

CHAPTER II.

DROWNING—HANGING—STRANGULATION—SUFFOCATION.

THESE modes of death are brought together in the same chapter, as they are all forms of apnea, or sudden death beginning at the lungs.

DEATH BY DROWNING.

The medico-legal importance of this cause of death may be inferred from the fact, that on an average of the five years 1852–56, 2352 deaths were caused by drowning, of which 1847 in males and 505 in females. Of this number 164 (87 males and 77 females) were ascertained acts of suicide.

Although death by drowning is commonly attributed to apna, it is not always due to that cause. Hence this subject is not so simple as at first sight it would appear to be. To make it intelligible it will be necessary to describe the various modes in which a man found in the water may have come by his death, *supposing him to have died in the water.*

When a man in perfect possession of all his faculties falls into the water, he sinks to a greater or less depth, but immediately rises to the surface again; and, if he is a swimmer, makes efforts to save himself, till at length he is reduced to the condition of one who cannot swim at all; with this difference, that he has already exhausted the strength which the other has in reserve for the death-struggles common to both. These struggles consist of irregular movements of the arms and legs, and graspings of the hand at all objects within reach, whether floating in the water, fixed at the bottom of it, or growing on the banks. In the course of these irregular movements he rises repeatedly to the surface, tries to breathe, and takes in air and water. The contact- of the water with the windpipe causes a cough, by which part of the fluid is rejected, and with it some of the air contained in the lungs. This occurs again and again, till the body no longer rises to the surface ; water alone is received in the vain efforts to respire, while forcible involuntary expirations continue to expel the air from the lungs. At length all these efforts cease, the body sinks to the bottom of the water, and bubbles of air are forced from the chest by the elastic reaction of its parietes. The greater part of the water which has been taken in finds its way into the stomach, and a smaller portion into the lungs; and this portion, mixed with the

secretions of the mouth and air-passages, and frothed by the air inspired and expired, forms the foam so constantly met with in persons who have perished in this way.

In cases belonging to the class just described, we may expect to find the appearances proper to death by apnoea, coupled with those due to the medium in which the death takes place. In the case of the swimmer death may take place from exhaustion, with only indistinct signs of death by suffocation.

But death may take place in the water, and yet be caused neither by apnoea nor by exhaustion. There may be a complete loss of consciousness at the very moment of immersion. This may happen from fright, from drunkenness, from an attack of hysteria, or of catalepsy (of which latter the author has known one melancholy instance) ; and in this case the body falls to the bottom of the water, rises again to a certain height, and sinks without a struggle. In these cases death is due to shock, or to syncope, and not to suffocation. Again, a person may fall or throw himself into the water with the head foremost, and, striking against a rock or fragment of wood, or even against the surface of the water itself, perish by concussion ; or the body falling or thrown from a height may strike the water with the chest and pit of the stomach, so as to cause instant death from shock. In these cases, also, death is due to causes other than apnoea. Again, cold, excitement, or the first violent struggles, may occasion apoplexy, or sudden death from disease of the heart. These sudden deaths by diseases of the brain and heart are of occasional occurrence in persons bathing in cold shallow water.

Death by drowning may also be of a mixed character. A man falls into the water in the full possession of all his faculties ; he preserves them for a time, till, struck with horror at the death which threatens him, he faints, and thus perishes.

It appears, then, that death by drowning may be due to apnoea, to exhaustion, to shock or syncope, and to apoplexy ; and, further, that death may be brought about partly by apnoea and partly by one of the other causes now specified. The cases in which marks of apnoea more or less distinct are found in the body, either separately or blended with those proper to some other form of death, form the great majority, and cases in which the signs of apnoea are wholly absent a small minority, while cases of pure and unmixed apnoea occupy an intermediate place. Devergie, whose opportunities of experience in this class of cases have been already alluded to, estimates the cases of unmixed apnoea as *one in four or two in eight* of the whole, the cases in which no traces of apnoea exist as *one in eight* of the whole, and the mixed cases as *five-eighths* of the whole.

The appearances present in the body of the drowned must of necessity vary with the manner and precise cause of death.

In those cases in which death has been due to apnoea, the post-mortem appearances will be those proper to that mode of death

see p. 223), but blended with those due to the medium in which the death happened, and modified by the time that the body has remained in the water, as well as by the period of exposure to the air after removal from the water.

