

ASPHYXIA, ITS RATIONALE AND ITS REMEDY.

By MARSHALL HALL, M.D., F.R.S.

THE term Asphyxia, which ought to be exchanged for Apnoea, designates that condition of the animal system which results from the suspension of respiration.

Respiration involves two processes—the inhalation of oxygen, and the exhalation of carbonic acid.

The remedy for the suspension of respiration is, on every principle of common sense, the restoration of respiration. This view might be considered, irrespective of physiological inquiry and proof, as self-evident; but that proof is amply supplied by physiology.

Of the two functions suspended, it is certain, from physiological inquiry, that the retention of the carbonic acid is by far the more fatal, and that, in a word, asphyxia is the result of carbonic acid retained in the blood, which becomes, in its excess, a blood-poison.

If this view be correct, it is evident that restored respiration is to the blood-poison in asphyxia what the stomach-pump is to poison in the stomach; and that it is the special remedy, the *sine quâ non*, in asphyxia.

But this blood-poison is formed with a rapidity proportionate to the circulation, which is, in its turn, proportionate to the temperature. To elevate the temperature, or to accelerate the circulation, *without* having first secured the return of respiration, is therefore *not to save*, but in reality *to destroy life*!

Now, let me draw my reader's attention to the Rules for treating asphyxia, proposed and practised by the Royal Humane Society. They are as follow:—

"1. Convey the body carefully, with the head and shoulders supported in a raised position, to the nearest house.

"2. Strip the body, and rub it dry; then wrap it in hot blankets, and then place it in a warm bed in a warm chamber free from smoke.

"3. Wipe and cleanse the mouth and nostrils.

"4. In order to restore the natural warmth of the body,—
Move a heated covered warming-pan over the back and spine.

Put bladders or bottles of hot water, or heated bricks, to the pit of the stomach, the arm-pits, between the thighs, and to the soles of the feet.

Foment the body with hot flannels.

Rub the body briskly with the hand; do not, however, suspend the use of the other means at the same time; but, if possible, immerse the body in a warm bath at blood heat, or 100 deg. of the thermometer, as this is preferable to the other means for restoring warmth.

"5. Volatile salts or hartshorn to be passed occasionally to and fro under the nostrils.

"6. No more persons to be admitted into the room than is absolutely necessary."

My first remark on these rules for treating asphyxia is, that "to convey the body to the nearest house," is doubly wrong. In the first place, the *loss of time* necessary for this purpose is—*loss of life*! on the contrary, not a moment should be lost; the patient should be treated instantly, on the spot, therefore. In the second place, except in very inclement weather, the exposure of the face and thorax to the breeze is an important auxiliary to the special treatment of asphyxia.

But most of all, the various modes of restoring the temperature of the patient, the warm-bath especially, are objectionable, or more than objectionable; they are at once inappropriate, unphysiological, and deleterious.

If there be a fact well established in physiology, it is that an animal bears the suspension of respiration in proportion, not to the warmth, but, within physiological limits, to the lowness of the temperature, the lower limit being about 60° Fahr. A warm-bath of 100° Fahr. must be injurious.

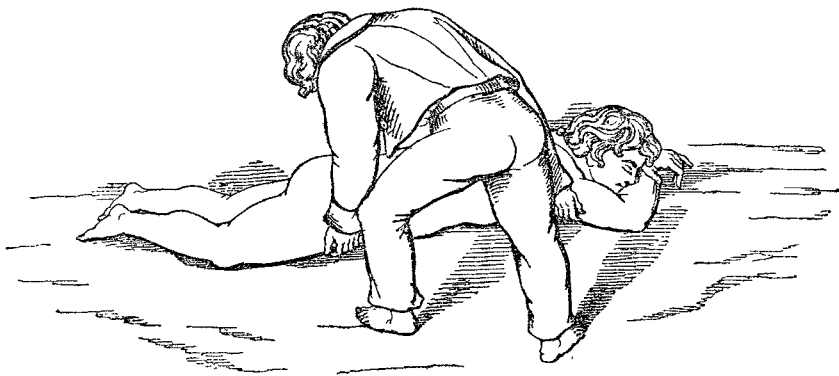
All other modes of inducing warmth are also injurious, if they divert the attention from the *one remedy* in asphyxia—artificial respiration,—or otherwise interfere with the measures to be adopted with the object of restoring this lost function.

