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CLINICAL AND PHYSIOLOGICAL STUDIES ON CHRONIC BRONCHITIS

I. Clinical Description of the Patient Material

By

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INTRODUCTION

During the last two decades the importance of so-called non-specific broncho-pulmonary disease, especially chronic bronchitis, has grown considerably (8, 20, 44). This is thought to reflect to a large degree the effect of smoking and air pollution, which are both growing problems in industrialized modern society (18, 24, 41, 43, 45).

In 1958 a clinical and physiological study on bronchitic subjects was started at this hospital. It was designed to be a thorough investigation of a limited number of patients with little and moderate severity of disease.

Results of these studies will be presented in the following series of papers:

- I. Clinical Description of the Patient Material.
- II. Classification According to Spirometric Findings and Effect of Bronchodilators.
- III. Bronchial Reactivity to Inhalation of Acetylcholine.

¹ Scholar of the Swedish Association Against Heart and Lung Diseases.

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- IV. Effect of Isoprenaline aerosol on the "Alveolar Nitrogen Plateau".
- V. Gas Exchange at Rest and During Work (49).

I. Clinical Description of the Patient Material.

There are great difficulties in obtaining generally accepted criteria for diagnosis of the various forms of non-specific broncho-pulmonary disease. Therefore certain discriminatory answers to a questionnaire and data from the case histories, as well as clinical and laboratory findings, will be presented in the following.

The material consists of 30 male and 28 female subjects who were treated once or several times after 1957 at The University Lung Clinic, Renströmska sjukhuset, under the diagnosis "Chronic bronchitis". According to British workers (13), chronic bronchitis refers to a condition with chronic or recurrent cough with expectoration, present for at least two years, which is not attributable to conditions excluded from chronic non-specific broncho-pulmonary disease. The diagnostic criteria for selection of the present material were clinical and were similar to those given above. Thus the main prerequisite for participation was lack of evidence of other overt diseases which could simulate chronic bronchitis, such as, for example, tumours, tuberculosis, sarcoid, fibrosis or heart disease. Infection of the bronchi was frequently but not necessarily present. With the intention of studying even subjects with early chronic bronchitis and little disablement, a few subjects with cough but with minimal or no expectoration during the hospitalization period were included. Individual data on age and physiological characteristics are given in Table 1; male patients are numbered from 1 to 30, female patients from 101 to 135. The number of patients in different age and FEV% group is listed in Paper II.

METHODS

A. *Clinical Studies.*

The patients were interviewed by the investigator regarding their symptoms, using the standard British Medical Research Council Questionnaire (22) with some additional questions concerning heredity and childhood diseases (see Appendix for questionnaire). At least one complete *physical examination* was performed, including measurement of brachial arterial blood pressure, using a standard aneroid manometer, and auscultation of heart and breath sounds. Most patients were re-examined several times between 1958 and 1964.

Frontal and lateral *roentgenograms* of the chest were obtained, often with barium contrast in the oesophagus. Tomograms were made in most of those subjects in whom pulmonary parenchymal changes were found. Twenty-eight patients also had roentgenograms of their paranasal sinuses.

On 54 of the patients *bronchoscopy* was performed; in 19 males and 11 females biopsy was taken from the bronchial mucosa for histological examination. During 23 of the bronchoscopies, non-contaminated samples of bronchial secretions for bacterial cultures were collected with a special instrument which was constructed to avoid contamination from secretion in the upper airways (6).

In 27 male and 25 female bronchitis, *bronchography* was performed; in 20 males and 21 females it was made bilaterally in two séances, the first one usually in connection with bronchoscopy.

B. *Laboratory Tests.*

The principal tests are listed in Table 2; these included standard examination of blood and urine. When called for, other tests were performed, *e.g.* endogenous creatinine clearance, GOT, GPT, thymol test, paper electrophoresis on plasma, and gel-precipitation test. Several sputum specimens from each patient were searched for the presence of *Mycobacterium tuberculosis*, and specimens of sputum or gastric lavage were sent for culture and guinea-pig tests for *Mycobacterium tuberculosis*. All subjects were tested with an intradermal injection of 0.05 mg tuberculin and, if negative, 1 mg (Mantoux test).

During the period in the hospital, sputum was measured over every 24-hour period, except during the 5-7 days following endo-bronchial procedures. During three consecutive days *eosinophils* were counted in sputum smears, and eosinophil counts were made on blood; in most patients samples were obtained several times during the period 1958-1964.

Eosinophils in venous blood were dyed with an aqueous solution of Magdala red (1 per cent), acetone and sol. natr. carb. and were counted/mm³ in Jessen's chamber as well as counted in standard white cell smears dyed according to May-Grünwald-Giemsa; the result was expressed in per cent of the total number of white cells. Sputum specimens were searched for eosinophils, especially in lumps of mucus smeared and dyed according to May-Grünwald-Giemsa. Fifty to 100 fields were scrutinized under a microscope with immersion lens at 100 × magnification and the average number of eosinophils per field was recorded. When the

patients were in hospital, the samples were taken in the mornings; when tests were made on out-patients they were sometimes performed later during the day.

Intracutaneous tests with common allergens were performed in most patients at the Department of Allergology, the Sahlgrens Hospital, through the kind collaboration of Ass. Professor H. Arnoldsson and co-workers. Thirty-five allergens¹ were injected intradermally and the response was compared with that after injection of histamine and Coca's solution. In the majority of subjects, intracutaneous tests were also made by the author. Only "respiratory allergens" were then used, namely pollen, house dust, horse or dog epithelium and, as a special test, *Aspergillus fumigatus* antigens. Usually 0.1 cc of a solution of 1/1000-1/100 was injected. The "wheal" was measured after 15 minutes with a ruler along the maximal axis and in 90° angle to that. If the sum exceeded 20 mm it was graded + (3, 4).

In 36 subjects *inhalation tests* of dust 1/10 ("BC-dust") or mould-preparations 1/10 were performed. They were made routinely with the dust antigen and with those allergens which gave positive or suspected positive skin reactions. The technique was identical with that used for epinephrine inhalation, *i.e.* a series of forced expiratory spiograms was obtained before and after inhalation of 1 cc of the allergen. A Vaponefrin nebulizer was used with an air-flow of 3 lit/min., (see Studies on bronchitis, No. II, pages 301-324).

ECG was done on all patients at rest. Standard leads were used, *i.e.* I, II, III, aVR, aVL, aVF, and V₁, V₄, V₇. *Working capacity tests* with ECG were made on a cycle ergometer on 30 males and 24 females.

C. Pulmonary Function.

Tests will be described in the following papers. They included measurements of:

- a) Ventilatory capacities.
- b) Lung volumes.
- c) The acute effect of bronchodilators.
- d) Bronchial reactivity, tested by means of inhalation of acetylcholine.
- e) The ventilatory effect of allergen inhalation.
- f) Single-breath N₂ curves.
- g) The effect of inhalation of Isoprenaline and bronchoirritating agents on the "alveolar nitrogen plateau".
- h) Arterial blood gas studies at rest and exercise.

The patients were divided into four groups according to predicted FEV %.

RESULTS

The data given refer to an initial study when not otherwise stated. Physical characteristics and answers to questionnaire

¹ See Appendix pages 299-300.

are given in Table 1. The mean age in the male group was 60 years (range 28–68) compared to 47 years (27–61) in the female material. All patients were or had been at work within a year when the study started. Most male patients were labourers, while $\frac{1}{3}$ of the females were housewives.

All the patients had coughed for more than two years, but not necessarily continuously. In cases with obvious signs of airways obstruction, this was preceded by cough and expectoration. Coughing started as an average at 36 years (8–58) in the male group as compared to 27 years among the females (4–48). In 3 males (9, 10, 15) and 3 females (102, 104, 113) there were, in addition, periods with increased airways obstruction, justifying the terms “chronic bronchitis with asthma” or “asthmatic bronchitis” (13).

The diagnoses of obstructive ventilatory impairment and reversibility were judged by dynamic spirometry before and after administration of bronchodilating drugs, as described in Paper II. Other current diseases or operations are listed in Table 1.

