Title: PREVENTION OF ATELECTASIS AFTER UPPER ABDOMINAL OPERATIONS

Authors: M. C. Stock, M.D., J. B. Downs, M.D., P. K. Gauer, R.R.T., R. B. Cooper, R.R.T.

Affiliation: Departments of Anesthesiology and Pulmonary Medicine, Mercy Hospital, 1400 West Park Avenue, Urbana, Illinois 61801

Introduction. Atelectasis and pneumonia are frequent postoperative problems. Continuous positive airway pressure (CPAP) administered with a mask at intervals throughout the day and incentive spirometry (IS) were compared with a regimen of coughing and deep breathing (CDB) to determine the best prophylaxis against pulmonary complications after upper abdominal operations.

Methods. Preoperatively, 65 consenting adults were assigned randomly to one of three treatment groups. All patients performed spirometry and multiple breath N_2 washout to determine functional residual capacity (FRC). All underwent physical and roentgenographic examination of the chest. Postoperatively, volumetric incentive spirometers (Bartlett-Edwards^R) were used to deliver IS (N=22). A mask was used to deliver 7.5 cm H_2O CPAP (N=23). Twenty patients received the CDB regimen. All treatments were supervised by physicians or trained therapists, lasted 15 min, and were delivered every 2 h during waking hours from the fourth to the seventy-second h postoperatively. Spirometry, FRC determinations, and physical examinations were performed at the bedside 4, 24, 48, and 72 h postoperatively. Oral temperatures were recorded every 6 h. Chest roentgenograms taken 24 and 72 h after operation were interpreted by radiologists unaware of the treatments assigned. The ratio of postoperative FRC at 24, 48, and 72 h to that at 4 h was used to minimize interpatient variability. A probability less than 0.05 that differences occurred by chance was considered significant.

Results. The mean FRC of the groups did not differ statistically preoperatively or 4 and 24 h postoperatively. The FRC of all but one patient decreased postoperatively, but only 2 patients developed pneumonia (3.1%). The 48 h: 4 h FRC ratio of patients receiving CPAP (1.8 ± 1.0; $\bar{X}$ ± S.D.) was greater than that of those receiving CDB (1.2 ± 0.4) (figure). The latter value did not differ from that of patients receiving IS (1.6 ± 0.7). Similarly, the 72 h:4 h ratio of the CPAP group (1.9 ± 1.0) was greater than that of the CDB group (1.4 ± 0.4), which was statistically equivalent to the IS value (1.6 ± 0.8). The proportion of patients with roentgenographic evidence of atelectasis 72 h after operation was significantly less with CPAP (23%) than with CDB (45%), which was not different from IS (41%). There were no differences in oral temperature or physical examination among or between the groups.

Discussion. Although the incidence of pneumonia was low in all groups (none in the CPAP group), recovery of FRC after upper abdominal operation was significantly faster and more complete after CPAP delivered at intervals than after conservative CDB regimen. Incentive spirometry offered no advantage over the CDB therapy.