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A TWO YEAR FOLLOW-UP STUDY OF FORCED  
EXPIRATORY VOLUMES IN A GROUP OF  
CEMENT WORKERS WITH CHRONIC BRONCHITIS

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In a group of 37 cement workers, eight retired cement workers and 20 shipbuilding control workers — all with the symptoms of chronic bronchitis — forced expiratory volumes were followed during a two-year period.

The values of controlled ventilatory indices in all three compared groups show a tendency to become lower. However, FEV<sub>1.0</sub>/FVC (%) was significantly reduced only in the group of cement workers. The FEV<sub>1.0</sub> was also significantly lower only in active and retired cement workers.

When smoking habit was considered separately, cement workers-smokers had significantly reduced FEV<sub>1.0</sub> and FVC values. This was not the case with the smoking controls.

In a previous cross-sectional study a higher rate of the symptoms and objective findings indicative of chronic nonspecific lung disease was recorded in cement workers if compared to the controls (1). An inverse relationship was found between the duration of occupational exposure to cement dust and values of forced vital capacity (FVC) and ratio of one second forced expiratory volume to forced vital capacity (FEV<sub>1.0</sub>/FVC) (2). This was confirmed to a certain extent by an examination repeated later in a group of cement workers from the same sample which included a follow-up of ventilatory indices. A decline in FEV<sub>1.0</sub> and FEV<sub>1.0</sub>/FVC ratio was faster in cement workers than in controls. In evaluating the results we considered the effects of smoking, symptoms of chronic bronchitis, age, duration of previous exposure to cement dust and the interval between the two examinations (3).

The present paper deals with a further follow-up (1972—1974) of a group of cement workers with the symptoms of chronic bronchitis.

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## SAMPLE AND METHODS

The study was carried out in 37 workers from the cement production, eight retired cement workers and 20 control shipbuilding workers (without exposure to dust or chemical irritants) — all with the symptoms of chronic bronchitis. Chronic bronchitis was defined as phlegm production in the morning and during the day and/or night for at least three winter months per year, in the course of the last two years or longer (4). The three groups were compared with regard to FVC, FEV<sub>1.0</sub> and FEV<sub>1.0</sub>/FVC (%) values. The significance of the differences in ventilatory indices over the follow-up period was examined by paired t-test.

Table 1 shows the followed-up groups of workers by age and smoking habit.

Table 1  
*Followed-up groups by age and smoking habit*

	Age		Non-smokers		Past smokers		Present smokers				Present and past smokers			
	N	$\bar{X}$	SD	f	%	f	%	Light	Moderate	Heavy	f	%		
Cement workers	37	43.8	6.0	6	16.2	8	21.6	—	16	43.2	7	18.9	31	83.8
Control workers	20	45.0	6.0	4		3		1	7	35.0	5	25.0	16	80.0
Retired cement workers	8	60.0	3.8	—	—	2		—	—		6		8	100.0

Note: Categories of smokers are based on the criteria proposed by Brinkman and Coates (5). When the frequencies (f) were under 5 no percentages were calculated.

Table 2  
*Values of ventilatory volumes (in ml) measured in 1972*

	FVC		FEV <sub>1.0</sub>		FEV <sub>1.0</sub> /FVC (%)
	obtained (lit.)	% of predicted	obtained (lit.)	% of predicted	
1. Cement workers	4.8 (0.8)	92.5 (13.9)	3.3 (0.7)	84.8 (17.6)	68.8 (10.3)
2. Control workers	4.2 (0.8)	82.8 (12.8)	3.0 (0.8)	80.0 (20.9)	71.5 (12.3)
3. Retired cement workers	4.0 (0.9)	84.9 (12.6)	2.7 (0.6)	80.2 (9.0)	67.8 (7.5)

Note: Numbers in parentheses are standard deviations (SD). Predicted values are those developed by Jouasset (6). FVC (% of predicted value) 1-2 P < 0.05

## RESULTS

The values of ventilatory volumes measured in 1972 are presented in Table 2.

Tables 3 and 4 show the mean changes of ventilatory volumes over the follow-up period in compared groups of workers.

