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A NEW APPLIANCE DEvised FOR THE RELIEF OF
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[REPRINTED FROM THE BOSTON MEDICAL AND SURGICAL JOURNAL, MAY 3, 1877.]



CAMBRIDGE:
Printed at the *Hiverside* Press.
1877.

THE RESPIRATORY BRACE: A NEW APPLIANCE DEVISED FOR THE RELIEF OF ORTHOPNŒA.¹

BY GEORGE F. FRENCH, M. D., PORTLAND, ME.

DIFFICULTY of breathing so extreme as to require the erect posture, or orthopnœa, is a feature of various diseases, but all alike send the same dispatch to the nerve centres for more oxygen to aërate the blood. In some diseases, as in hysteria, the wires themselves are deranged, and the impression conveyed to the brain is exaggerated and fallacious; nevertheless the dispatch is believed at headquarters, and all the vital power of the heart and lungs, reinforced largely by the voluntary muscular system, is at once ordered to the rescue.

Difficulty of breathing is made worse by the recumbent posture, on account of the pressure of the abdominal viscera, which gravitate against and interfere with the respiratory movements of the diaphragm. The erect posture, then, is most favorable for perfect respiration, but I believe it will be conclusively proved by this paper that the recumbent position is not essential to the complete refreshment of the body. In health the advantage which would be gained in favor of respiration by the upright position is more than counterbalanced by the muscular power wasted in counteracting gravitation; but if an appliance could be devised which would maintain the body erect without the slightest muscular exertion, sleep would be as refreshing as in the usual recumbent position. The upright position long maintained is very wearisome and exhausting. The persistent holding of the body in any fixed position implies a proportionate expenditure of muscular power, and all active exertion superadded to this, such as we observe in every form of difficult breathing, is as much more exhausting as it is laborious and painful; and when we consider that orthopnœa is often so extreme as to preclude sleep or nourishment, we can hardly estimate the depression of vitality which must ensue. The respiratory muscles languish, the heart propels the blood feebly, the nutrition of the body is in the same degree slackened, and the disease which has given rise to the orthopnœa, finding less resistance, tightens its grip at the throat of Nature. To one who has observed the effect of prolonged orthopnœa in cases of asthma this is no fancy picture. One of the most prominent features of every such

¹ Read before the Cumberland County Medical Society, February 28, 1877.

case is exhaustion, and I believe I might add muscular exhaustion. The symptoms of non-aëration of the blood in asthma, as shown by the cyanotic countenance, do not manifest themselves till the muscles of respiration and circulation are exhausted; and the ill effects of severe attacks of asthma, such as the dilatation of the right side of the heart, the œdema of the extremities, and the debility that results from such a paralysis of all the vital forces is traceable largely to muscular exhaustion. Next in importance, then, to the removal of the cause of any disease is the support of those forces which most effectually resist the disease, a universal maxim in therapeutics. In the orthopnoea of asthma the greatest outlay of strength is in muscular exertion; the sufferer is conscious of this, and in every possible way economizes muscular movement. No avoidable word, look, or motion escapes him; that position is chosen which will carry on forced respiration with the least effort; the head is never moved when a turn of the eyeballs will answer, and the elbows are planted on the knees or table to secure an advantage in elevating the shoulders. Every means of abridging muscular effort in orthopnoea tends inevitably, then, to aërate the blood, to promote nutrition and sustain life. A most terrible source of exhaustion in orthopnoea is the loss of sleep; when the need of it becomes imperative, the sufferer nods first toward one side, then toward the other, which results in a waste of muscular effort to regain his equilibrium, — this harassing process being kept up for hours, to the utter exhaustion of the patient. If at such a time refreshing sleep could be secured, Nature might recruit her forces sufficiently to repel the attack or abridge its duration. The want of some means to diminish this waste of muscular strength and to afford sleep has long been a desideratum in the orthopnoea of asthma; any appliance to accomplish this must hold the patient not only in an upright posture, but in an attitude most favorable to forced respiration, which is one with the shoulders elevated, the arms raised from the sides, and the head kept from falling. The characteristic attitude of one suffering extremely from asthma will furnish us a model: the shoulders are raised high and kept elevated, in order to avoid the tiresome repetition of the act; the arms are withdrawn from the sides of the chest to permit the free lateral expansion of the thorax; and the head is thrown back that the air-passage may not be constricted.

The appliance here exhibited is so simple as hardly to need any description. It consists of a cross-bar, from the extremities of which hang two loops of strong elastic webbing for the support of the shoulders. The broad band encircling the head is steadied by guys stretching across on both sides to the upright elastic supports. The apparatus is suspended by a pulley or ring from the ceiling.

