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Phonocardiographic diagnosis of diaphragmatic flutter

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Summary

A 45-year-old man was reported who experienced rapid rhythmic nodding of his head and equally rapid contractions in his epigastrium, which participated by certain psychic situations. Auscultation and phonocardiography revealed a sound with " machine " rhythmicity at a rate of 333 per minute over the lower lateral thoracic region during all cardiac phases, and a diagnosis of " diaphragmatic flutter " was established. The symptoms and signs were controlled by diazepam.

Key words

Auscultation Phonocardiography Diaphragmatic sound Diaphragmatic tic Flutter fibrillation of the diaphragm Vegetative lability Diazepam

Introduction

Phonocardiographic evidence of rapid rhythmical sounds over the thorax is rare, and atrial flutter and diaphragmatic flutter should be differentiated diagnostically.

Tic or flutter of the diaphragm consists of pathological contractions of the diaphragm, and they differ from each other in form and cause. Tonic contractions of the diaphragm are observed mainly in tetanus, spasmophilia, rabies, strychnine intoxication, and pneumothorax. Clonic contractions occur both as hiccough and diaphragmatic flutter. The hiccough is characterized by an inspiratory sound of swallowing, and has a lower contraction frequency than does diaphragmatic flutter.

Flutter of the diaphragm is characterized by rapid rhythmic contractions in the epigastrium and in the region of the lower intercostal spaces[1]. More rarely observed are rapid rhythmic sounds, or brief murmurs. To date, nearly 15 cases with auscultatory findings have been reported, approximately half of them with phonocardiographic confirmation[2]. It is assumed that these sounds or brief murmurs are brought about by diaphragmatic muscle contractions or by compression of portions of the lung close to the diaphragm.

Case report

This 45-year-old man with diaphragmatic flutter had no history of illness except for scarlatina and mumps. At the age of 10 or 11 years he had fallen from a height of 7 m without obvious injury except for skin abrasions on his back.

At 24 years of age, a rapid rhythmic nodding of his head was first observed. This nodding or tottering occurred spontaneously both when he was seated or standing, and especially after being face-to-face with another person for extended periods. For 1.5 years the rapid rhythmic nodding of his head had become increasing-

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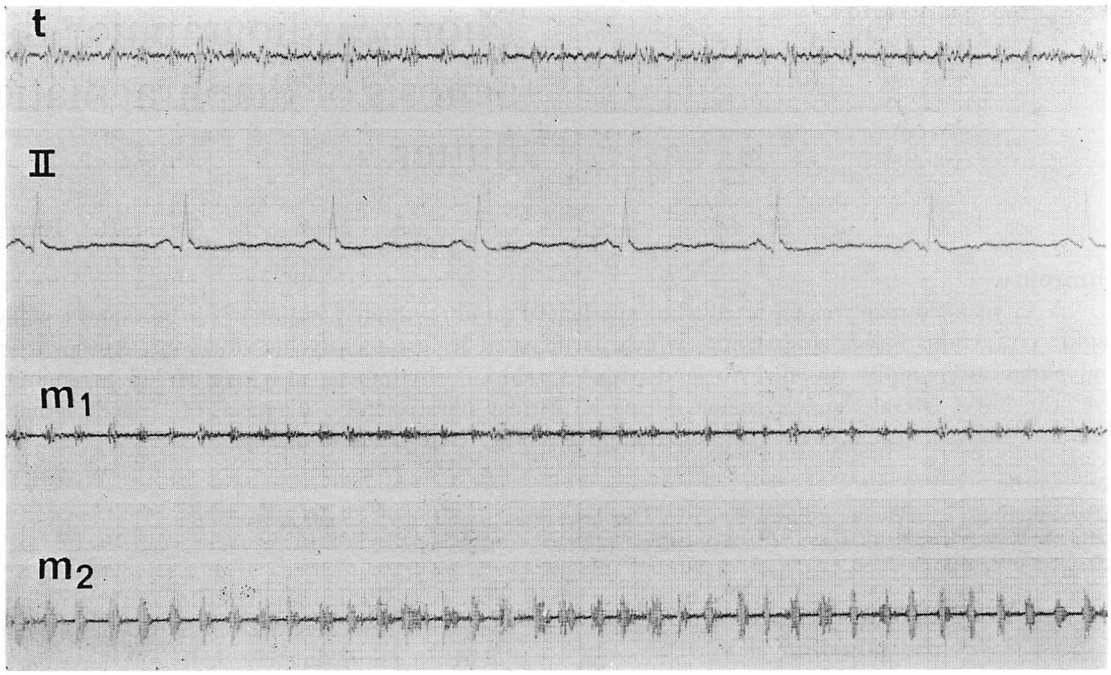