Table 3

Mean changes of ventilatory volumes (in ml) in compared groups of workers over the follow-up period

	FVC		Signifi- cance of diffe- rence	FEV <sub>1.0</sub>		Signifi- cance of diffe- rence	FEV <sub>1.0</sub> / FVC (%)		Signifi- cance of diffe- rence
	Mean	S <sub>x</sub>		Mean	S <sub>x</sub>		Mean	S <sub>x</sub>	
Cement workers	-111.4	59.9	NS	-176.2	59.2	P < 0.01	-2.2	1.1	P < 0.05
Control workers	-82.5	48.9	NS	-127.5	73.1	NS	-1.9	1.5	NS
Retired cements workers	-116.2	108.4	NS	-133.8	45.4	P < 0.05	-1.6	1.3	NS

Table 4

Mean changes of ventilatory volumes (in ml) in cement and control workers smokers over the follow-up period

	FVC		Signifi- cance of diffe- rence	FEV <sub>1.0</sub>		Signifi- cance of diffe- rence	FEV <sub>1.0</sub> / FVC (%)		Signifi- cance of diffe- rence
	Mean	S <sub>x</sub>		Mean	S <sub>x</sub>		Mean	S <sub>x</sub>	
Control workers	-160.3	61.1	P < 0.05	-181.0	67.4	P < 0.05	-2.0	1.2	NS
Cement workers	-106.2	57.0	NS	-128.1	87.9	NS	-1.1	1.7	NS

## DISCUSSION AND CONCLUSION

The results show that in the period of two years the values of controlled ventilatory indices tend to diminish in all three compared groups. As shown in Table 2, in the case of FVC% only the initial values statistically differed between the cement and control workers. However, a decrement in FVC volume was not statistically significant in any of the three groups.

In the follow-up period FEV<sub>1.0</sub> expressed in liters was significantly reduced at a 1% confidence level in the group of active cement workers and at a 5% confidence level in the retired cement workers. If compared as the percentage of the predicted values the reduction in FEV<sub>1.0</sub> was also statistically significant at a 5% confidence level in control workers (mean changes: -2.5; S<sub>x</sub> 0.9; P < 0.05).

The FEV<sub>1.0</sub>/FVC ratio was significantly reduced over the same time period only in the group of cement workers.

When smoking habit was considered separately it was shown that smokers in the group of cement workers had significantly reduced both FEV<sub>1.0</sub> and FVC values, while this was not the case with the smoking controls. As shown in Table 1 these two compared groups did not differ by categories of smokers. The retired cement workers were all smokers (two were past smokers).

The results of this study also indicate that the work in cement production i. e. exposure to cement dust may contribute to the development of expiratory airflow obstruction.

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#### Sažetak

#### KRETANJE FORSIRANIH EKSPIRATORNIH VOLUMENA U DVOGODIŠNJEM RAZDOBLJU U SKUPINI RADNIKA S KRONIČNIM BRONHITISOM IZ PROIZVODNJE CEMENTA

U skupini od 37 aktivnih i 8 penzioniranih radnika sa kroničnim bronhitisom iz proizvodnje cementa, te 20 brodogradilišnih radnika također sa kroničnim bronhitisom koji su služili kao kontrola, praćeni su u dvogodišnjem razdoblju forsirani ekspiratorni volumeni.

Iako je u svim uspoređenim skupinama došlo do pada kontroliranih ekspiratornih volumena, FEV<sub>1.0</sub>/FVC (%) statistički je značajno snižen samo u skupini aktivnih radnika iz proizvodnje cementa. FEV<sub>1.0</sub> statistički je značajno snižen u aktivnih i penzioniranih radnika iz proizvodnje cementa (prikazan kao postotak od očekivanih vrijednosti taj je volumen bio značajno snižen i u kontrolnoj skupini). Pušači iz skupine radnika u proizvodnji cementa imali su statistički značajno snižene vrijednosti FEV<sub>1.0</sub> i FVC, dok to nije bio slučaj sa pušačima iz kontrolne skupine.

Rezultati i ovog ispitivanja upućuju na to da rad u proizvodnji cementa može doprinosti razvitku ekspiratorne opstrukcije.

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