Death by Drowning.

Its Post-mortem appearances

Treatment.

by

Francis Hunt Richardson

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Death by drowning may be due to two pathological conditions, Syncope & Asphyxia. Death in the one case commencing at the heart, in the other at the lungs - Desgranges denominates these two modes of death by drowning "Asphyxia synéopali" and "Asphyxia congestiva". The first mode of death, viz. by Syncope, is by far the less common, principally occurs in very delicate or nervous subjects, especially females, or in cases where organic disease of the heart is present: it would probably occur more fre- quently in accidental drowning, or in murder by drowning, than in suicidal drowning.
In this form of death the countenance is generally very pallid, and the features not distorted, but calm and placid. In the second mode of death, viz. by true asphyxia, the features are as a rule livid and distorted, and the tongue swollen and protruded. The congestion according to Mare may take place either in the lungs or in the Brain. Though it is difficult to understand how congestion could occur in the latter situation without previous congestion in the lungs mechanically preventing the return of venous blood by the jugulars. Other authorities have gone more minutely into the subject. Thus de Lorme recognizes 5 ways in which drowning may prove fatal. 1. by syncope. 2. by pure asphyxia. 3. by cerebral commotion. 4. by apoplexy. 5. by the functions of the brain, heart, and lungs being simultaneously changed. According to him, asphyxia in combination with syncope, or cerebral commotion, constitutes the greater proportion of cases of drowning, at least
five-eights — A more recent authority on this subject, Dr. Samuel Wright, admits four kinds of asphyxia: 1. common 2. syncopal 3. apoplectic 4. heroic.

The true cause of death primarily in this asphyxia congestion is the increase in the amount of carbonic acid always existing in the blood, from the interruption to the acts of respiration and consequent stoppage to the interchange of carbonic acid of the blood and the oxygen of the air. The carbonic acid acting as a narcotic on the brain first renders the patient insensible, then puts a stop to the action of the muscles of respiration and circulation. In fact death by drowning is in reality death by poisoning, only the poison instead of being introduced from without, is developed accumulated within the animal's frame. It may aptly be compared to death by coma in the last stage of morbus Brightii, from excess of urea in the blood, in consequence of the loss of function of the kidney. Carbonic acid holding the same relation to the lung as urea does to the kidney. The congestion in the
Drugs is explained by the demonstrated fact that blood loaded with carbonic acid experiences great difficulty in passing through the capillaries. It is in this second form of death rather than in syncopeal asphyxia, that we should expect to find substances grasped in the hands, or mud or sand beneath the nails, or excoriation of the fingers, or substance from the surrounding water in the stomach.

Death from apoplexy has been said to occur from the individual having fallen with his head first from a great height or to the surface of the water, or from having struck his head against some hard body under the water. It is also conceivable, though I am not aware of any recorded case, that a person might be seized with a fit of apoplexy, say when fishing, a stumble insensible into the water.

Dr. Marshall Hall finds fault with the term asphyxia, which he says ought to be exchanged for apnoea. He does not give his reasons.

The greater the functional activity of the higher the
Temperature, the greater the rapidity with which death takes place on immersing animals in water, as shown on experiments with hibernating animals or frogs when the temperature is reduced.

Period of death. When the mouth is stubil are completely covered by water, and no artificial provision be made for the introduction of air, asphyxia is complete (supposing syncope has not occurred) in two minutes at the farthest. The Avarino divers according to Dr. Seefar could never remain submerged longer than seventy-six seconds and the best hydro divers are said not to be able to remain submerged for more than thirty-five seconds. This latter statement I should be inclined to doubt, for I find that after taking three rapid inspirations and expiration, so as to oxygenize the blood as far as possible, I finally taking a very deep inspiration, I can remain without breathing for more than sixty seconds. It may perhaps be explained by supposing that those divers do not take the above precautions, and also by the fact that
They are actively engaged in collecting the oysters when as submerged, the muscular waste causing an increased demand for oxygen.