Such, then, are the views which the scientific physician must take in regard to the late rules for treating asphyxia promulgated by the Royal Humane Society.

I now proceed to state the measures by which those rules must be replaced.

I revert to a proposition already made: as asphyxia is the result of suspended respiration, the one remedy for the condition so induced is, self-evidently and experimentally, the restoration of respiration.

But there is an impediment to artificial respiration never before pointed out. It is the obstruction of the glottis or the entrance into the windpipe, in the supine position, by the tongue falling backwards, and carrying with it the epiglottis—an event which can only be effectually remedied by adopting the *prone position*. That position is displayed by the subjoined figure.



In this position the tongue falls forward, drawing with it the epiglottis, and leaving the ingress into the windpipe free.

But even when the way is patent, there remains the question, how is respiration to be effected? The syringe or the bellows may not be at hand, and if they were, the violence used by them is apt to *tear* the delicate tissue of the lungs. The mode proposed by Leroy, of compressing the thorax by means of a bandage, and allowing its expansion by the resilience of the costal cartilages, is proved by experiment to be futile, chiefly, no doubt, from its being attempted in the supine position, with the glottis obstructed.

The one effectual mode of proceeding is this: let the patient be placed in the prone position, the head and neck being preserved in their proper place. The tongue will fall forward, and

leave the entrance into the windpipe free. But this is not all the thorax and abdomen will be compressed with a force equal to the weight of the body, and expiration will take place. Let the body be now turned gently on the side, (through rather more than the quarter of a circle,) and the pressure on the thorax and abdomen will be removed, and inspiration—effectual inspiration—will take place! The expiration and inspiration are augmented by timeously applying and removing alternately pressure on the spine and ribs.

Nothing can be more beautiful than this life-giving—(if life can be given)—this breathing process.

In one series of experiments, twenty cubic inches of air were expelled on placing a corpse in the prone position, and ten cubic inches more by making pressure on the thorax and ribs,

the same quantities being inhaled on removing that pressure, and on rotating the body on its side. But I must give the experiments in detail:—

A subject was laid on the table, and pressure made on the thorax and ribs, so as to imitate the procedure of Leroy. There was no result; a little gurgling was heard in the throat, but no inspiration followed. The tongue had fallen backwards, and closed the glottis or aperture into the windpipe! All inspiration was prevented.

Another subject was placed in the prone position. The tongue having fallen forwards, and the glottis being free, there was the expiration of twenty cubic inches of air, a quantity increased by ten cubic inches more on making pressure along the posterior part of the thorax and on the ribs. On removing this pressure, and turning the body through a quarter of a circle or rather more, on the side, the whole of the thirty cubic inches of air were inspired!

These manœuvres being repeated, ample respiration was performed!

Nay, there may be a question whether such considerable acts of respiration may not be too much.

It is to be observed, however, that, in this mode of artificial respiration, no force is used; the lung therefore is not injured; and that, as the air in the trachea and bronchial tubes undergoes little or no change in quantity, the whole inspired air passes into the air-cells, where the function of respiration is alone performed.

It deserves to be noticed, that in the beginning of this experiment in the prone position, the head had been allowed to hang over the edge of the table: all respiration was frustrated! Such is the importance of position.

Reserving the full exposition of this method of postural respiration, this theseopnoea, (from *θεσις*, position,) for another occasion, I will conclude by reducing these views into the simplest Rules for the treatment of asphyxia.

New Rules for the Treatment of Asphyxia.

I. Send with all speed for medical aid, for articles of clothing, blankets, &c.

II. Treat the patient on the spot, in the open air, exposing the face and chest freely to the breeze, except in too cold weather.

I. To excite Respiration,

III. Place the patient gently on the face, (to allow any fluids to flow from the mouth.)

IV. Then raise the patient into the sitting posture, and endeavour to excite respiration,

1. By snuff, hartshorn, &c., applied to the nostrils;
2. By irritating the throat by a feather or the finger;
3. By dashing hot and cold water alternately on the face and chest.