Blood-stained sputum or hemoptysis was recorded in 15 subjects (50 per cent) in the male, and in 23 subjects (82 per cent) in the female group. Answers to certain discriminatory questions (23–49 in questionnaire) are summarized as follows:

	<i>Males</i>	<i>Females</i>
Breathlessness	23 (76 %)	20 (72 %)
Have to walk slower than people of own age on the level	10 (33 %)	9 (32 %)
Have to stop for breath when walking on the level at own pace	5 (17 %)	3 (9 %)
Wheezing or rales only during colds	5 (17 %)	3 (9 %)
Wheezing or rales even without colds	17 (57 %)	18 (64 %)
Significant chest illness during the last 3 years	22 (73 %)	23 (82 %)
Have had pneumonia	13 (43 %)	15 (54 %)
Have had pleuritis	2 (7 %)	2 (7 %)

TABLE
Physical Characteristics

Subj. no.	Record no.	Age	Ht cm	Wt kg	Occupation	Smoking		Cough start age	Hemo pty.
						Start age	Cig/ wk		
Males									
1	310905	28	179	58	Carpenter	14	90	25	+
2	220301	37	175	55	Metal wrk	16	-	29	+
3	211010	38	175	72	Waiter boat	15	140	23	+
4	210216	37	172	52	Mechanic	20	30	20	-
5	140921	45	169	63	Trk drivr	21	140	25	+
6	121012	46	172	53	Machinist	17	50	36	+
7	120723	47	168	56	Musician	14	210	27	+
8	110402	48	172	78	Toolsharper	15	85	26	-
9	101224	48	174	75	Bldg maint	13	85	30	+
10	100706	51	171	62	Music inst. maker	-	-	45	-
11	080315	51	172	62	Road wrk	17	20	17	+
12	080313	52	183	77	Editor	16	150	17	-
13	060706	54	177	65	Trk drivr	20	70	8?	-
14	041213	57	168	67	Lngshormn	13	10	51	-
15	021123	59	166	67	Labourer	33	-	49	-
16	021120	57	168	56	Engineer	15	210	43	-
17	001016	58	176	60	Sheetmetal	16	50	50	-
18	990912	60	162	46	Shipyard wrk	10	85	44	-
19	981019	60	172	63	Printer	17	140	48	(+)
20	970621	64	181	95	Electrician	12	-	54	-
21	960813	63	178	77	Diver	25	-	43	-
22	951225	63	173	70	Factory wrk	21	70	55	+
23	951010	63	172	56	Pipemaker	20	-	30	+
24	950705	63	174	65	Night watch	18	105	54	+
25	940422	66	168	77	Steward	9	350	48	-
26	940401	66	178	74	Inspector	16	-	55	-
27	940319	64	177	82	Cement wrk	16	-	30	+

and Questionnaire.

Dyspnoea ¹			Wheezing		Chest illness			Child dis. ²	Diseases other than Chron. bronchitis
23	24	25	29	30	46	48/49			
+	—	—	—	+	+	—	—	I	Insuff. dorsi
+	—	—	—	+	+	—	—	P?	Bronchiectases
									lob. inf. dx.
									Cataract one eye
—	—	—	—	—	—	—	—	?	
+	+	—	—	+	+	Pn/Pl		P?	Pernicious anemia
—	—	—	—	+	—	—	—	P, M	Bronchiectases
									lingul., op.
+	—	—	—	+	+	—	—	Pn, I, M	Coronary insuff.
+	—	—	+	—	+	—	—	D, P, M	Arthrit. urica
+	—	—	—	+	—	Pn	—		
(+)	—	—	—	+	+	—	—	P, D, I	
—	—	—	+	—	—	—	—		Hypertension
+	—	—	—	+	+	Pn	—		
—	—	—	—	—	+	—	—	P, M, Br	
—	—	—	+	—	—	—	—		Rhinophar. sicca,
									Hypercholest.
+	+	+	+	—	—	—	—		
+	+	—	—	+	+	Pn	—	?	
—	—	—	+	—	+	Pn	—	P, I, M	
+	—	+	+	—	+	Pn	bilat	M	Tbc? pulm. san.,
									Ulcus, op.
+	—	—	+	—	+	Pn	—		
+	+	—	—	+	—	—	—		
+	+	—	+	—	+	Pn	—	P?	Hypertension,
									Hypertroph. prostata
+	+	—	—	+	+	Pn	Pl?		* "Emphysema,
									Bronchiectases
									Cardioscl.
									Myocardial infarct."
+	+	—	+	?	+	—	—		
+	—	—	—	+	+	Pn	bilat	I	Tub. pulm. san.,
									Bronchiectases
+	+	+	—	+	+	—	—		* "Cardioscl."
+	+	+	—	+	+	Pn	—		Diab. mell. levis
+	—	—	+	—	+	—	—	?	Hypertension
+	—	—	—	+	+	Pn	—	P, I, M	Hypertension

TABLE 1

Subj. no.	Record no.	Age	Ht cm	Wt kg	Occupation	Smoking		Cough start age	Hemo- ptys.
						Start age	Cig/ wk		
28	931201	68	167	63	Machinist	-	-	50	+
29	131022	46	165	68	Machinist	17	-	25	+
30	011208	59	164	74	Shipyard wrk	18	15	19	-
<i>Females</i>									
101	320905	27	167	66	Office wrk	15	105	14-16	+
102	240911	34	168	55	Cashier	22	56	27	-
103	240101	35	169	73	Waitress	22	70	17	+
104	220705	37	158	57	Presser	19	70	28	+
105	210423	38	163	63	Waitress	26	70	4	+
106	200423	39	168	57	Seamstress	22	60	30	+
107	190117	39	167	56	Cashier	18	140	16	+
108	150324	46	171	59	Store clrk	14	70	10	+
109	150510	44	155	50	Housewife	12	175	12	+
110	130207	46	162	61	Stockrm clrk	21	-	30	+
111	131005	46	162	59	Textile wrk	18	35	25	++
112	131222	48	162	64	Store clrk	26	40	34	+
113	121102	46	164	74	Store clrk	28	140	21	+
114	110414	49	164	68	Housewife	-	-	35	+
115	080818	51	162	66	Housewife	27	140	43	+
116	050220	55	170	80	Housewife	15	Few	Child	-
117	041122	56	169	60	Housewife	19	70	36	-
118	040810	54	156	57	Kitchen wrk	-	-	28	+

(cont.)

Dyspnoea ¹			Wheezing		Chest illness			Child dis. ²	Diseases other than Chron. bronchitis
23	24	25	29	30	46	48/49			
+	—	—	+	—	+	—	—		Hypertension, Hyperthyr. Amyo- troph. lat. scler.?
+	+	+	—	+	+	Pn × 3			Hypertension, Bronchiectases
(+)	—	—	—	+	—	—	—		
—	—	—	+	—	(+)	—	—		
+	+	+	—	+	+	—	—	D	
+	—	—	—	—	—	Pn?			Chron. Endometrit.
+	+	—	—	+	+	Pn	—	?	
+	+	—		+	+	Pn	bilat	I, M, Pn	Chronic Rhinitis Bronchiectases
+	+	—	—	+	+	Pn × 10, Pl		E, Br	
+	?	—	—	+	+	Pn	—	I, M, Tbc	St. p. Tbc. art. talo-crur. dx.
(+)	—	—	+	—	+	Pn?	—	P	Lumbago, Hysterectomy.
—	—	—	—	+	—	—	—	P, I	Anemia sideropen. Sialolith. Sicca-syndrom?
+	—	—	—	+	+	—	—	D, I, M, Sc	Chronic Pyelonephritis
+	—	—	—	+	+	—	—	P, D, I, Rhin	Anemia sideropen. Rhin., Cardioscl.
+	—	—	—	+	+	Pn		D	Hysterectomy, Eczema, Neurosis
+	+	+	—	+	+	—	—	Phar, Br	Ulcus duod., Op. Diab. mell.
+	—	—	—	—	+	—	—	P, Sc	Oophorectomy
+	+	?	—	+	+	—	—	D, P, Phar.	Ulcus duod., neurosis
—	—	—	—	+	—	Pn	(Infl)	M, D	Oophorectomy dx.
+	+	+	—	+	+	—	Pl	P, M, I	Hypertension, Tuberculosis pulm. san?
—	—	—	+	—	+	—	—	Phar., Br	Sinusitis max.

TABLE 1

Subj. no.	Record no.	Age	Ht cm	Wt kg	Occupation	Smoking		Cough start age	Hemo-ptys.
						Start age	Cig/wk		
119	040118	57	159	69	Seamstress	20	20	18	+
120	030214	58	167	110	Cook	—	—	48	++
121	010802	57	163	59	Seamstress	54	21	42	+
122	991117	60	156	51	Housewife	—	—	36	+
123	970107	61	164	73	Housewife	—	—	33	+
124	020930	58	154	53	Housewife	23	105	25	+
127	110315	49	159	74	Saleswmn	40	140	30	+
130	240223	36	157	57	Housewife	25	35	31	—
131	080829	52	161	52	Waitress	44	42	40	—
135	171228	44	166	50	Day nurs'y ass't	20	50	33	+

¹ Legend:

Question 23: Do you have breathlessness?