The susceptibility of restoration to life differs in different individuals, although immersed for the same space of time, identical remedial means being employed. According to Segreto and other authorities, cases are met with which it is impossible to resuscitate, even if only one minute submerged, while others are so tenacious of life as to be capable of resuscitation although submerged for five minutes. It is difficult in the present state of our knowledge to account for such differences. A recovery after five minutes' submersion is a rare circumstance. In the records of the Royal Humane Society of London, up to the year 1841, only one such case had occurred. The most remarkable case on record is the one detailed in the 31st volume of the Medical Gazette, where the patient completely recovered, though perfectly submerged for ten minutes. Cases have been recorded after longer submersion than even this in many of
more care needed

by matthew allanwoods

more adventures of superman
Here the time has been guessed at rather than actually measured by the bystanders, everyone knows how extended a short period of time may appear, when many rapidly succeeding events are crowded into it. In other cases the individual has, though in the water for a long time, managed to keep his head above water for some minutes, or has risen to the surface several times. Other recorded cases must be considered as incredible.

**Post-Mortem Appearances** - These vary according to the length of immersion, the period intervening between the removal of the body from the water and the examination, also according to the treatment the body has undergone. It is as well to remember that in performing the 'Sectio', the Thorax should be the last cavity examined, in order that the descent of the diaphragm and the arching of the chest may be better observed. The following appearances apply only to recent cases, before the supervision of decomposition.

The object of the Post-Mortem is to discover whether the body
was submerged alive or dead. According to Ambrose Paré, a body submerged alive, the stomach and intestines are filled with water; a gray mucus sometimes blood runs from the nose and mouth; and the extremities of the fingers oozed whilst in a body submerged when dead. None of these appearances are present. This was the general opinion up to the commencement of the last century. Slightly the appearances after death are of comparatively little value. They must be taken in combination with the internal appearance of the body. The skin is cold and remarkably pallid, occasionally cutis aneuris (this probably depending on the low temperature of the water). Often livid discoloration in different parts of the body, especially the face, which may be swollen. The eyes are half open, and the pupils much dilated. The tongue swollen, protruded, and may be lacerated by the teeth. A mucous froth runs from the mouth and nostrils; the mouth being closed or half-open. The body generally in a state of spastic rigidity, the hands being clenched. This rigidity continues for some considerable time if
The weather be cold generally however when taken from the water the limbs are found relaxed. This post-mortem rigidity takes place more rapidly if the body be removed from the water as soon as dead than it would if allowed to remain in the water. If the water be very cold the last struggle of the patient may be indicated in the rigidity. Various substances, as a part of the dress of a suspected murderer, may be found clenched in the hand of the body. The presence of such substances goes far to prove the life of the individual when submerged. Occasionally dirt and sand are found beneath the finger nails, as also excoriations of the fingers. The excoriations may be present, though the body has been submerged after death, from its rolling over and over on a rough bottom. They will not be seen where the water is very deep, where there is nothing to grasp, or in cases of syncope. Weeds and mud may be found in the ears and amongst the hair. After several days submersion the skin of the palms and soles becomes white and sodden, and the mucous froth at the mouth and nose disappears.
Various wounds and bruises may exist on different parts of the body. Echymoses may occur from the body falling against rocks &c. It is highly important to determine whether these bruises were inflicted before or after death. Bruises may be really present on the body of a drowned person, and yet not apparent when first removed from the water, owing to the inhibition of water by the skin, as the water evaporates they become visible. It is perfectly conceivable that bruises might entirely disappear in this manner, the colouring matter of the extravasated blood becoming dissolved out. Large circles have been found round the necks of drowned persons, giving rise to the suspicion of strangulation before immersion in one case. This was produced by the string of a cloak, the body being fixed by some impediment, and the stream towing the cloak in a direction away from the body, and in keeping the string tight. In another case the suspicious appearance was owing to a tight shirt collar. All such marks about the throat deserve especial attention.
Other injuries have been found. Thus a case is recorded of a man jumping into the water from a great height with his feet foremost and his arms at right angles to his body. Both his shoulders were dislocated.