Supposing the death to have been due to apna, and the examination of the body to be made soon after the death and removal from the water, it may be expected to present the following appearances: The face and general surface of the body are either pale or slightly livid, with occasional patches of a deeper tint. The expression of the face is generally calm. The tongue is swollen, and closely applied to the teeth, rarely protruded between the closed jaws, and still more rarely wounded and bloody ; and there is a frothy foam at the mouth. The air-passages also contain a froth, which is sometimes tinged with blood ; and the trachea and larger bronchial tubes contain water which sometimes penetrates to their most minute ramifications. Sometimes the water is in such quantity as to fill the whole of the air-passages, and it occasionally carries with it portions of slime or mud, or fragments of aquatic plants.

The lining membrane of the air-passages is sometimes found congested ; the lungs contain a large quantity of black fluid blood; the vena cava and right cavities of the heart are distended with dark blood, while the left cavities and aorta are comparatively empty. The stomach almost always contains water, of which the quantity is sometimes very considerable. The intestines have a rosy colour ; the liver, spleen, and kidneys are gorged with blood ; and the bladder sometimes contains urine tinged with blood. The brain presents the same appearances as in other cases of death by apna. Sand or mud are often found in the hollow of the nails, the fingers are sometimes abraded, and portions of plants growing in the water, or on the banks of the stream, are sometimes found grasped in the hands. Injuries received in falling into the water during the death-struggles, or through the violence of the stream, may also leave their marks upon the body. These will presently be more minutely described.

In bodies which have remained in the water, or been exposed to the air for some time, the pallid, or slightly livid hue of the features just described may be exchanged for a bloated appearance, and large livid spots may show themselves on different parts of the body, as in other cases of death by apna.

In death by shock, syncope, or exhaustion, there is little or no water in the air-passages or in the stomach. The cavities of the heart and large vessels are equally distended with blood, or are nearly empty, and the brain and internal viscera are in their natural state. Death by concussion or by apoplexy, or by disease of the heart, will reveal itself by the usual post-mortem appearances.

In mixed cases the post-mortem appearances due to apna will be less strongly marked. There will be less froth at the mouth, less water and froth in the air-passages, and in the stomach ; and less

congestion of the lungs, of the heart and great vessels, and of the internal viscera.

Several medico-legal questions suggest themselves in reference to a body found in the water, of which the first in order is the following:—*Was death caused by drowning?* In the case of a person found dead in the water, the death may obviously have happened from natural causes or from intentional violence prior to the immersion ; and in the latter case the death may have been due to some cause producing apnea, and giving rise to the characteristic appearances proper to that mode of death. In other words, a person may be strangled or suffocated, and then thrown into the water to conceal the true cause of death. In forming a decision on a question of so much difficulty, we shall have to consider the several post-mortem appearances alleged to be characteristic of death by drowning, and to determine whether they might have been occasioned by causes acting before immersion. We must also determine whether, in the case of bodies remaining in the water some time after death, the appearances usually attributed to the mode of death may not be explained by the peculiar circumstances in which the body is placed.

Of the post-mortem appearances present in bodies found in the water, some are common to death by drowning and to death by other forms of apnea, while others are peculiar to death by drowning. To the first class belong the position and swollen state of the tongue ; the pallor with rosy or violet discolorations of certain parts of the skin; the injected state of the brain; the congestion of the internal viscera ; the fulness of the right cavities of the heart, and emptiness of the left ; the fluid state of the blood; and the existence of bloody urine in the bladder. To the second class belong: —excoriations of the fingers, with sand or mud in the hollow of the nails; fragments of plants grasped in the hand ; water in the stomach; froth at the mouth and nostrils ; and froth, water, mud, or sand in the air-passages.

Of the post-mortem appearances belonging to the first class, it will suffice to observe, that their presence in persons found dead in the water is consistent with the supposition of death by drowning, but that they might have been caused prior to immersion by any of the modes of death which act by occasioning apnea. If the body is free from marks of strangulation, death might still have been caused by suffocation produced by forcible closure of the mouth and nostrils.

The post-mortem appearances alleged to be due to drowning, and to be characteristic of that mode of death, must now be briefly considered.

Excoriations of the Fingers are much more frequently absent than present ; but, when they exist, may be regarded as a probable, though not certain sign of death by drowning. They might be caused previous to forcible immersion, by the rubbing of the fingers against any hard and rough body; and possibly after death in running streams.