Question 24: Do you have to walk slower on the level than others of your age?

Question 25: Do you have to stop for breath when walking on the level at your own pace?

Question 29: Do you have wheezing or rales only when you have a "cold"?

Question 30: Do you have wheezing or rales sometimes without having a "cold"?

Question 46: Chest-illness during last 3 years that have forced to absence from work, bed-rest or staying indoors.

Question 48/49: History in the past of pneumonia or pleuresy.

Childhood Diseases were reported as follows:

	Males	Females
Bronchitis	1	4
Diphtheria	2	8
Eczema	0	1
Influenza	6	9
Measles	7	6
Whooping cough	9	10
Sore throat (repeated)	0	4
Pneumonia	1	3
Rhinitis, repeated	0	3
Tuberculosis	0	2

(cont.)

Dyspnoea ¹			Wheezing		Chest illness			Child dis. ²	Diseases other than Chron. bronchitis
23	24	25	29	30	46	48/49			
—	—	—	+	—	+	—	—		Neurosis
—	+	—	—	+	+	Pn	—	D	Op. Thecomatosis ovarii. Adipositas
+	—	—	+	—	+	Pn	—	Phar., Br, P, I	Hysterectomy, neurosis
+	+	—	—	+	+	Pn × 3	Pl, Tbc	M, P, I, Tbc	Neurosis
—	—	—	—	—	—	—	—	?o	Hypertension, Ulcus.v., op.
+	—	—	+	—	?	—	—	Rhin	Tuberculoma lob. inf. pulm. dx., op.
+	—	—	—	+	+	Pn × 2		D, I	
+	—	—	—	+	+	Pn × 3		P, Pn	Eczema (Ni), lumbago
—	—	—	+	—	+	Pn		Pn, P, Rhin	Lumbago, neurosis
+	+	—	—	+	+	Pn	—	P?	Salpingect., neurosis

Diseases:

Br : Bronchitis.
D : Diphtheria.
E : Eczema.
I : Influenza.
M : Morbilli.
P : Pertussis.
Phar: Pharyngitis.

Pl : Pleuritis.
Pn : Pneumonia.
Rhin: Rhinitis.
Sc : Scarlatina.

* Diagnoses from autopsy-reports.

Thus 13 of the males and 23 of the females reported some childhood disease that might have some connection with present symptoms of broncho-pulmonary disease.

Twenty-eight out of 30 male bronchitis had been *smokers*; the average cigarette consumption in 20 patients still smoking was 105 per week (10–350). The average age for start of smoking was 17 years (9–33). There were 23 smokers among the 28 females; one had stopped smoking at the time of the study. The average consumption was 78 cig./week (few–175), and the mean age for start of habitual smoking was 24 years (12–54), Table 1.

TABLE
Physical Examination, Blood,

Subj. no.	Blood pressure	Electrocardiogram ex: exercise	Whee- zing or rales at least once.	Sputum cc MV 7 days at hosp.	SR mm		HB g%	
					Max.	Min.	Max.	Min.
1	120/65	o pathol.	o	20	5	2	16.0	
2	155/70	o pathol.	++	22	15	3	16.2	14.7
3	125/90	o pathol.	o	64	24	9	16.5	
4	180/90	o def. pathol.	+	84	22	12	13.4	10.9
5	140/100	o pathol.	+	37	30	6	14.9	13.1
6	115/75	Ex: S-T depression Coronary insuff.	+	22	38	10	16.5	14.4
7	160/100	o pathol.	+	15	72	6	15.8	13.4
8	140/90	o pathol.	+	o	14	7	13.5	12.7
9	140/90	o pathol.	+	30	4	1	16.0	
10	185/105	o pathol.	++	15	4	3	15.6	13.7
11	150/100	o pathol.	o	18	20	7	16.9	14.2
12	160/90	o pathol.	o	—	5	3	17.9	17.0
13	120/80	o pathol.	+	17	45	15	14.2	
14	150/90	Lt. v. strain—64 (BP 200/110)	+	22	25	2	17.8	14.2
15	170/95	o pathol.	++	25	86 ^x	21	16.7	16.6
16	150/100	o pathol.	+	10	31	6	16.2	13.6
17	115/85	o pathol.	o	40	54	10	12.4	
18	145/70	o pathol.	+	13	44	26	13.3	12.0
19	150/85	o pathol.	+	9	29	3	15.3	14.9
20	195/110	o def. pathol.	+	Tr	10	7	16.0	
21	135/80	Ex: S-T depression	+	Tr	12	3	15.3	14.9
22	125/85	S-T depression	+	11	45	2	17.0	14.9
23	150/80	o def. pathol.	+	52	40	29	14.4	
24	150/95	o pathol.	+	23	73	9	16.0	15.1
25	150/100	o pathol.	+	13	21	14	16.7	14.4
26	210/115	Lt. v. strain	+	15	36	4	14.4	
27	175/110	o pathol.	+	—	11	4	14.2	13.8
28	160/80	Lt. v. strain (BT—61 205/110)	+	15	16	6	17.6	14.4
29	170/110	Lt. v. strain	+	60	90	5	16.5	12.6
30	160/90	o pathol.	+	—	14	—	14.6	
101	120/60	o pathol.	+	9	38	16	12.0	
102	120/80	Ex: o pathol.	++	o	26	5	13.7	13.5

2
Urine, and Sputum Tests.

Diff. count	White blood cell count max.-min.	RN ₂ or pl. creat. mg %	Mantoux	Bacterial cultures		
				TB	Sputum Other	Bronchial secretion
Dx	6700	1.2	+1 mg	—		H. Str. St. aur.
N	7800-6100	—	+1 mg	—	OF	H. Str. St. aur.
N	6700		+0.05	—	OF	Pnc
Sin	11500-9700	36	+0.05	—		o
Sin	11200-7000	30	+0.05	—	H. I.	St. alb. Enteroc.
Sin	13600		—1 mg	—	Pnc	
Dx	8100-8000		+0.05			
Dx	7200-7100		+0.05			o
Sin	8500		+0.05	—	OF	
Eos	5300-5300		+0.05	—		α -Str, N
Eos, Dx	6400-4600		+0.05			
Dx	7500		—1 mg	—		OF
N	8800		+0.05	—		
Dx	14400-7400		+0.05	—		α -Str. N, S
Eos, Sin	15000-9500	1.6 ^y	+0.05	—	OF	o
Dx	6200-6100	45	+0.05	—		o
N	8000	24	+1 mg	1+	H. I.	
Sin	6400-5500		+0.05	—	Pnc	
N	7600-4200		+1 mg	—		
N	6000		+1 mg	—		N, α , γ -Str.
N	7600-4200		+1 mg	—		
Eos, N	7000-5000		+1 mg	—	OF, Fungi	Pnc
Sin	3400		—1 mg	—	H. I.	
Eos, Dx, Sin	10200-6000	37	+0.05	1+	H. Str. St. aur. Fungi	
Eos	15700-8300	34	+0.05	—		
Eos	6400		+0.05	—		α -Str.
Sin	6200		+1 mg	—	St. aur.	
N	6300-4000	1.1	+0.05	—	H. I.	
					Enteroc. Pnc	
Sin, Eos	14200-5000	1.1	+0.05	1+	H. I. Pnc.	
Dx	8800		+1 mg	—		
Sin	5000		+0.05	—		
Eos	7800		+0.05	—		

TABLE 2

Subj. no.	Blood pressure	Electrocardiogram Ex: exercise	Whee- zing or rales at least once.	Sputum cc MV 7 days at hosp.	SR mm		HB g%	
					Max.	Min.	Max.	Min.
103	140/90	o pathol.	+	6	13	8	12.9	
104	140/95	o pathol.	+	30	11	6	15.6	
105	140/95	o pathol.	+	57	30	9	14.6	12.7
106	135/80	o def. pathol.	+	10	47	10	13.3	
107	130/65	o pathol.	+	101	25	6	14.4	13.7
108	160/110	o pathol.	+	0	25	11	17.0	14.6
109	125/75	o pathol.	+	16	46	15	11.5	8.5
110	140/105	o pathol.	o	13	26	11	13.3	11.1
111	140/85	RBBB	+	12	69	18	13.3	12.0
112	180/100	o def. pathol.	+	9	22	9	15.4	12.6
113	155/90	o pathol.	++	22	27	9	13.7	10.7
114	170/90	Ex: S-T depression	o	0	37	20	12.0	
115	130/80	o pathol.	+	7	60	27	15.0	14.0
116	160/90	Ex: o pathol.	+	Tr	29	11	13.5	
117	155/100	Lt. v. strain	+	91	50	10	15.8	12.9
118	170/90	o pathol.	o	6	36	12	13.5	12.9
119	130/90	Ex: S-T depression	(+)	1	6	2	16.7	13.0
120	190/100	o pathol.	o	80	48	17	13.6	12.2
121	180/120	o pathol.	(+)	9	52	13	12.5	11.5
122	160/90	o pathol.	o	25	8	4	13.9	11.9
123	140/90	Lt. v. strain-62	o	15	10	9	13.5	12.6
		o pathol.-63						
124	120/80	o pathol.	(+)	50	37	6	14.6	10.1
127	150/90	o pathol.	(+)	5	9	5	14.4	13.1
130	120/80	o pathol.	+	0	37	23	13.3	11.8
131	140/80	o pathol.	(+)	0	19	6	14.2	12.2
135	150/80	o pathol.	+	30	35	3	16.1	14.4

H. I. : Haemophilus Influenzae.

H. Str.: Haemolytic Streptococci α - β - γ -Str.

N : Neisseria.