Blood - Opinion is divided as to the state of this fluid. The best authorities agree in thinking it uncoagulated. According to the personal experience of Professor Traill it is universally fluid. Orfila only met with one case in which the blood was coagulated in drowning dogs; however this latter authority admits that the blood is always coagulable. Beck agrees with Traill and Orfila as to the fluidity of the blood. He says "The blood is in a permanently fluid state, and oozes from the body on the slightest touch with the scalpel." Other authorities, as Taylor, are opposed to these statements, supposing the body has been soon removed from the water, that when the non-coagulable condition of the blood is present it is due to the inhibition of water, or to putrefactive changes. The same fluidity it must be remembered, occurs in
other forms of violent death, as in death by lightning or in cases of narcotic poisoning, and in some forms of natural death, as apoplexy.

The Abdominal Cavity

1. Stomach. This organ generally contains water, sometimes however none is found. When present it may vary greatly in quantity, the variation probably depending upon the rapidity with which death takes place. It appears unless the stomach by deglutition, otherwise it is difficult to see how it could enter, since the walls of the stomach are in close contact. Water will not enter the stomach if an animal is immersed when insensible, or is thrown into the water after death. The water may have been taken by the individual immediately previous to this immersion— it should therefore be submitted to an examination, to discover if it is of the same nature as the water from which the body was removed. Thus a body might be found in salt water with fresh water in the stomach. Pyle suggests that water may be found, in consequence of artificial injection after
death a very improbable circumstance! The quantity of the water will be greater the sooner the animal comes to the surface to respire. In some cases the water has also been found in the oesophagus. The water though present in the stomach when removed from the water may not be found at an examination, in consequence of the time that has been allowed to elapse, and especially if during that time barbarous attempts have been made by ignorant people to resuscitate the body by shaking it by the heels, or rolling it on stones &c. Various vegetable matter growing in the water, as duckweed, may be found mixed with the water in the stomach; as also mud and sand, only however in very shallow water. From the experiments of Professor Taylor it appears that water will enter the stomach of even a dead animal by its columnar passage, if it be sunk to a sufficient depth. The presence of this water taken with others is a very important sign of death by drowning. Formerly the water in the stomach was considered to be the cause of death, and hence various means, as casually mentioned above, were had recourse to to get rid of this
In cases examined by Dr. Ogston, water was found in the stomachs of 5 (Edin. Med. Surg. Journal, Jan. 29). According to Pfiera, the alimentary canal is sometimes much discoloured. Digestion was going on at the time of submersion; the stomach will be found of a pinkish red colour. It is questionable whether if the stomach were full of food at the time it would not be discharged by vomiting. At least in a case of drowning that happened to witness myself, on lifting the head of the body out of the water a large quantity of vomit escaped from the mouth, as well as feaces from the rectum. As the patient recovered under prompt treatment there was no post-mortem by which the state of the stomach might have been ascertained. If very long in the water, the stomach acquires a deep violet or brown hue, such an appearance might give rise to a suspicion of poisoning. The whole intestinal canal is frequently of a bright colour. The liver presents nothing remarkable. It is sometimes enlarged, engorged, and in one or two cases has been described as being of a bright red colour. (Phil. Med. Examiner, March 15.) In some cases profuse blood flows when cut into. The spleen presents...
somewhat the same appearance.
The Bladder - Poiry affirms that this viscus is empty in all sudden deaths, but he found it full in drowned dogs. In the human subject it is as often found full as empty. In some cases it is quite empty, strongly contracted. Sometimes the urine contained within the bladder is found tinged with blood, probably in consequence of the congested condition of the kidneys.
The Thoracic Cavity
The Heart - In the greater number of cases the right side of the heart is distended with venous blood - cases however occur where they are collapsed, and emptied of blood. In these exceptional cases the lungs show no appearances of congestion. Such cases have either been cases of syncope, or cases where the body has remained a very long time in the water before examination. The left heart is either empty, or does not contain more than one half of what is present in the right heart. This blood is black - Osfila and Goodwin agree in supporting the above statement - Severjee differs from them, he affirms that the right heart contains but a very little more blood than the
left, and that only in a small proportion of cases. According to another authority, D. Ogston, the congestion in the heart and lungs of drowned persons is far from striking. De Fila has found the muscular substance of the right ventricle to be of a blackish brown colour, that of the left of a clear rose colour; and that the right side of the heart retains its contractile property longer than the left.

