dilated.

Any heroic attempt to dislodge the electrode would have resulted in evulsion of the tricuspid leaflet or valve. Fibrous adhesions with the tricuspid ring have been previously reported. It is suggested that great care be taken under similar situations and that leaving the electrode in place may be a better part of valor.

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The Breathing Pattern in Chronic Obstructive Lung Disease during the Performance of Some Common Daily Activities

To the Editor:

Patients with chronic obstructive lung disease often complain of shortness of breath following simple activities such as bending, tying shoe laces, brushing teeth, brushing hair and shaving. It seemed unlikely that shortness of breath after brushing teeth, for example, was due to the minor effort involved. The present study was designed to investigate this further by recording the breathing pattern during the performance of some of these common daily activities.

MATERIALS AND METHODS

Six men and one woman took part in the study (age range 40-85 years). All complained of severe shortness of breath limiting them to less than two blocks of slow walking on the level. Clinical examination showed hyperinflated lungs and the breath sounds were distant. Pulmonary function tests confirmed the clinical impression of advanced chronic obstructive lung disease and showed very low results for forced expiratory volume (one second), maximal mid-expiratory flow rate, maximum voluntary ventilation, and pulmonary diffusing capacity.

The breathing pattern was recorded by means of a "pneumobelt"* tied at the level of the nipple. This enabled the patient to perform the required activity in as natural a fashion as possible. Changes in pressure in the belt were recorded by a Statham transducer (PR23-2D-300) and recorded by an Electronics for Medicine multichannel recorder.

The patient was seated on a stool and records were made of normal relaxed breathing. He was then asked to bend down and tie his shoe laces, brush his teeth, or comb his hair. One patient was asked to bend down as if working a drilling machine and another pretended to reverse his car. These two latter maneuvers were used as these individuals particularly complained of shortness of breath following these specific activities.

The tracings were inspected as to the breathing pattern.

RESULTS

Examples of breathing patterns in individual patients are shown in the figure. Common to all the activities was irregular, rapid breathing. The activity was followed by a period of breathing that was faster than before the activity. The pneumobelt measures accurately only respiratory rate, and changes in functional residual capacity will change the calibration. However, the marked change in height of each respiration suggests that the breathing during the activity is shallow as well as frequent; and after the activity, the breathing appears to be deeper as well as more frequent than before the activity.

To further investigate the breathing pattern, some patients were asked to do the activities while diaphragmatic movement was observed by fluoroscopy, with the patient in the standing position. Brushing hair and brushing teeth were the activities used. The same pattern of diaphragmatic movement, as shown on the pneumobelt tracings, was observed during the activity, namely shallow irregular diaphragmatic movements, and more frequent, deeper movements after the activity.

Normal subjects, ignorant of the results of the study, were asked to perform some of the activities and to observe their breathing pattern. They noted irregular breathing or breath holding. However, there was no dyspnea following the activity.

Some of the patients were asked to do simple...
breath holding for durations similar to that of the activity, and subsequently they complained of dyspnea similar to that following the activity.

**DISCUSSION**

This study shows that during some common activities, there appears to be shallow, irregular breathing involving both chest and diaphragmatic movement, and this is followed by a period of increased ventilation. It is possible that during the activity, there is some carbon dioxide retention and possibly a fall in arterial oxygen tension. Hyperventilation after the activity is needed to return the blood gases towards the previous resting level. This increased breathing following the activity is appreciated as dyspnea in patients with obstructive lung disease. In normal subjects, compensation for the shallow, irregular breathing is achieved by a few deep breaths which are easily performed without subjective discomfort.

Patients become fearful when they find themselves short of breath after such minor exertion as doing their hair, and explanation that this is due to a breathing pattern, which they can personally observe, can do much to reassure them and eliminate unnecessary fear of their disease.

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**The Electrocardiogram as a Diagnostic Aid in Pneumothorax**

*To the Editor:*

The electrocardiographic changes of spontaneous pneumothorax are not widely appreciated, although they may be of considerable diagnostic aid. Careful attention to the electrocardiogram, which is usually readily available in the emergency room, office or on the hospital ward, may provide rapid confirmation of a diagnosis of pneumothorax. Physical examination may be unreliable, especially in patients with obstructive lung disease. Even the chest roentgenogram may be misleading—if the patient has visible blebs or bullae—or may be technically unsatisfactory resulting in an undesirable delay in treatment.

Patients with tension pneumothorax and a reduction of cardiac output may be difficult to differentiate from patients with an acute myocardial infarction on the basis of clinical signs. The electrocardiogram could well alert the physician to the proper diagnosis and emergency life saving treatment. The following two brief patient reports illustrate the electrocardiographic changes of pneumothorax, alterations of which most physicians appear to be unaware.

**Case 1**

A 37-year-old white man who smoked suddenly developed left anterior chest pain which began while he was at rest. When he was first seen six hours later the pain radiated through to the back and was associated with dyspnea and lightheadedness. He had no previous pulmonary symptoms and worked as an orthopedic appliance fitter. Physical examination: blood pressure-120/70 mm Hg, respiration-28 and pulse-96 per minute. Vocal and tactile fremitus were decreased, the percussion note was increased and breath sounds were absent over the left hemithorax. The heart tones were markedly diminished. A 50 percent collapse of the left lung was seen on the chest roentgenogram. The electrocardiogram (Fig 1-upper) showed poor progression of R wave amplitude across the left precordial leads with a decrease in the amplitude of the QRS complexes in all precordial leads. Following insertion of a chest tube and reexpansion of the lung, the electrocardiogram showed recovery of the R wave amplitude and normal progression of the QRS complexes (Fig 1-lower).

**Case 2**

A 67-year-old black man was hospitalized because of the rapid onset of dyspnea and a tight sensation in the right chest. His history included 20 years' employment as an underground hard coal miner, 50 pack years of cigarette smoking and pulmonary tuberculosis. Physical examination:

**FIGURE 1.** Upper tracing: ECG during partial lung collapse. Lower tracing: immediately following decompression.