OF : "Ordinary sputumflora".

Pnc : Pneumococci.

S : Sarcina.

(cont.)

Diff. count	White blood cell count max.-min.	RN ₂ or pl. creat. mg %	Mantoux	Bacterial cultures		
				TB	Sputum Other	Bronchial secretion
Sin	6500		+0.05	—	Pnc	
Eos, N	7500		+0.05	—	Pnc, S	
N	9000-5500	34	+0.05	—	Coli, Pnc	
Sin	9300		+0.05	—		
N	10800-7000		+1.0	—	H. I.	
N	12000-6500		—1.0	—		γ-Str.
N	9500-8800	29	+1.0	—		α, γ-Str.
N	6000-5500	1.9 ^z	+0.05	—		o
Dx, Eos	5800-4100	25	+1 mg	—	St. aur. H. I.	
Dx	3900-3500	0.9	+0.05	—		St. aur.
M	10000-5300	35	+0.05	—	Pnc, H. I.	OF
Dx	7000		+0.05	—		α, γ-Str. N
Dx	10000-5500	0.8	+0.05	1+		o
Sin	6500		+1 mg	—		
Sin	11500-5800	29	+0.05	1+	Cand. A	
N	3700	28	+1 mg	—		
N	6700		+1 mg	—		
Sin	6500-3500	32	+1 mg	—	OF	H. I. Cocci
N	4200	28	+1 mg	—	OF	
Sin, Eos	4000-4000	33	+0.05	—		
N	5200		+1 mg	—	Cand. A	
Eos	8400-6600	1.5	+0.05	—7	OF	o
Dx, Eos	8500-8700		—1 mg	—		
N	7200	1.0	+1 mg	—		
N	5900-5800		+0.05	—		
N	7200-6800		—1 mg	—		α, γ-Str.

St : Staphylococcus.

alb : albus.

aur. : aureus.

x Pneumonia.

y Creatinine clearance 97 litres per 1.73 sq. metres BSA.

z Pyelonephritis.

Forty subjects (70 per cent) were unfavourably affected by *fog* (18 males and 20 females), 28 (48 per cent) by generally *damp weather*, and 18 (31 per cent) by pure *cold*. Six did not like hot weather. Winter, accordingly, was considered to be the worst season by 19 males and 12 females (53 per cent), (Table 3).

Wheezing or rales were heard at auscultation at least once in 25 male and 22 female bronchitics, (Table 2).

Laboratory Tests.

The average 24-hour *sputum volume*, measured over 7 successive days, was 27 ml for the 24 males and 24 ml for the 25 females who brought up sputum enough to measure.

The maximal *sedimentation rate* (SR, Westergren) averaged 31 mm (4-90 mm); the minimal values were 8 (1-29) and 17 (2-27) for males and females, respectively, (Table 2). The maximal *hemoglobin concentration* averaged 15.5 (10.9-17.9) g per cent among the males and 14.0 (11.5-17.0) g per cent in females. *Differential white blood cell count* disclosed a neutrophilia in 18 subjects (10 M, 8 F), and lymphocytosis in 14 subjects (9 M, 5 F). Eosinophilia (> 5 per cent) was present in 14 subjects (8 M, 6 F). The maximal number of white cells averaged 8500 (3400-15700), in the male and 7300 (3700-12000) in the female group. Electrophoresis on plasma was performed in 5 subjects where it was found normal.

Two patients (Nos. 15 and 110) showed moderately increased levels of creatinine in plasma; number 15 had had a nephritis, and number 110 had a chronic pyelonephritis.

The *Mantoux tuberculin test* was positive in 52 patients, 27 males and 25 females (33 to 0.05 mg, 19 to 1 mg); 6 were negative to 1 mg. All had negative Wasserman tests. Mycobacterium tuberculosis were found in single cultures from subjects number 17 (1948), 24 (1957), 29 (1957), 115 (1964), and 117 (1963); both before and after these tests repeated (3-12) cultures, guinea-pig tests and direct smears were all negative.

*Bacterial cultures on sputum*¹ in 14 male and 11 female patients revealed "ordinary throat bacteria" in 9 cases, *H. infl.* in 9, pneumococci in 8, yellow staphylococci in 3, coliforms in 1, and *Candida albicans* in 2 cases (Table 2).

Non-contaminated specimens¹ obtained in 24 cases during bronchoscopy revealed growth of bacteria in 17 patients and no growth in the remaining 7. In 10 subjects there were streptococci in the bronchi and 4 showed staphylococci, 1 *H. infl.*, and 5 neisseria.

Data on allergy, weather sensitivity and eosinophilia in blood and sputum are collected in Table 3. Nine/30 and 20/28 in the male and female groups, respectively, had relatives with asthma, bronchitis, eczema, vasomotor rhinitis, or alimentary allergy. In 6/29 male and 8/26 female subjects there were positive *intracutaneous reactions* to one or more allergens, mostly moulds and house dusts.

In one (number 105) of 30 patients tested, there was a clearly positive late reaction to *Aspergillus fumigatus*. No precipitins to that or other mould antigens were found, however, on gel-precipitin tests using Ouchterlony's methods. No. 123 had a positive late reaction to *Candida albicans*-antigen.

Four males and 8 females were thought to have a personal allergy, judged from their records of eczema, etc. (Table 3). After dust or mould inhalation there was a decrease of ≥ 10 per cent in total or one-second vital capacity (FVC or FEV_{1.0}) in 4/27 males; one (number 9) reacted with a severe bronchoconstriction to BC-dust. In the female group 7/21 subjects decreased ≥ 10 per cent, but none went down more than 16 per cent. Thus about a quarter of the patients showed some reaction after inhalation dust or mould preparations, but only 1 subject experienced an acute attack of bronchoconstriction.

Eosinophilia was considered to be present when more than 400 eosinophils/mm³ were found in direct counts or more than 5 per cent were seen in differential counts (5). In sputum more

¹ Routine specimens to Dept. of Bacteriology, the Sahlgren Hospital. Head: Ass. Prof. G. Vahlne.

TABLE
Allergy, Eosinophils and

Subj.	History of allergy		Tests with allergens	
	Familial 0 = none ¹	Personal 0 = none	Cutan 0 = neg. — = not done	Inhalation effect on FEV, FVC, PEF % control ²
1	E R?	eczema	—	—12 % BC +
2	o	o	o	— 1 BC
3	o	o	+ mould I + Asp. f.	— 8 BC o moulds
4	o	o	o	— 1 BC
5	B	o	+ mould	— 8 BC
6	o	o	(+) pollen	— 7 BC o pollen
7	B sister	o	o	— 4 BC
8	o	+ pc	(+) moulds	o moulds + 8 BC
9	B?	o	(+) dusts	—58 BC +++
10	o	o	o	+ 5 BC
11	A	o	o	— 1 BC
12	o	o	o	+ 2 BC
13	o	o	o	o BC
14	o	o	o	— 9 BC
15	o	o	o	+13 BC o moulds
16	B E	+ Crayfish chlorom.	+++ mould I	+ 2 mould I + 6 BC
17	o	o	o	+ 1 BC
18	o	o	o	—
19	o	o	o	— 7 BC
20	R son	o	+ mould I + cow	— 2 moulds — 5 BC
21	o	o	o	—11 BC +
22	o	o	o	— 2 BC
23	o	o	(+) mould	o mould
24	o	o	o	—
25	A	o	o	— 9 BC
26	o	E	o	+ 3 BC
27	B?	o	(+) mould	+ 5 BC o moulds
28	o	o	+ BC + Asp. f.	—14 BC +