Figure 1¹ represents a patient resting with the brace applied under the shoulders. Whenever from the weight or helplessness of the patient, or from the tedious duration of the case, the circulation in the arms is impeded, the support should be afforded by the elbows, as in



(FIGURE 1.)



(FIGURE 2.)

Figure 2, in which the entire pressure comes upon the outside of the fore-arm. Usually, however, the degree of pressure under the arms requisite to sustain a person who is sitting is insufficient to interfere with the circulation.

The merits of this appliance do not hang on theoretical considerations alone; in a modified form, less complete than the present, I have used it in a variety of cases for more than a year. It invariably affords relief, and is incapable of doing harm. It is invaluable in many chronic diseases not attended with dyspnoea, affording a patient who is hardly strong enough to be got out of bed an opportunity to rest in an upright position without exertion, and gives the nurse every facility for rubbing the back or dressing a bedsore. Its value is manifest in those diseases in which it is desirable to counteract the ill effects of hypostatic hyperæmia by friction and change of posture. Its adaptability to the treatment of *spinal disease* is obvious; at the present time I have a little patient resting in it who is unable to wear the ordinary spinal brace.

It would be an inestimable comfort as an attachment to the field ambulance or any vehicle used for the conveyance of the sick or wounded. But its most signal value is in the *orthopnoea of asthma*; in this disease,

¹ Russell and Richardson, Designers and Engravers, 194 Washington Street, near State Street, Boston.

where emphysema and dilatation of the right side of the heart have supervened, the paroxysms are not susceptible of sudden interruption, but run a definite course, the severity and duration of which can be controlled by suitable remedies. But those remedies which most effectually subdue the asthmatic spasm at the same time induce sleep, and to put a patient to sleep who can breathe only in the upright position is obviously a hazardous procedure. Persistent orthopnœa always contra-indicates the free use of narcotics, because the somnolent state is unfavorable to efficient respiration. To enable an asthmatic, then, to sleep with perfect comfort in an upright position not only recruits the sufferer's strength, but *permits the administration of curative remedies otherwise dangerous.*

This apparatus for orthopnœa renders sleep easy, safe, and compatible with the most efficient respiration. It saves and turns against the disease the muscular strength usually wasted. By affording the system the refreshment of sleep the vital current does not ebb, but assimilation and nutrition go on unchecked; the state of the general health being kept unimpaired, the disease is not reinforced by the usual ill effects which it produces in the shape of non-aërated, impoverished blood, inanition, and nervous debility. The vital force thus saved always averts a hard struggle, and gives to nature a speedier victory.

In conclusion, I will cite but a single case in illustration. Mr. D., aged forty-five, physically well endowed, has been an intense sufferer from asthma for more than twenty years. Up to within two years the attacks have been steadily increasing in frequency and severity. Usually as the system grows weaker the inroads of disease become more terrible. The less the resistance the more heavily falls the blow. An attack of asthma which a weak man would sink under a strong man may endure without exhaustion. Such has been the history of this case. When I first saw Mr. D. he was breathing very laboriously, even in a sitting posture; the face was livid and slightly œdematous, and the feet and ankles were considerably swollen. He had the usual expression and attitude of one in a severe paroxysm of asthma. The intensity of the orthopnœa permitted him to take neither food nor sleep; he had been thus spellbound nearly a week, and during the whole period had been unable to lie down. Drowsy from exhaustion and a state bordering on asphyxia, he would lurch backward and forward, and from side to side, as limp as a drunken man. One would hardly dare give a narcotic to a patient in such a condition; indeed, it was not needed, for no sooner was the "orthopnœa apparatus" applied than he was sound asleep, and sleeping in an attitude favorable to efficient respiration. In about two hours he awoke, seemed much easier, and took some nourishment, when he again fell into a comfortable sleep, from which he did not awake till we roused him to take food a second time. His recovery from that paroxysm

was particularly satisfactory, and yet not so much so as in subsequent attacks, when we have been able to afford the relief earlier, and also to administer suitable antispasmodic and hypnotic remedies which were no longer contra-indicated by the orthopnœa. Paroxysms which formerly lasted ten days or even a fortnight have been superseded by very much milder ones of three or four days' duration, during which time the patient has been able to sleep and take food. For the past seven months the attacks have not been attended with much exhaustion, and there has been no œdema as formerly. The paroxysms are not only milder, but are becoming more and more infrequent, and the state of the general health is unexceptionally good.