The Lungs. Water is occasionally found in the bronchi and bronchiae in variable quantity, and when the lungs are raised a clear fluid may run from the cut bronchi. Sometimes it will run from the mouth of the lungs be pressed before cutting through the bronchi. The same frothy mucus as is found in the trachea is found here. Often when the trachea is empty, it is present in these smaller tubes. The mucous froth may be so abundant as to fill the tubes and air vesicles. The presence or absence of water in the lungs will depend upon the state of the bowels. When present it generally amounts to about 1 oz. The quantity does not differ whether the animal be allowed to rise to the surface, or be kept totally submerged. It may enter the lungs thought the body be thrown in dead, and therefore it is probable that the amount increases.
after death. Necessity may be found in the water. This is strong evidence in favour of the body being alive when submerged. If the head has remained dependent after removal from the water, or the body has been long exposed to the air, new water will generally be found. The frothy mucus has been found in other modes of sudden death than drowning. The lungs are generally gorged with blood, and consequently increased in weight. In a few cases they are pale and collapsed, where death has taken place from syncope. The posterior lobes are the most congested. The residual air in the lungs is said to be almost entirely deprived of oxygen. Grayer, Dufila, Devergie, Ostrow, Polett, and Locke are all agreed upon the great frequency of water in the lungs in cases of drowning by true asphyxia. The first authority concludes that in every such case water is present: and the last gentleman makes the two following deductions from his experiments. 1. If the animal be taken out previous to its last effort to respire, no fluid will be found in the lungs. 2. That when water is found in the lungs it is absolutely necessary that the animal be under water when making its last efforts to breathe. That water will enter after death is proved by the experiments of Dufila and
Johnson with coloured liquids.

The diaphragm is depressed into the abdomen, according to Helvetius, others, and the chest arched, in those immersed alive, but absent in those thrown into the water dead. This is denied by other authorities. Dr. Ogston only met with one case where there was well marked depression of the diaphragm. Dr. Traill notices the occurrence of the arching of the chest, pushing down of the diaphragm into the abdomen.

The Head - The vessels of the surface of the brain will be engorged to a greater or less extent according to the length of the struggle and its violence. Hopfenstock of Prague constantly met with this appearance in his dissections. Its occurrence is readily explained by the obstruction to the flow of blood through the right heart. Goodwyn states that in his experiments the surface of the brain was darker than usual, but the vessels engorged. The darkness here was probably due to the darkening of the blood in the arteries. The congested appearance is seen in cases of asphyxial drowning. Dr. Ogston mentions a congested state of the cerebral vessels in all his cases. According to Taylor's
experience the quantity of blood in the cerebral vessels is rarely so great as to call for particular notice. In some of the cases brought forward by brain, the appearance was very well marked, in one especially at the base, while in others the cerebral vessels were nearly empty. Apoplectic clots are present in a few exceptional instances. The examination of the brain does not lead to any positive conclusions is yet of negative value.

