TITLE : DOES LIDOCAINE INDUCE CHANGE IN LUNG MECHANICS ?

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INTRODUCTION. Lidocaine has a direct relaxant effect on smooth muscles which may induce changes in pulmonary mechanics. The increase in postoperative respiratory compliance and in functionnal residual capacity (CRF) induced by epidural anesthesia (1) are supposed to be due to the neural blockade only. However, systemic lidocaine per se may also have a role in these changes by its action on peripheral airway smooth muscles. Such a hypothesis has never been investigated. On the other hand, Loehning et al (2) found no change in airway resistance during intravenous lidocaine infusion. Their study, however, was performed in patients who had a tracheal tube and were under general anesthesia. The aim of the present study was to measure specific airway resistances ($S_R aw$), pulmonary volumes and lung compliance (C_l) in awake healthy subjects during lidocaine infusion with serum levels close to those found during regional blocks.

METHODS. Thirteen male ASA I volunteers were studied. Research Ethics Committee approval for the study was obtained and all subjects gave informed consent. Their mean (±SD) age, height and weight were 31±5 yrs 176±7 cm and 74±10 kg respectively. All subjects had fasted, took no drugs and no caffeine-containing beverages for 12h before the study. A bolus of 1.5 mg/kg of lidocaine was injected intravenously over a 5 min period and followed by a continuous infusion of 60 µg/kg/min of lidocaine during 30 min. The subjects were divided in two groups. In group I (n = 5) lung mechanics consisting of total lung capacity (TLC), vital capacity (VC), funtional residual capacity (FRC) and compliance (as a quasi static expiratory transpulmonary pressure volume curve with computation of k a constant of monoexponential function and compliance near FRC level (C_l)) were studied before and 30 min after the onset of lidocaine infusion. In group II (n = 8) $S_R aw$ obtained by the panting method was measured before, 15 and 30 min after the onset of lidocaine infusion and 30 min after discontinuation of lidocaine infusion. Serum level of lidocaine was assayed in duplicate by the EMIT immunoassay from venous blood samples taken just before each set of measurements. Statistical analysis of the data was performed by Student t-test for paired data.

RESULTS. During lidocaine infusion all the subjects reported a feeling of sedation. Table I and Table II show that lidocaine infusion did not induce changes in pulmonary volumes, compliance or airway resistance.

DISCUSSION. The absence of changes in pulmonary compliance and lung volumes during lidocaine infusion suggests that the increases in respiratory compliance and FRC (1) induced by epidural anesthesia are due only to the neural blockade. On the other hand, the absence of change in airway resistance during and after lidocaine infusion is consistent with previous data obtained in intubated patients under general anesthesia (2). However, since intravenous lidocaine has been found to induce a decrease in airway resistance in chronic stable bronchial asthma patients (3), our results, which were obtained in healthy volunteers, must not be extrapolated to patients with abnormal lung mechanics. In conclusion, serum levels of lidocaine close to those observed during regional blocks do not change lung volumes, compliance or specific airway resistances in healthy subjects.

REFERENCES.

1.BROMAGE PR : Extradural analgesia for pain relief Brit. J. Anaesth., 39 : 721-729, 1967.

2.LOEHNING RW, WALTEMATH CL, BERGMAN NA : Lidocaine and increased respiratory resistance produced by ultrasonic aerosols. Anesthesiology 44 : 306-310, 1976.

3.WEISS EB, PATAWARDHAN AV : The response to lidocaine in bronchial asthma. Chest 72 : 429-438, 1977.

	CONTROL	30 MIN
TLC (l)	7.25 ± 0.75	7.47 ± 0.64
VC (l)	5.91 ± 0.4	5.97 ± 0.37
FRC (l)	3.25 ± 0.71	3.37 ± 1.11
K (KPa^{-1})	1.24 ± 0.23	1.06 ± 0.21
C_l (l/KPa)	5.09 ± 1.17	4.86 ± 0.78
Serum lidocaine (mcg/ml)		2.30 ± 0.72

TABLE I : Lung volumes and compliance before and during lidocaine infusion. Mean values ± SD.

		LIDOCAINE		
	CONTROL	INFUSION 15 MIN	INFUSION 30 MIN	POST-INFUSION 30 MIN
$S_R aw$ (cmH2O.sec)	0.56 ± 0.16	0.57 ± 0.17	0.55 ± 0.22	0.58 ± 0.18
Serum lidocaine (mcg/ml)		1.98 ± 0.63	2.05 ± 0.46	1.56 ± 0.60

TABLE II : $S_R aw$ before during and after lidocaine infusion. Mean values ± SD.