Sand or mud in the hollows of the nails, also, affords a probability

of immersion during life, inasmuch as it implies, like the excoriations of the fingers, that the drowning man grasps at the bed or banks. But if the body remained long in the water, mud or sand might be deposited in the hollow of the nails.

If the hands were found clenched and *grasping weeds growing in the stream or upon the banks*, there would be the strongest probability in favour of death by drowning.

Water in the Stomach.—The discovery of water in the stomach affords another strong presumption in favour of death by drowning ; especially if the water can be identified with that in which the body was found by its containing leaves of plants growing on the banks or at the bottom. Except in the cases presently to be mentioned, it presupposes acts of deglutition during efforts to breathe. It must, however, be admitted to be possible, though very unlikely, that the water might have been swallowed a very short time before submersion. The quantity of water found in the stomach is very variable; and depends partly upon the number of efforts at respiration made during the act of drowning, and partly on the depth of the water. In animals that have been stunned before immersion, as well as in animals kept under water from the first, and prevented from rising to the surface, the stomach contains no water; while in animals allowed to rise to the surface, it is found to be in proportion to the number of times that the animals so rise.

That the depth of the water also influences the quantity found in the stomach is proved by the experiments of Dr. A. Taylor. The stomach of a cat held two feet below the surface of the Thames contained scarcely any water ; but that of a cat lowered to the depth of fifty-five feet contained a large quantity. The stomach of a third cat which was allowed to rise repeatedly to the surface of the water, was distended, but not so much as the one which had been lowered to the depth of fifty-five feet.

The influence of the columnar pressure of the water is, therefore, considerable ; and it is probable, that where the water is very deep the pressure of the fluid may overcome the resistance offered by the collapse of the oesophagus, even though the animal died previously to submersion. It appears, moreover, that water may enter the stomach in consequence of putrefaction producing a general relaxation of the tissues.

From what has just been stated, it is obvious that the discovery of water in the stomach is not to be considered as conclusive evidence of death by drowning, when the water is of great depth, or when the body is far advanced in putrefaction. It must also be admitted to be possible that the water might have been swallowed immediately previously to immersion, and possible, also, though most improbable, that it might, as suggested by Orfila, be maliciously injected after death.

But though the discovery of water in the stomach affords a presumption of death by drowning, its absence must not be taken as evi-

dence to the contrary ; for it is not present in cases of death by drowning due to causes other than apnoea, such as shock, syncope, concussion, or apoplexy. The tendency to swallow may also be voluntarily resisted ; or the body may be, in some way or other, prevented from rising to the surface.

On the other hand, water may have entered the stomach, and yet not be found there after death ; for if the head be allowed to hang below the rest of the body, the water will flow from the stomach. This fact also has been proved by Dr. Taylor's experiments. If, moreover, the body is long exposed after its removal from the water, the fluid contained in the stomach may transude through its coats, and disappear.

The absence of water from the stomach, therefore, is not conclusive against death by drowning, for it may have gained access to the stomach, and subsequently disappeared ; or it may never have entered the stomach at all.

Froth, water, mud, or sand, in the Air-Passages. Mucous froth.

The experiments of Piorry and Orfila have clearly shown that the presence of mucous froth in the air-passages is due to the body rising repeatedly to the surface for air, and that it does not exist in animals kept entirely under water.

This froth is also absent when the body remains in the water a long time after death, or is subject to long exposure after its removal from the water, or when the head is placed below the level of the body. The value of this mucous froth as evidence of death by drowning is also impaired by the fact that it exists not only in the several forms of death by apnoea, but in death by apoplexy or epilepsy, and in catarrhal and other affections of the lungs.

Water in the lungs.—That water generally enters the lungs in death by drowning has been abundantly proved by experiments on animals, and by cases in the human subject in which not water only, but sand and mud, have entered the air-passages. By drowning rats in chalk and water, with free access to the air, I have never failed to obtain effervescence by means of acids in every part of the lungs. **But the value of this sign is impaired by the fact that water may enter the lungs of those who have been thrown into the water after death.** Orfila and Piorry found, that the quantity which thus gained admission to the lungs, varied according to the position of the body. When it remained upright there was a large quantity; less when horizontal.

It has been suggested that water may be *injected* after death. This is most improbable. But water is not always present in the lungs of those who have died by drowning ; for, as in the case of the stomach, if the head is left depending, the water flows out. Long exposure, too, will cause it to transude and be lost.