The Neck. Its vessels are commonly greatly distended with venous blood. Mucous froth, sometimes tinged of red colour, is commonly found in the trachea. This froth has a white appearance, and when minutely examined is seen to consist of minute vessels. This appearance is due to the agitation of the air with the mucus of the air passages during the act of drowning. It will not be seen if the person has sunk immediately below the water; or if the body has remained too long a period in the water; or has been exposed too long after removal from the water. The same appearance has been witnessed in cases of Hanging and Apoplexy, in cases of suffocation from fumes getting into the trachea during delirium. Dr. Reedall considers
it a constant sign of death by submersion (Med. Gaz. 46).
From Perrin, Osfela's, and Taylor's experiment it appears that
the gas is not present in animals kept totally submerged, but is
always present if the animal is allowed to come to the surface.
Osfela found that it was not present in bodies that had
been upwards of 12 days in the water. If the body has been held
up by the feet it will probably disappear by being washed
out by the water in the lungs. The appearance is preserved
for the longest period at the bifurcation of the trachea. The
vegetable matter growing in the surrounding water has been
found in the trachea; likewise sand and mud. Occasionally
a portion of the contents of the stomach is found in the same
locality. The epiglottis is said by some to be elevated.
Treding affirms that it is pushed down as to close the
larynx, but Osfela and Beergie totally deny this.
The vertebrae of the neck have been found broken. In one
case, a boy, the processus dentatus of the axis was completely
separated from the atlas, and the ligaments ruptured.
This was proved however to be in consequence of injury re-
ceived before submersion & South also in his translation.
of Chelini's Surgery mentions cases of fracture of these vertebrae. In one of these, the body of the fifth cervical was ruptured, from the patient's statement, and from the absence of mud upon the head. Reveillon, the reporter of the case, believed it depended upon violent muscular action, the man finding he was approaching the bottom sooner than he expected, and violently jerking back his head. In another case, a sailor, the fourth and fifth cervical were ruptured, from jumping into the water headfirst from the yard-arm of the ship, a sail being spread 3 feet below the surface of the sea.

So much for the Post-mortem appearances. We now proceed to the Treatment of Drowned Persons.

Perhaps the most important item in the treatment is to get about as soon as possible after the finding of the body. Though the body has not been submerged for more than one minute, yet, if measures be delayed, recovery may prove hopeless. Thus Prof. Taylor remarks in his Medical Jurisprudence, "there will be a better chance of recovering one who has been five minutes submerged, where the treatment is immediate, than another
who may have been only two minutes submerged, but where a delay of from 15 to 20 minutes has occurred in the application of the necessary means. The objects of treatment are threefold, to renew respiration, to restore the animal heat, and to excite the system - the first the primary object. It is generally recommended to remove the body at once to the nearest convenient spot, but unless this be close at hand, we should attempt to excite respiration immediately after removal of the body. Artificial respiration acts in the same way as the carbonic acid, as the stomach does to a poison in the stomach. Opinions were divided formerly as to the benefit of this agent. It is perfectly true that many cases have recovered without its use. In the annual reports of the Humane Society, Wooley, one of the medical assistants, says that in all his successful cases he never used inflation, and that whenever he used the bellows he failed. One of the most remarkable cases on record occurred to H. Douglas of Florida. A sailor in a state of intoxication fell into water 16 feet deep, was supposed to have remained there with his head beneath the mud for half an hour. He had, when taken out, the carried half a mile to the
hospital where hot friction, sandbags were applied, and artificial respiration attempted but not persisted in. After 8½ hours hard rubbing respiration was established and the man recovered. All are now, however, agreed as to its efficacy. Dr. Harvey of Aberdeen in his lectures on "The causes of sudden and violent death," remarks, that no remedies are to be put in comparison with artificial inflation, it being indicated by all theoretical considerations. He adverts to an experiment of Bichat to illustrate its effect: The tracker of an animal was cut across, and a stop-cock fixed on to the cut end; an artery was then divided, and shutting the stop-cock the flow became slower and the stream darker, but regained its original colour and quickness on opening it again. Some have thought, and probably with good reason, that before proceeding to inflation, exhaustion should be had recourse to, with the idea of getting out as much of the carbonic acid and mucus as has collected in the air tubes and cells as possible. Mr. Peade has the merit of first proposing the method of 'Exsanguination,' it may be done by means of a bellows furnished with a
spring valv[e]. Such instruments are often not at hand. In such cases we must have recourse to simpler means. Blowing into the throat of the patient, in some cases served to excite respiration. A large gum catheter, or a piece of card rolled into a tube, or the nozzles of common bellows will prove amply sufficient. According to Brodie it is sufficient to introduce one or other of these into one nostril, and to let the other nostril and mouth remain open as safety valves, then introduce the air. The larynx must be pressed against the spine to prevent air passing into the stomach, which, becoming distended, would considerably impede the action of the diaphragm. This is one reason why artificial respiration should not be tried by inexperienced persons. The introduction of air must be slow and steady, taking care not to blow into much, and to injure the delicate air cells, and give rise to lobar or pulmonary emphysema. About 16 inflations should be made in the minute, and after each pressure it be made on the thorax as to expel the air. If no spasm of the glottis it might be impossible to get the air in by the normal channel - in such a case it is necessary to make an artificial
*Lancet. 1830.*
opening, which is most readily done in the chest-thorax space. Mr. Maldein Hills recommends this procedure from the commence ment in all cases where artificial respiration is requisite, either by a large trocar, or by introducing a penknife, and placing a piece of quill in the opening.