3
Weather Sensitivity.

Eosinophils			Weather	
Blood		Sputum No. field	Worst type ^a	Worst Season W=winter
No./mm ³	Diff. count %			
255	4.5	0-1	o	o
116	1	20-60	F D C	W
380	3	few	o	o
229	1	few	o	o
359	7.5	o	F	W
84	4.5	few	o	W
387	2	few	o	o
298	0.5	few	o	o
16	2	0-3	F D C	W
1171	17	6-8	F	o
238	10	few	F D	W
700	2	few	F D	o
190	2.5	few	o	o
205	1	few	F D C	W
530	8	single	F D C?	W
190	3	single	F D	W
126	5	-	F D	o
139	2	o	F D	W
198	3	0-4	C	o
294	3.5	single	C	W
-	3.5	-	o	o
750	11	20-30	C H	W
427	4	0-2	F D	W
850	18	30-50	F D C	W
550	4	0-2	F D C	W
405	5.5	Abund.	F D C?	W
290	2	o	(F)	W?
390	3	4-5	F D C	W

TABLE 3

Subj.	History of allergy		Tests with allergens	
	Familial 0 = none ¹	Personal 0 = none	Cutan 0 = neg. - = not done	Inhalation effect on FEV, FVC, PEF % control ²
29	B E	o	o —53	-
30	o	o	o	- 2 BC
101	B daughter	o	+ dust	- 7 BC
102	B A	o	o	- 7 BC
103	o	o	+ mould I (+) cows	-
104	B	o	+ dust	-15 BC +
105	A E	+ iodine	+ mould I + Asp. f.	- 6 BC -16 Asp. f. +
106	R E B	+ iodine eczema	+ mould I, II	o BC
107	A R	o	o	-
108	o	o	o	+15 BC
109	o	o	+ mould I	- 8 BC
110	A?	o	o	- 9 BC
111	A B	? eczema	o	- 2 BC
112	B A	+ eczema	o	- 9 BC
113	A B E	?	o	- 8 BC - 8 Asp. f.
114	o	o	o	BC neg
115	E B	o	o	- 2 BC
116	B E	?	(+) dust	-11 BC +
117	o	+ eczema	o	+16 BC
118	A	o	o	-10 BC +
119	B sister	o	o	+ 6 BC
120	ent.	o	o	-12 BC +
121	o	? blossom odors	+ mould I	+ 6 BC
122	o	o	o	-
123	A?	o	+ mould I wool, tob.	- 1 BC -12 mould +
124	A	o	o	-
127	B	o	o	-
130	A E	+ eczema	Ni +	-
131	o	+ eczema	-	-
135	A E	o	o	-10 BC +

¹ A = Asthma.

B = Bronchitis.

E = Eczema.

R = Rhinitis (vasomotor).

(cont.)

Eosinophils			Weather	
Blood		Sputum No./field	Worst type ³	Worst season W=winter
No./mm ³	Diff. count %			
205	10	o	F C H	W
259	4	single	F	W
71	1	few	F D	o
710	5.5	few	F D	o
1000	8.5	few	F	o
634	7.5	0-5	F D	W
153	3	0-5	F	o
229	2	some	F D C H	W
-	4		F D C	W
348	1	some	o	o
193	1.5	0-5	F D	o
313	4	some	o	o
204	11	0-6	F C	(W)
302	3.5	few	F	W
277	4	few	o	W
434	2.5	o × 4	F C	o
258	3	0-3	F D	o
40	4	few	F D	W
130	3.5	few	F D C H	o
30	1	o	?	W
305	4	few	F	W
150	1.5	few	o	(S)
179	o	o	F C	(W)
-	1		F D H	
48	o	o	o	o
136	7.5	few	F	o
280	5.5	o	F D	o
77	3	few	F D H?	o
81	1		F D	W
320	2.5	few	F D	(W?)

ent = Enteral allergy.

BC = BC-dust.

³ F = Fog.

D = Damp.

C = Cold.

H = Hot.

than 20 eosinophils/field was considered pathological. According to these standards, there were 12 subjects (8 males and 4 females) who had more than 400 eosinophils/mm³, 7 other subjects had a diff. count of > 5 per cent. In total 35 per cent had blood eosinophilia at some time. Four males, but no females, disclosed sputum-eosinophilia. In 2 of these males, sputum contained moulds; 3 of these subjects also had blood eosinophilia (Table 3).

TABLE 4
Roentgenological Findings.

Parameters judged	Total		FEV % groups							
			I		II		III		IV	
	M	F	M	F	M	F	M	F	M	F
<i>Diaphragm position</i>										
Normal	7	18	1	2	1	7	3	3	2	6
Possibly lowered	8	8		1		1	3	1	5	5
Definitely lowered	15	2	1		3		3		8	2
<i>Vascularity</i>										
Normal	15	24	1	3	3	8	6	4	5	9
Possibly decreased	13	4	1		1		3		8	4
Definitely decreased	2	0								2
Bullae or Blebs	4	0	1						3	
Infiltrations	7	4	1		1	1			5	3
Signs of sinusitis	11/27		0/2		2/3	3/4	1/2	0/1	1/6	4/9
Number of subjects										
per group	58		2	3	4	8	9	4	15	13

Roentgenological and bronchological studies. In Table 4 are assembled data from chest radiograms and x-ray studies of paranasal sinuses¹.

A lowered diaphragm was judged to be definitely present in 17 patients (Nos. 2, 6, 9, 11, 13, 14, 16, 17, 18, 19, 21, 23,

¹ The x-ray studies of paranasal sinuses were mostly performed at the radiological department of Ekmanska sjukhuset. Head: Dr. E. Billing.

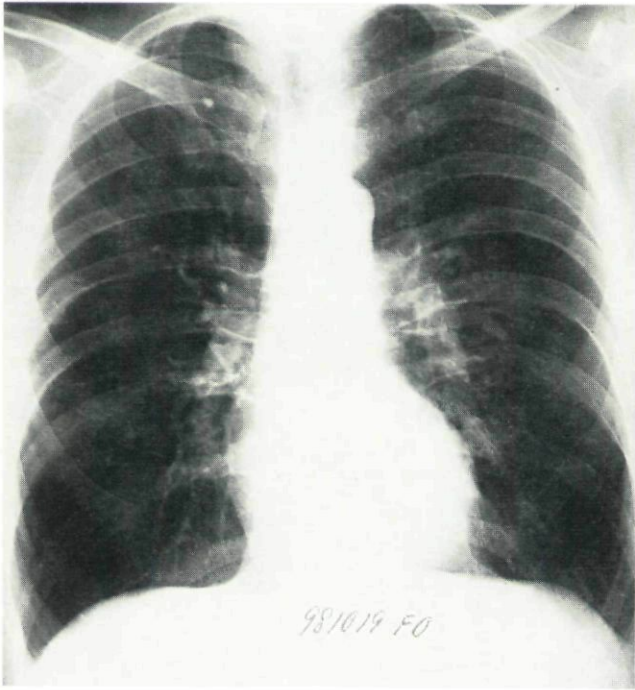


Fig. 1 A.

Fig. 1.

Patient No. 19. Frontal (A) and lateral (B) views; note depressed diaphragm. On the bronchograms widespread bronchiolectasis (C).

24, 25, 27, 113, 117). A decrease of vascularity, though difficult to evaluate, was obvious in only 2 male patients (Nos. 21 and 23) and possibly present in 17 cases (Nos. 2, 4, 5, 6, 13, 14, 16, 17, 18, 19, 22, 27, 29, 106, 113, 117, 135). Four patients showed evidence of bullae or blebs. Eleven patients disclosed small parenchymal infiltrations, which later disappeared. Signs of sinus-infection were found in 11 of 27 patients studied.

When the described findings were related to the spirometric classification, according to measured FEV%, as described in Paper II, the following distribution was found (Table 4). Out



Fig. 1 B.

of the 17 patients with a definitely lowered diaphragm, 13 were in Group III-IV with airways obstruction. Out of the 19 patients with possible or definite decreased vascularity, 17 were in Group III-IV.

From the reports of *bronchoscopy*² statements on 4 parameters were noted. Hyperemia and/or oedema to some degree

² The pathological-anatomical description and diagnoses were kindly made by the pathology specialists at the Departments of Pathology I and II at Sahlgren's Hospital. Heads: Prof. J. Mellgren and Prof. S. Ranström.