Fig. 1. Phonocardiogram at 5R25 (25 cm from the mid-sternal line in the 5th right intercostal space) **in a 45-year-old man with diaphragmatic flutter.**

ly severe, especially during his professional public appearances. He could not suppress it, and it was accompanied by rapid rhythmic vibrations in his epigastrium. Investigations of his illness in other cardiological and neurological clinics yielded no diagnostic or therapeutic results. The patient was therefore referred to us for evaluation of his " uncharacteristic murmur ".

Our auscultation revealed a highly characteristic phenomenon: a sound with " machine " rhythmicity at its maximum point above the lower lateral thoracic areas on either side during all phases of the cardiac cycle, with a loudness grade of 2–3/6. Stethoacoustically, at the first examination, this could be classified as a diaphragmatic tic, and distinguished differential-diagnostically from atrial flutter.

By phonocardiography a rhythmic sound of mean amplitude, initially at 333 times per min, and at later examination, 364 times per min, was demonstrated with a maximum point at 5R25 and 5L25, particularly in the frequency ranges m_2 and h_1 but also in m_1, as well as discretely in t (**Fig. 1**). The ECG showed a sinus rhythm, and was otherwise quite normal. Later auscultation and phonocardiographic recording revealed a similar rapid-frequency yet brief murmur of scratching character, grade 2–3/6, in the same foci.

The patient exhibited a vegetative lability, which we assumed to be the cause of the diaphragmatic flutter. The phenomenon could be considerably diminished by persuasive conversation with the patient, and by prophylactic peroral administration of 0.5 mg diazepam, thus eliminating this professional handicap during his public appearances.

Discussion

Among the rapid sound sequences detectable over the thorax one must distinguish the rare diaphragmatic flutter from the more frequent atrial flutter. The former includes sounds or

short-sound murmurs, of " machine " rhythmicity, during all phases of the cardiac cycle, with a maximum point outside the heart silhouette, particularly in the lower regions of the thorax. In individual patients these sounds occur 120 to 400 times per min. The heart rhythm cannot simultaneously be established at the maximal points of rapid fluttering of the diaphragm.

In contrast, the sounds of atrial flutter are recordable within the heart silhouette either in systole or in diastole, or in both. There, the heart beat can be registered additionally. Valsalva maneuver and carotid sinus pressure lead to a transient pulse retardation.

Diaphragmatic flutter occurs mainly over the phrenic nerve either because of " central " (e.g. encephalitis[3], neurasthenia[4,5]) or peripheral influences. (e.g. rib fracture[6], heart dilatation[7], peritoneal adhesions[8]). Also under discussion have been direct irritation of the diaphragm in cases of xiphoid fractures[9].

Our patient exhibited a vegetative lability. The severe fall he experienced in childhood may have led to a central or peripheral irritation of his phrenic nerve. The diaphragmatic flutter was accompanied by rapid rhythmic nodding of his head. The phenomenon, which had imposed a serious handicap on this patient, was improved by persuasive conversation and the administration of diazepam, to a degree that he is now able to carry on undisturbed in his professional public activities.

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