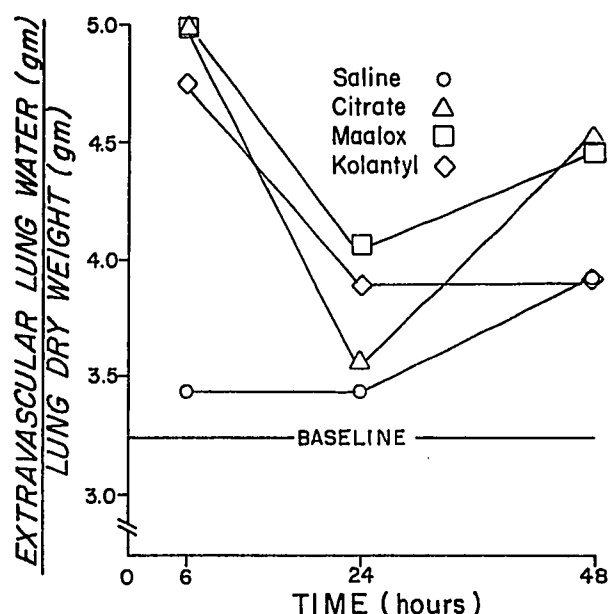


Figure 2. N = 6 for each point