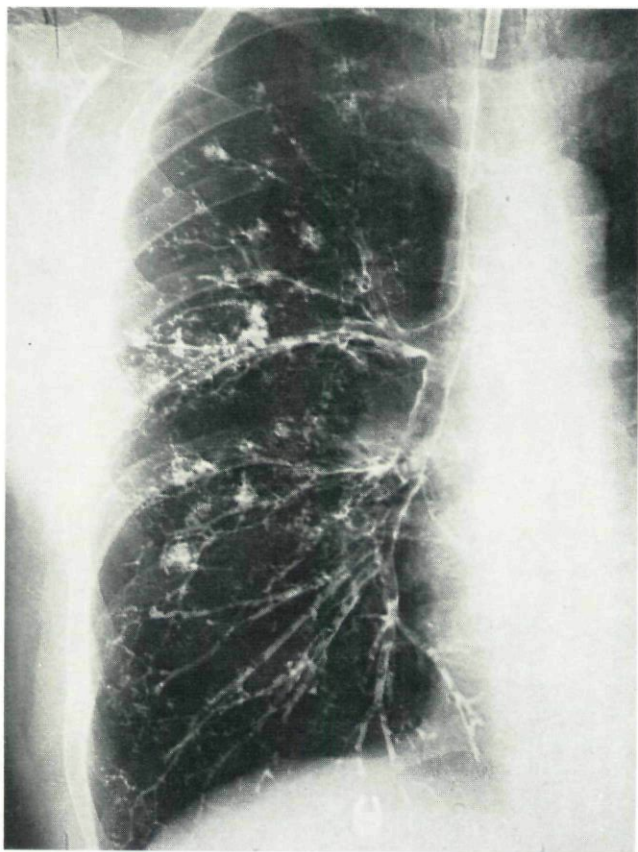


Fig. 1 C.

was found in 50 of 54 studied subjects, and presumably increased secretion in 45/54. Of 8 patients with airways obstruction, 7 showed obvious respiratory cycle variations in large airways caliber (Table 5).

Laryngitis was noted in 6/54 cases; all of these also had signs of irritation in the bronchial tree. The histological examination showed inflammatory cell reactions and/or epithelial hyperplasia and thickening of the basal membrane, to warrant the diagnosis of "bronchitis" in 24/28 subjects studied.

On the radiograms from the *bronchography*, which was

usually performed immediately after the bronchoscopy; the following changes were looked for:

diverticula, irregular bronchial lining, irregular caliber, so-called "naked filling", *i.e.* peripheral branches which were not filled with contrast, dilation of bronchi—"bronchiectasis", peripheral pooling—"bronchiolectasis", bronchial spasm.

TABLE 5
Bronchoscopic and Bronchographic Findings.

Bronchoscopy 28M 26F subjects	Total		FEV ₀ groups							
			I		II		III		IV	
	M	F	M	F	M	F	M	F	M	F
Number of studies/group .			2	3	4	8	8	2	14	13
Hyperemia, oedema	25	25	2	3	4	8	8	1	11	13
Hypersecretion	25	20	2	2	3	7	8	2	12	9
Respir. cycle variations of airway caliber	7	1	1				2		4	1
Laryngitis	6/54				1		3		2/12	
Histological diagnosis of "Bronchitis"	24/28		2/2	1/1	0/1	3/3*	6/6	—	6/9	6/6
<i>Bronchography</i>										
27 M 25 F Subjects										
Bronchogr./group			2	2	4	8	7	3	14	12
Dilated bronchial glands, irreg. bronch. lining, irreg. caliber ("beading")	27	23	2	2	4	7	7	3	14	11
"Naked filling"	23	12	2	0	3	5	6	1	12	6
Dilation of bronchi ("bronchiectasis")	7	3	0	0	1§	0	1	1	5	2
Pooling— "Bronchiolectasis"	7	3	—	—	—	—	1	1	6	2
Spasm	7	4	1	—	1	—	1	—	4	4

* PAD from resected specimen (Subj. 124).

§ Normal 1953 (Subj. 24).

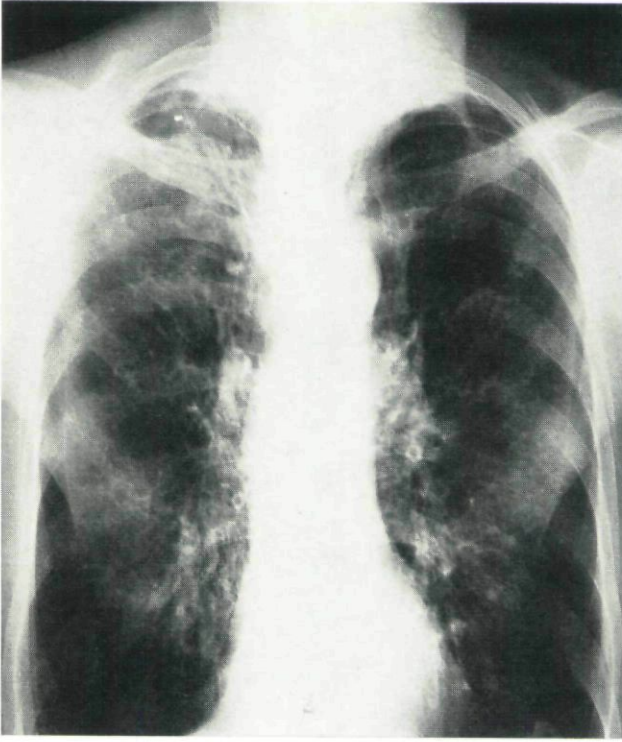


Fig. 2 A.

Fig. 2.

Patient No. 23. Frontal and lateral view. (A, B); note depressed diaphragm and decreased vascularity. On the bronchograms are seen excessive bronchial changes including cylindrical ectasis (C).

Bronchial diverticula and/or irregular lining or caliber were found in 50/52 subjects. Naked filling was recorded in 37 cases; the relevance of these findings will be discussed later.

In 10 subjects (7 M, 3 F), being obstructive, dilated bronchi were found which might be called bronchiectasis. In 2 subjects (23 and 29) these were relatively large. So-called "bronchiol-ectasis" was found in 10 subjects, all being obstructive (Table 5). In Figs. 1 and 2 are shown chest roentgenograms and bronchograms from 2 patients. Patient number 19 had lowered

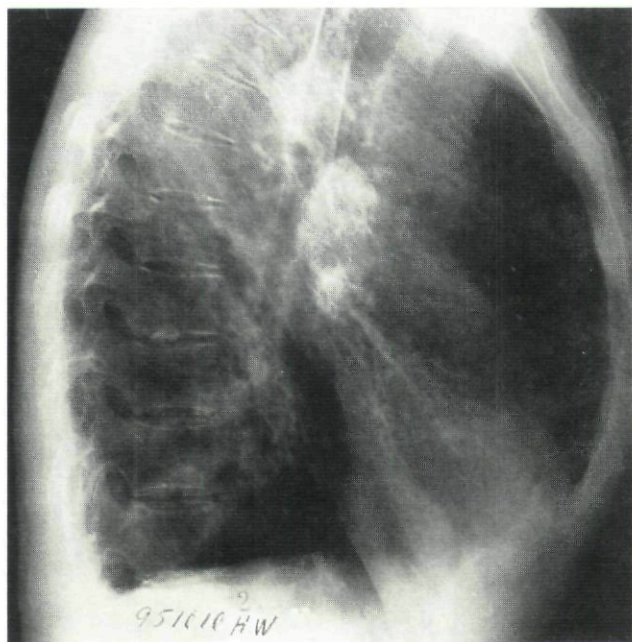


Fig. 2 B.

diaphragm and widespread bronchiolectasis; number 23 had a low diaphragm, decreased vascularity and excessive bronchial changes with cylindrical bronchiectasis.

Brachial Arterial Blood Pressure and ECG.

There was a systolic brachial artery *blood pressure* of more than 170 mm Hg and/or diastolic pressure of more than 100 mm Hg at the first study in 6 male and 5 female patients. When the blood pressure was recorded in 46 subjects during the latest study, 6 additional males and 8 females showed elevated pressures (Table 6).