The advantages of the operation are these. 1. There is no danger of inflating the stomach. 2. The rapidity with which it is performed. 3. The certainty of being able to introduce air. The only disadvantage, and a very trivial one, is the formation of a wound, which, however, heals up very readily. Dr. Taille mentions an ingenuous method proposed by Dr. Delaun for expanding the chest by means of atmospheric pressure; such a process would of course be quite out of the question except in the receiving rooms of the Humane Society.

Some have proposed inflation of the lungs with oxygen. Theoretical considerations seem in favour of the practice. It would seldom be practicable, but if it should be found useful stores of it might easily be preserved in a barometer in those places appointed for the reception of drowned bodies.

Dr. George Wilson recommends that a mixture of black
oxide of iron, with five times its weight of chlorate of potash, should be kept in dry bottles, tightly stoppered and kept carefully free of dust. With such a mixture he says it is possible with sufficient heat to throw-off 200 cubic inches of oxygen in four minutes. The inhalation of pure dilute ammonia has been proposed, but I don't think tried, with the idea of neutralising the carbonic acid. I cannot see any theoretical grounds for its use, as carbonate of ammonia would be formed, a salt certainly not much less dangerous in its action on the nervous system when existing in the blood than carbonic acid, as shown in the conversion of urea into carbonate of ammonia in cases of suppressed urine. The transfusion of arterial blood has also been recommended with greater show of reason.

Salvarsan is said to be of powerful service in establishing the respiratory acts. It probably is often found deficient from being applied improperly. For if both poles are placed over the abdomen, the diaphragm is thrown into a state of permanent contraction, there being consequently no alternate descent and ascent of
What muscle. One of the poles should be placed over the epigastricus, the others at the nuchae. Probably the direction of the current may be of importance, but this has not been determined. Dr. Todd thinks that this agent should be brought to bear upon the patient in every case, in the manner just described. Care must be taken not to continue the application of galvanism too long or too uninterruptedly.

Latterly Mr. Marshall Hall in some papers in the Journal has pointed out that the impediment to artificial respiration in the supine posture is the obstruction of the superior aperture of the larynx by the falling back of the tongue. He remedies this by adopting the prone position. By this position expiration takes place, the thorax and abdomen being compressed by the weight of the body. The body is now turned on its side, and the pressure being taken off from the abdomen and thorax, they by their elasticity expand, and an inspiration is the consequence. These measures are aided by alternate pressure on the ribs and spine. Some experiments on the dead body are mentioned by him in support of this practice. Bent tubes containing a little water was inserted into one nostril, the other and the mouth being
closed, on moving the body in the same way above described, air
passed freely out and then entered again. In one experiment
as much as thirty cubic inches were inspired. To procure success
by this mode, the whole body must be on the same level.
The body should be lifted up and depressed again, sixteen times
in the minute. The advantages are that it can be done by any
body and anywhere as soon as the body is removed from
the water, and that there is no danger on injuring the lung

tissue.