Froth at the Mouth and Nostrils.—This, too, is a sign of death by drowning ; but it is open to all the objections just stated in respect of

froth in the air-passages. It depends, indeed, very closely on the existence of froth in the air-passages, as well as on the development of the putrefactive process, and the consequent generation of gas forcing the froth in the larynx and trachea into the fauces. Hence it is more frequently present in summer than in winter.

From the signs of death by drowning, it appears there is no single sign on which entire reliance can be placed. When, however several signs happen to coincide, the probability is greatly strengthened. Like the Symptoms of disease, they may be of little value when taken separately, but when combined they enable us to form a safe diagnosis. Some authors, and Orfila among the number, have, indeed, thought that the question, Was death due to drowning? of no deoska ; but from this opinion Devergie very properly dissents.

It is important to bear in mind, that the appearances characteristic of death by drowning are not permanent. In winter they may continue after the body has lain from fifteen to eighteen days in the water, while in summer they would disappear from the third to the sixth or eighth day of immersion. The exposure of the body to the air also causes them rapidly to disappear, and in the height of summer a few hours would suffice to dissipate them. When putrefaction has gone to any considerable extent, all the signs of death by drowning are of course completely removed.

The time that the body has remained in the water will be determined approximately by the signs laid down at page 217.

The evidence derived from the signs of death by drowning already discussed admits of being confirmed or invalidated by the condition of the body in other respects, especially by the presence or absence of

Marks of Violence.—With regard to injuries discovered on bodies of persons found in the water, three questions arise:

1. Were they inflicted during life?
2. If inflicted during life, are they of such a nature as to account for death before submersion?
3. Were the injuries accidental, suicidal, or homicidal?

The first question—whether the injuries were inflicted during life? and the third question—were the injuries accidental, suicidal, or homicidal? are fully discussed under the head of wounds. The fact of the body having been immersed in water will influence the decision of this question, only in so far as the injuries are altered in appearance by the continuance of the body in the water.

Are the Injuries of such a nature as to account for Death before Submersion?

There are five different ways in which a body taken from the water may come to exhibit marks of violence. 1. A man may be murdered, and, when dead, thrown into the water. 2. He may receive severe injury from the hands of others or himself, and may then be thrown (or throw himself into the water while still alive. 3. The body may

be bruised by the struggle which the drowning man makes to save himself. 4. It may be borne away by the violence of the stream against some obstacle. 5. The body may sustain severe injury in the very act of falling into the water.

1. On the supposition that a man has been murdered and thrown into the water quite dead, we should expect to find an absence of all the signs of death by drowning; with the exception only of such as may be present under certain circumstances already mentioned, such as uncommon depth of water, or advanced states of putrefaction.

2. On the supposition, again, that a man found in the water had first been severely injured and then thrown in whilst still alive, we might expect to find some at least of the signs already mentioned, and these might be sufficiently marked to enable us to come to a decision; but this would, of course, depend on the strength still left to the drowning man, after the violence inflicted upon him.

3. The injuries which the body might sustain through the struggles of the drowning man would not be such as to raise any question of the true cause of death. They would consist of bruises more or less extensive and severe, but not so severe or extensive as to endanger life.

4. The injuries which may be inflicted on the body by the violence of the stream would also consist of bruises more or less extensive. It is very unlikely that such severe injuries as dislocations or fractures could originate in this way.

5. *Falling into the Water.* There is no doubt that considerable injury may be inflicted if a person falls or throws himself from a considerable height upon a hard bank or pier or abridge. Fracture of the skull or limbs, extensive bruises, and severe lacerated wounds may be readily accounted for by this cause.

Dislocation of the extremities is also a possible consequence of the mechanical obstacle presented by the water to the body falling from a great height. This accident happened many years since, as stated by Dr. Gordon Smith, to a man who was in the habit of jumping from the parapet of London Bridge into the Thames for a wager. He had previously performed this feat with impunity, but the last time he sank and was drowned. Both arms were found dislocated, in consequence, it is thought, of his having fallen with them in the horizontal position, instead of holding them close to his sides.

Two cases are also recorded (South's edition of Chelius's Surgery, vol. i. p. 532), the one of fracture of the body and arch of the fourth cervical vertebra, the other of fracture of the body of the fifth cervical vertebra, made in jumping into the water, due to the violent muscular effort to avert collision with the bottom, by drawing back the head.