ECG was judged to be definitely pathological in 12 patients (7 M, 5 F); S-T changes similar to those seen in coronary insufficiency were found in two patients at rest and in four only during or after exercise. Six (4 M, 2 F) showed signs of

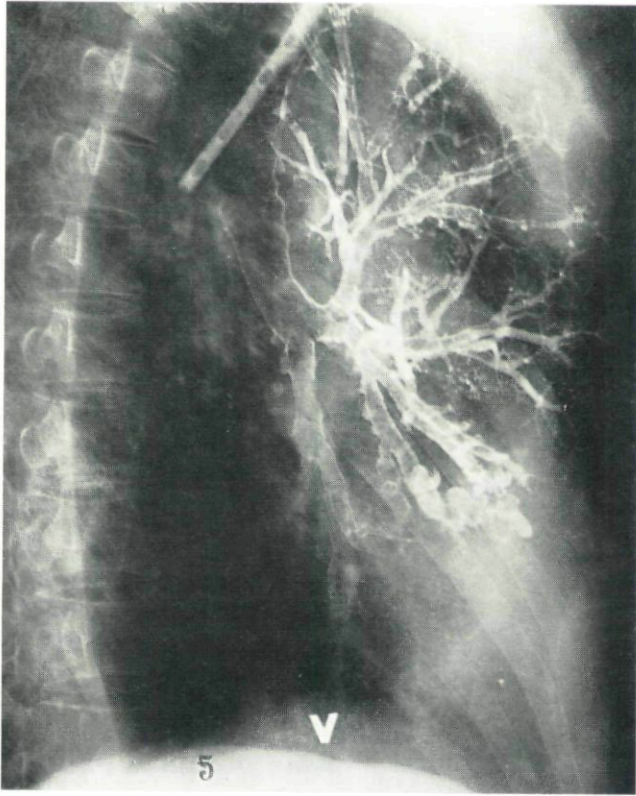


Fig. 2 C.

left ventricular strain; these subjects had arterial hypertension. In one of these the changes were transient and later control showed a normal ECG. One subject (111) had a right bundle branch block. She had a coronary sclerosis shown at angiography. Heart catheterization showed normal pressure in the right heart and the pulmonary artery.

DISCUSSION

The diagnosis of chronic bronchitis is difficult to establish when scientific accuracy is pursued. By using specified criteria and wide-scale examinations, however, as those reported, a

TABLE 6
Brachial Artery Blood Pressure at First and Latest Study.

Pat.	Systol. pressure — mm Hg		Diastol. pressure — mm Hg	
	≤ 170	> 170	≤ 100	> 100
<i>Males</i>				
1st study n: 30	25	5	25	5
Add. pat. latest study n: 24	1*	5§	1	5
<i>Females</i>				
1st study n: 28	25	3	25	3
Add. pat. latest study n: 22		8†	1	7

Additional pat. No. * 4.

Additional pat. No. § 8, 11, 14, 28, 30.

Additional pat. No. † 106, 113, 117, 118, 123, 127, 130, 135.

number of causes other than chronic bronchitis can be eliminated (19, 32, 36). Among these are tumours, congenital and acquired malformations, (*e.g.* aneurysms, pharyngeal or oesophageal diverticula or stenoses, vascular rings), localized infections such as abscesses, generalized infections of tuberculous or non-specific types, pulmonary fibrosis, "collagenoses", pneumoconioses, or primary cardiovascular-renal diseases. Chronic bronchitis may, as the CIBA symposium stated, co-exist with other diseases; two independent diagnoses should then be made (13). This also concerns the diagnoses "asthma" and "emphysema".

The clinical term "asthma" should be used in patients "if they are symptom-free in remission or under treatment". Patients with chronic bronchitis with obvious changes in degree or airways obstruction over short periods may be called chronic bronchitics with asthma or chronic bronchitics with reversible airways obstruction, when this is confirmed by appropriate function studies.

The clinical term "emphysema" is often misused for persistent airways obstruction in combination with radiological signs of hyperinflation. It has been suggested that the diagnosis of emphysema should be a histological diagnosis from lung pre-

parations distended and fixed before they are cut (13). Thus the corresponding clinical diagnosis should be of irreversible or partly reversible airways obstruction, which can be combined with chronic bronchitis.

In the present material the most disabled subjects were found among the males. There is a high incidence of smokers among both sexes, and a higher percentage of bloody sputum (hemoptyses) than in other samples (25, 31, 44).

The difference in age for the onset of cough between the male and the female groups may be explained by a better memory for such things in the younger female group. The same trend was seen concerning childhood diseases. If these were true differences, on the other hand, childhood diseases would partly explain why the females started coughing earlier than the males; this would be in line with other reports (27, 33, 36, 37, 58).

In both sex groups there was an increased sedimentation rate, which, together with an elevated white blood-cell count, suggests bronchial infection. Bacteriological studies on bronchial secretions showed growth of bacteria in 17 patients of 24. In contrast to the sputum findings, where *Haemophilus influenzae* dominated, streptococci were the most prevalent in the bronchi. The same trend has also been found in a larger material, where comparisons are being made between samples from bronchi and sputum (7). The findings of single positive TBB cultures or guinea pig tests in five of the patients may be due to possible activation of old tuberculous foci by the chronic bronchitis (9, 47).

Half of the patients reported some allergy connection, but only one-fourth had any positive intracutaneous allergen tests. The figures on familial allergy have to be regarded with care due to the difficulty for the patient to remember and the doctor to interpret the true nature of asthma—cardiac or allergic—and eczema—toxic or allergic. Eleven out of 48 patients reacted to inhalation of dust or mould preparations with a more than 10 per cent decrease of ventilatory capacities; thus there seems to be a larger percentage of subjects with some

evidence of presumed allergic reactions than in a normal population (29). Only one patient showed a strong pulmonary allergy. The present study agrees with others in that discrepancies between skin test and inhalation test are relatively common (14, 17, 40). The question arises as to whether the moderate airways constriction recorded after inhalation was caused in most cases by an allergic reaction, or to some extent by the high reactivity to irritating substances found in these subjects, (see Paper No. III).

The presence of eosinophils in blood and sputum in bronchopulmonary disease is usually accepted as a sign that allergy is the cause (1, 5). The eosinophils contain a component which acts antagonistically to histamine by blocking the histamine receptors (2). Central stimulation of the vagus leads to collection of eosinophils around the nerve endings. Eosinophilia is also considered to be related to non-specific hyperreactivity (42). Thus, the eosinophilia may be primarily evoked by presence of histamine in the tissue due to either an allergic reaction or possibly to other tissue damage (35).

There was no correlation between eosinophils in blood or sputum and positive skin or inhalation tests (12). The low incidence of eosinophils in sputum or in blood, together with an elevated SR, and bacteriological findings speaks for bronchial infection and against "allergic asthma" (15, 26).

There are great individual variations in interpretation of roentgenograms (21, 28). Nevertheless, in a series of roentgenograms, including bronchograms, which were read also by an experienced interpreter (G. Birath), there was a good agreement on major points. The division of the finding into normal, possibly pathological and definitely pathological was made because of the difficulty in stating the lower degree of abnormality, especially as regards the vascular pattern (48).

There are great difficulties in diagnosing anatomical emphysema from radiograms. Thus large lungs with a lowered diaphragm may be free from emphysema, while lungs with apparently normal radiograms may show emphysematous changes (30). In the present material there seem to be few

roentgenographic signs indicating the presence of emphysema. Only in 2 subjects a definite decrease in vascularity was recorded, and in 4 there were slight bullous changes. So-called bronchiolectases were recorded in 10 obstructive patients. The concept of bronchiolectasis as evidence of centrilobular emphysema might be true, as this form is considered to be prevalent in chronic bronchitis (34). In judging "naked fillings", *i.e.* lack of peripheral filling in bronchograms, it is sometimes difficult to know whether this is due to secretion or other kinds of blocking of the bronchi, or to faulty bronchography technique. If neighbouring regions have been filled, however, and there is contrast medium in the central parts on several successive films, there are reasons to believe that pathological blocking is present (48).

Cylindrical and/or saccular dilations of bronchi are relatively late sequelae in chronic bronchitis (23). In bronchitis these are wide-spread and irregular and occur in lobes with normal or increased volume (46). Based on clinical history and bronchographic evidences, none of the patients in the present material was considered to have bronchiectasis in the restrictive sense of the word, *i.e.* saccular dilations, usually limited to certain parts of the lung. In subject No. 24 development of "ectasis" during the course of the disease was found: in 1953 there was no dilation while in 1958 cylindrical dilation in the left lower lobe had supervened.

Difficulty was met with also in the interpretation of bronchoscopic observations, which may be differently described by different bronchoscopists¹, and the figures for bronchoscopic findings, especially concerning hyperemia and oedema and possibly secretion, must be regarded with caution. No attempts were made to divide the changes into diffuse or constrict (11).