If there be no success, lose no time, but

II. To imitate Respiration,

V. Replace the patient on his face, his arms under his head, that the tongue may fall forward, and leave the entrance into the windpipe free, and that any fluids may flow out of the mouth; then

1. Turn the body gradually but completely on the side, and a little more, and then again on the face, alternately (to induce inspiration and expiration);
2. When replaced, apply pressure along the back and ribs, and then remove it (to induce further expiration and inspiration,) and proceed as before;
3. Let these measures be repeated gently, deliberately, but efficiently and perseveringly, sixteen times in the minute, only;

III. To induce Circulation and Warmth,

1. Continuing these measures, rub all the limbs and the trunk upwards with the warm hands, making firm pressure energetically;

2. Replace the wet clothes by such other covering, &c., as can be procured.

VI. Omit the warm-bath until respiration be re-established.

To recapitulate, I observe that—

1. If there be one fact more self-evident than another, it is that artificial respiration is the *sine quâ non* in the treatment of asphyxia, apnoea, or suspended respiration.

2. If there be one fact more established in physiology than another, it is that within just limits, a low temperature conduces to the protraction of life, in cases of suspended respi-

ration, and that a more elevated temperature destroys life. This is the result of the admirable, the incomparable, work of Edwards.

3. Now the only mode of inducing efficient respiration artificially, at all times and under all circumstances, by the hands alone, is that of the postural manœuvres described in this paper.

This measure must be adopted.

4. The next measure is, I have stated, to restore the circulation and warmth by means of pressure firmly and simultaneously applied in the course of the veins, therefore upwards.

5. And the measure not to be adopted, because it tends to extinguish life, is the warm bath, without artificial respiration.

This measure must be relinquished.

These conclusions are at once the conclusions of common sense and of physiological experiment. On these views human life may, nay, must, sometimes depend.

Practical Contributions

ON THE

DISEASES OF FEMALES.

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No. X.

A REVIEW OF THE PRESENT STATE OF UTERINE PATHOLOGY.

The Displacement Theory.—In my preceding communication I drew attention—to the smallness of size and lightness of weight of the uterus; to the great laxity of its means of support and fixity; to the extreme mobility which it consequently evinces; to the ease with which it obeys the many physiological causes of displacement to which it is subjected; and to the complete immunity from pain, or even inconvenience, with which these displacements are borne.

I explained the immunity from pain evinced by the uterus when displaced under the influence of physiological causes, by referring to the law through which all our viscera bear, without inconvenience, any amount of displacement compatible with their means of fixity, and any amount of pressure to which they can be exposed from the proximity and functional activity of surrounding organs. I pointed out that this capability of our organs to bear considerable pressure without inconvenience is not only observed in the temporary physiological conditions described, but is also found to exist under the permanent pathological pressure of non-inflammatory morbid growths, such as tumours, aneurisms, &c. I then laid stress on the very important fact, that when once inflammation supervenes, this immunity from pain and inconvenience on pressure ceases;—as evidenced by the inability of patients suffering from inflammation of the abdominal or thoracic viscera to lie otherwise than on their back: or as evidenced by the pain which is experienced on the pressure of an inflamed finger. Finally, I recalled the rapidity with which the uterus increases in size and weight under the influence of the physiological stimulus of pregnancy, and reverts to its natural size and weight when that stimulus is removed.—This brief recapitulation of my last communication is necessary, as in the above facts is found the key to the history of uterine displacements or deviations, as I have interpreted them.

The uterus may be displaced or deviated in various ways. Its position and form may be modified with reference to its own axis, or with reference to its conventional anatomical pelvic axis, which corresponds, as we have seen, to that of the upper pelvic outlet. When the axis of the uterus itself is modified, the uterus is said to be flexed, anteriorly, posteriorly, or laterally; and we have thus antero-flexion, retro-flexion, and latero-flexion. When the uterus is displaced *in toto*, without any abnormal bend or flexion taking place, so that its axis is