The medical man should, therefore, first ascertain whether the drowned man fell from a height into the water, whether the stream is rapid, and what obstacles present themselves; and if on careful examination he finds that there are no such causes as these to account for the violence which the party has sustained, he may fairly trace that vio-

lence to some cause preceding the immersion. In bodies found in shallow still water, marks of violence afford strong presumption of homicide. Having convinced ourselves, after a careful examination, that death took place by drowning, another question arises

Was the drowning the result of Accident, Suicide or Homicide?

This question is exceedingly difficult to answer. For if there are no marks of violence on the body, it is not possible to say whether the man fell in, or jumped in, or was pushed in. Again, in respect of bodies found in running streams, it may not be possible to ascertain at what point the body entered the water ; hence we are deprived of such information as might have been obtained from a close examination of the spot where the body is found.

Nor if we find the hands of the drowned man full of leaves or grass, showing that he struggled hard whilst in the water, can we affirm that he was thrown or pushed in by others ; for, if he fell in, he would do precisely the same.

Nor again, does the fact of a man being drowned in a shallow stream of water render the idea of homicide improbable; for if a strongman were to hold the head of a weak or infirm one in a basin of water, he might drown him just as effectually as in a deep stream. On the other hand, it should be borne in mind that cases of suicidal drowning in shallow water, or in very narrow spaces, such as small house-cisterns, are by no means rare.

It is evident, from what has been stated, that where there are no marks of violence on the body, we have no means of determining whether the drowning was the result of accident, suicide, or homicide. Nor does the discovery of external injuries throw any light upon the question, unless those injuries are of such a kind as that they could not have been inflicted by the person himself previous to immersion, or by the accidental striking of the body against an obstacle in entering the water, during the death struggle.

There is one case which would at first sight seem conclusive as to homicide, and that is where a body is found in the water, tied hand and foot. Dr. Smith, however, relates the following case : In July, 1816, the body of a gauging-instrument maker, who had been missing for some days from his home, was discovered floating down the Thames. On being taken out, his wrists were found tied together and made fast to his knees, which were in like manner secured to each other. He had been in a state of mental derangement for two years. The cord with which he had tied himself was recognised as one that had hung from the ceiling over his bed, and by which he used to raise himself up, as he had been confined to bed for some weeks. He was a good swimmer, and it was presumed he had taken the precaution to prevent himself from employing that power. The verdict in this case was, *' Found drowned." Two other cases of a similar kind are on record, one by Fodere, in which the hands and fingers were tied together with a silk riband, in numerous folds ; and another in the ninth

volume of the 'Annales d'Hygiene,' in which the feet, wrists, and neck were tied. Fodere in the one case, and the medical examiners (Marc, Guichard, &c.) in the other, gave their opinion in favour of suicide. In such cases as these it would be necessary to determine whether the knots or folds admitted of being made with the teeth, or by any movements of the hands or limbs.

Treatment of the Drowned. Before describing the proper treatment of the drowned, it may be well to recall the fact that in the majority of deaths by drowning the cause of death is apncea, simple or mixed ; and that the means to be adopted are those which would be prescribed in other cases of suffocation, with certain modifications obviously suggested by the circumstance of the death having occurred in the water. The contact of the water, for instance, will account for a lower temperature of the surface than would exist as a simple consequence of death from apncea. Hence the necessity for more prompt and sustained attempts to restore the heat of the surface. Such provision as may not be inconsistent with the use of other means of restoration should also be made for relieving the lungs and stomach of the water which had entered those organs.

The following rules for the treatment of the drowned are in accordance with the improved method of the late Dr. Marshall Hall. Strip the body, and carry it, resting on the belly with the face downwards, at once to a house close at hand, or to a convenient spot in the open air ; and wipe the body and face dry. Raise the body into the sitting posture, and endeavour to excite respiration by the use of smelling-salts, by tickling the nostrils and throat with a feather, and by dashing warm water on the face and chest. If these means of exciting respiration happen to be at hand, use them promptly, and desist if they do not produce an immediate effect : if not at hand, proceed at once to replace the body on the face with the arms crossed under the forehead. Then turn it to the side and back again to the face about fifteen times in a minute. In the short intervals apply friction and pressure to the ribs, and along the spine, and carry the hands with a firm pressure along the extremities from below upwards. If warmed blankets can be procured place them under and round the body, and rub the body with hot towels. Persevere with this treatment, with the assistance of other persons, for several hours, or until some of the more certain signs of death have made their appearance. (See p. 208 *et seq.*)