There was an unexpectedly large number of patients in whom the blood pressure with time exceeded the limits set for

¹ The bronchoscopies were performed by Drs. L. Andér, S.-G. Holmdahl, S. Jungert, and L. Tivenius.

arterial hypertension. It has been shown that the viscosity of the blood is higher in subjects with hypertension (10). The viscosity also increases with higher hematocrit (38). There were, however, no signs of increasing hemoglobin concentration in these patients, but this cannot with certainty rule out a possible increase in hematocrit. A neurogenic cause has also been proposed as a part of autonomic imbalance and reflex action from the lungs (39).

SUMMARY

Thirty males and 28 females, with a diagnosis of chronic bronchitis according to standardized criteria, are described concerning history, findings at physical and standard laboratory examinations, radiography of the chest, bronchoscopy, and bronchography.

The majority of subjects were little or moderately disabled. Many were smokers who showed dyspnoea and who were affected by the weather. Half the number of patients reported some allergy connection, but only one-fourth had any positive cutaneous allergen tests. One patient showed a strong pulmonary allergy. There was an appreciable increase with time in the number of subjects who were labelled as hypertensives. Few clinical and roentgenological signs of emphysema were encountered, while signs of inflammation were judged present in 50/54 patients at bronchoscopy.

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APPENDIX

1. *Questionnaire on Respiratory Symptoms.*

Date of Birth: _____ Sex: _____

Name: _____

Address: _____

Profession: _____

*Put ring around "Yes" or "No" according to answer.
Where boxes are given put × in one box only.*

COUGH

Questions 1-5 should only be answered "Yes" if the cough occurs most days for at least three consecutive months each year even if attributed to smoking. Transient coughs of shorter duration (e.g., with colds) should not be counted; they are dealt with later in the questionnaire. Clearing the throat does not count.

- Do you usually have a cough? Yes/No 1
- Do you cough at all on getting up, first thing in morning: In winter? Yes/No 2
Count cough with first cigarette or on "first going out of doors".
Exclude a single cough.
- Do you go on coughing during the day or at night: In summer? Yes/No 3
 In winter? Yes/No 4
Ignore just an occasional cough.
 In summer? Yes/No 5
- If cough is specially related to occupation or other activities give brief details here _____
- _____
- _____

PHLEGM

Use any appropriate word. Accept phlegm without cough or swallowed phlegm.

- Do you usually bring up phlegm from your chest (not from the back of your nose)? Yes/No 6
- Do you bring up any phlegm at all on getting up, or first thing in the morning: In winter? Yes/No 7
Count phlegm with first cigarette or on "first going out of doors".
 In summer? Yes/No 8
- Do you go on bringing up phlegm during the day: In winter? Yes/No 9
Ignore just an occasional expectoration.
 In summer? Yes/No 10
- What colour is this phlegm: (a) always clear white, grey or blackish? (check (b) before recording) ☐ 11
(except rarely in acute illness)
- (b) occasionally yellow or green, at least in parts? ☐ 12
(i.e. regularly with colds or part of day)
- (c) usually yellow or green? ... ☐ 13
- (d) Don't know ☐ 14

If phlegm is specially related to occupation or other activities give brief details here _____

How long have you had this cough and/or phlegm? Less than 2 years? ☐ 15
 2 years or more? ☐ 16

Do you get bouts of cough and phlegm lasting for at least 3 weeks each winter? Yes/No 17

If Yes: Last 2 winters only? ☐ 18

More than 2 winters? ☐ 19

Have you ever coughed up blood? Yes/No 20

If Yes: When was this? (*Years of occurrence*) _____

How much? (greatest amount) Streaks ☐ 21

More ☐ 22

BREATHLESSNESS

Questions refer to average condition in winter.

Are you troubled by shortness of breath? Yes/No 23

(*If No: check: Not even when hurrying on level or walking up a slight hill?*)

If disabled by a neurological or musculo-skeletal disease

put "disabled" here _____

If Yes: Do you have to walk slower than people of your own age on the level because of breathlessness? Yes/No 24

If Yes: Do you ever have to stop for breath when walking at your own pace on the level? Yes/No 25

If Yes: Do you have to stop for breath after walking about 100 yards (or after a few minutes) on the level? Yes/No 26

If Yes: Are you too breathless to leave the house or breathless on undressing? Yes/No 27

WHEEZING

Does your chest ever sound wheezy or whistling?

(If No: check: not even when you have a cold?) Yes/No 28

If Yes: Only with colds? ☐ 29Occasionally (apart from colds?) ☐ 30Most days or nights? ☐ 31

Is your breathing different in summer and winter? Yes/No 32

If Yes: Is breathing in summer: Better? ☐ 33Worse? ☐ 34

COLDS

If you get a cold does it *usually* go to your chest? Yes/No 35*Only record "Yes" if more than 50 per cent followed by cough
AND phlegm. Those who never get colds record "No".**"Only chest colds" record Yes*

WEATHER

Does the weather affect your chest? Yes/No 36

*Only record "yes" if weather definitely and regularly causes
chest symptoms.*

If Yes: What sort of weather? Fog Yes/No 37

Damp Yes/No 38

Cold Yes/No 39

Heat Yes/No 40

Does any other sort of weather affect your chest?

(Specify) Yes/No 41

Does this weather: make you wheeze? Yes/No 42

increase cough or phlegm? Yes/No 43

make you more breathless? Yes/No 44

have any other effect on your chest

(specify) Yes/No 45

CHEST ILLNESSES

During the past 3 years have you had a *chest* illness which
has kept you in bed, off work or indoors at home?

Yes/No 46

(If No, check: Not even 'flu?)

If Yes: Give details of each illness. If doctor not seen put "none" in first column.

Doctor's diagnosis	Duration in days	Year	Incr. cough yes/no	Incr. phlegm yes/no

PAST ILLNESSES If more than three attacks put "recurrent" after age at first attacks.

Have you ever had:—

Each age of occurrence

Pulmonary Tb. Yes/No _____ 47 Bronchial Asthma Yes/No 51

Pneumonia Yes/No _____ 48 If yes:

Pleurisy Yes/No _____ 49 Age started _____

Bronchitis Yes/No _____ 50 Age stopped _____

_____ Still present? Yes/No 52

*Record "yes" if attack within
past year.*

Were you gassed in Heart trouble Yes/No 53

World War I? Yes/No 54 Details _____

If Yes: Were you laid
up by it? Yes/No 55 _____

Type of gas _____

SMOKING

Do you smoke? Yes/No 56

If No: Have you ever smoked? Yes/No 57

Record "No" if never more on average than 1 per day for a year.

If Yes :

*Now**Changes in past 10 years**Ask about week-end consumption in calculating weekly amount.**Put "none" if no change*

Cigarettes per week	_____	_____
Oz. tobacco/week (handrolled)	_____	_____
Oz. tobacco/week (pipe) ...	_____	_____
Cigars per week	_____	_____
Age started regular cigarette smoking	_____	Age started regular pipe/cigar smoking _____
Age stopped regular cigarette smoking	_____	Age stopped regular pipe/cigar smoking _____
If smoking stopped or reduced give reason	_____	

DIAGNOSIS

Do you consider subject has:—

Chronic Bronchitis? Yes/No 58	Other chest diseases (specify) Yes/No 61
Emphysema? Yes/No 59	_____
Bronchial Asthma Yes/No 60	_____

Has patient had chest x-ray (including Mass Radiography)
within past 2 years? Yes/No 62

If Yes: Result : _____

details here _____

APPENDIX NO. 2

Test Scheme

No.	Reaction	Allergen 1:1000	Anamnesis	Provocation
1		Control (Fenol solution)		
2		Histamine (1 : 10.000)		
<i>Inhalation:</i>				
3		Dust A		
4		Dust B		
5		Dust C		
6		Mould spores I*	} 1 : 100	
7		Mould spores II		
8		Feather		
9		Cotton 1 : 100.000		
10		Wool		
11		Tobacco		
12		Dog		
13		Cat		
14		Horse		
15		Cattle		
16		Timothy grass		
17		Daisies		
18		Artemisia vulgaris		
19		Pinetree pollen		
20		Reeds		
21		Birch		
22		Alder-Hazel-Aspen		
23		Lycopodium spores		
<i>Food:</i>				
24		Meat		
25		Fish		
26		Vegetables		
27		Sea-food		
28		Milk		
29		Egg yolk		
30		Egg white		
31		Wheat		

* I: Alternaria, Hormodendrum, Monilia albicans.

* II: Botrytis, Penicillum.

No.	Reaction	Allergen 1:1000	Anamnesis	Provocation
32		Rye		
33		Oats-barley		
34		Hazel nuts		
35		Chocolate		

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