We now come to the second indication, to restore the animal that
formerly this was the primary object, at least if we may judge
from the practice. To restore the heat of the body before renewing
the respiration is madness. So by increasing the temperature you
increase the rapidity of the circulation, and consequently the amount
of carbonic acid in the blood. It is a well known fact in physiology
that animals bear suspension of respiration in proportion to the
diminution of their temperature, witness the slow and scarcely
observable respiration of hibernating animals, also newly born
animals, which, incapable of maintaining their temperature
apart from the parent, die almost immediately if plunged
under water, whilst those which cool lose their temperature when separated from the mother can bear a temperature for a considerable period, even as long as half an hour. Frogs also can remain much longer under water in cold than in hot weather. From these considerations it follows that artificial heat should not be applied until the respiratory process is set going. And there are various modes of applying heat and restoring the temperature. The warm bath was once much used; it is worse than useless before the establishment of respiration, for the contact of water will prevent any interchange of gases through the skin between the atmosphere and the blood, and indeed it has been proved by experiment that animals recover from asphyxia, ceteris paribus, when exposed to the air than when partially immersed in water. Taking all into consideration it would be better to banish this from the list of remedial means. Perhaps the same objection does not exist with regard to the warm air bath. In the Liverpool Northern Hospital a very simple form of warm air bath was used invariably in every case of drowning. It is described by the house surgeon
of that hospital in the Medical Gazette for Sep. 1838. In this instrument air was made to pass through iron tubes heated by spirit lamps. Blankets were placed under the patient, and a sort of tent formed of fracture cradles, and blankets placed over them. Under the cradles near the feet, the tubes were introduced — in five minutes it is said a temperature of 100°F can be produced in the tent. In most cases, however, such means are not at hand. The body should be stripped and dried, and placed in a warm well-ventilated room. It may be placed between warm blankets, and hot bottles, or hot bags of salt or sand, placed to the soles of the feet or between the legs, and in the armpits, taking care however that the temperature is not too high as to scald or burn the patient, as has happened before now, seriously complicating the process of recovery. Frictions with hot flannels should be made to all parts of the body by several pairs of hands, and this should not be done irregularly, but firmly and simultaneously in the course of the veins and therefore upwards, as favouring the return of venous blood to the heart, and the lungs, elimination of venous blood there. Switching
on brushing the soles of the feet and palms of the hands have been recommended.

The third indication is to excite the system by the cautious application of stimuli. Their utility is limited. In the first instance they are perfectly inadmissible, for we cannot be sure that they will pass into the stomach and not into the trachea. Diluted stimulii Professor Hall remarks may often be useful if introduced into the stomach on returning animation, and injections of urine, ammonia, andspiritsuous lavements, have occasionally been very useful. Stimulant to the nostrils, as ammonia, if used at all must be done so wary, as they are apt to give rise to troublesome results afterwards. The use of injections of tobacco smoke is a remnant of the practice of barbarous ages. What theoretical views led to its adoption I am unable to conceive. Stimulating stimulations to the trunk and extremities may prove of service.

Effort at treatment should be persisted in for at least one hour. There can be very little doubt from the case related by Sir Douglas, that if restorative efforts were con-
tinued longer, a greater number of cases would prove successful. As it is about three-fourths of all the cases of drowning are resuscitated. Thus out of 576 cases occurring in Paris from the year 1821 to the year 1826, 430 were resuscitated.

The fact of your efforts being successful is shown by the occurrence of slight lividity of the face, twitchings of the facial muscles, quite sighing respiration, and sometimes convulsive movements of the limbs and trunk. If the patient has been long submerged, respiration being established, consciousness is not regained until after the lapse of some considerable time. Again other very annoying cases occur where though respiration has been well established and in some cases even consciousness, yet in spite of all our endeavours they gradually sink.

I cannot do better than finish up this imperfect essay with the few Rules for the treatment of Asphyxia lately drawn up by Marshall Hall.

1. Send with all speed for medical aid, fragments 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.

III. Place the patient gently on the face (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, warm, hot, &c. applied to the nostrils;
2. By irritating the throat by a flatter on the finger;
3. By dashing hot and cold water alternately on face and chest.

If there be no success, lose no time, but

V. Replace the patient on his face, his arms under his head, that the tongue may fall forwards, and any fluids flow out of the mouth.

Then 1. Turn the body gradually but completely on the side, and a little more, then again on the face, alternately.
2. When replaced, apply pressure along the back and ribs.
3. Then remove it, and proceed as before.

3. Repeat these measures gently and deliberately sixteen times in the minute, only.
4. Continuing these measures, rub all the ribs, and the trunk upwards with the warm hands, making firm
Pressure energetically

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

6. Omit the warm bath until respiration be established.

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