

Interrupted blood supply to the respiratory centre the probable cause of death from air admitted rapidly and in large quantity through wounded veins : with sketches from nature / by P.D. Handyside.

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INTERRUPTED BLOOD SUPPLY

TO THE

RESPIRATORY CENTRE

THE PROBABLE CAUSE OF DEATH

FROM

AIR ADMITTED RAPIDLY AND IN LARGE QUANTITY
THROUGH WOUNDED VEINS;

WITH SKETCHES FROM NATURE.




BY

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ETC., ETC.

1837

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ACCOUNT, &c.

ON Saturday, February 18th, 1837, at half-past ten A. M., I was called to afford assistance in the case of Mr John Doherty, aged 36, who was then resident in Edinburgh during the first year of his medical studies, and who had a few minutes before met with his death from severe wounds in the neck made with a razor. I saw the body of Mr D. ten minutes after the incisions which had caused death had been made. It lay fully clothed and extended upon the floor of the bedroom, with the head towards the door. The fore-part of the body, and the back of the hands were in contact with the floor, and the razor stained with blood lay at the distance of about two inches from the open right hand. Respiration had ceased, and the pulsation of the heart and arteries was gone. There was no hemorrhage, scarcely indeed any oozing of blood, and not above one pound and a half of this fluid, and that for the most part venous, had escaped from the divided vessels. This blood lay, partially coagulated, upon three different parts of the floor of the apartment.

I immediately resorted to some of the usual methods employed for effecting recovery from asphyxia, caused by the entrance of air into the heart, but without any success.

I then examined the condition of two irregular incisions which I found upon the neck. The wound upon the left side was the smaller, and appeared from various circumstances to have been the first which was made. It extended obliquely downwards from the lobe of the ear, towards the junction of the body with the left cornua of the *os hyoides*, measured two inches and a half in length, and the angle of the jaw was one inch above the middle of it, and it appeared from its direction to have been inflicted with the instrument held in the left hand of the individual. (See Plate, Fig. 1.) The incision upon the right side of the neck was the larger, being four inches in length, and in making which one superficial

and two deep wounds had evidently been inflicted, and, if not by another person, with the right hand of the deceased himself, as was evident from the appearance of the edges of the incision. Its middle part corresponded likewise to the angle of the jaw, though placed half an inch beneath it. It may be added, that in making this very irregular incision, a slight wound had also been inflicted on the skin over the angle of the jaw. (See Plate, Fig. 2.)

Although I ascertained upon inquiry that Mr D. had been ambidexter, still, from the unusual position of the wounds and other circumstances peculiar to this case, I requested the valuable advice of Dr Christison, who concurred with me in opinion that the case should be judicially examined. I accordingly obtained a warrant for making an anatomical inspection of the body in order to discover the cause of death, which I undertook with the assistance of Mr Hutcheson, surgeon, Dr Houseman, Mr Atkin, and others, provided with means for performing with accuracy those experiments on the state of the blood-vessels which, in the event of finding no cause of death apart from the entrance of air into the divided vessels, seemed to me desirable, in order to be enabled to pronounce satisfactorily upon the subject.

Sectio.

The body was examined twenty-six hours after death, an interval during which the weather had been extremely dry and cold, and the body retained in an apartment equally so; and there was not the slightest trace of putrefaction apparent.

The integuments surrounding and implicated in the wounds were carefully removed and preserved, in order to exhibit the form of the incisions, which was next faithfully transferred to a plaster cast of the neck and head.

It was then found that on the *left* side the *platysma myoides*, to the breadth of two inches and a half, the anterior two-thirds of the *sterno-mastoid* with the trunk of the *spinal accessory* nerve, and the lower margin of the *parotid gland*, had been freely divided. Of the parts beneath, the conjoined origin of the *occipital* and *posterior auris* arteries, with the *posterior facial* vein, were found cut across; and through the latter of these vessels several globules of atmospheric air were found to have entered the *internal jugular* vein.

The incision on the *right* side, which was much deeper, and made evidently by three separate strokes of the cutting instrument, was found to have laid freely bare the *transverse process of the atlas*, and to have opened up the space which intervenes between it and the transverse process of the *axis*, sufficiently to

expose to view the *vertebral artery*. The following parts were discovered to have been also freely divided;—the *platysma myoides* to the breadth of four inches, the *sterno-mastoid* with the trunk of the *spinal accessory* nerve, the *external and internal jugular* veins, the *superficial cervical and auricular* branches of the third cervical nerve, the *anterior and posterior facial* veins, with the inferior border of the *parotid gland*, and the posterior margin of the *submaxillary gland*; the *digastric and stylo-hyoid* muscles, the *levator anguli scapulae*, the anterior margin of the *splenius capitis*, and highest insertion of the *splenius colli* muscles; the *pneumogastric*, and anterior branches of the *descendens noni* nerves, and the *posterior auris* artery. The *facial* artery near its origin was found to have been opened slightly.

On examining with great care the contents of the blood-vessels, I ascertained that the *internal jugular* veins, though empty of blood, were slightly distended with air. The arteries of the neck generally, were empty, with the exception of the left carotid, which contained a considerable quantity of air. The *middle* and the *inferior thyroideal* veins, and, on opening the *thorax*, the *venae anonymae*, the *descending vena cava* and the *vena axygos* were found partially distended with air, besides containing a little fluid blood.

On opening the *pericardium*, the cavities of the heart were found collapsed, and nearly empty. The *right auricle* was perfectly empty of blood, with the exception of a minute coagulum at the *foramen ovale*, which (as I have had occasion to observe in the average of one out of every eight cases in the adult) was patulous. This cavity contained some atmospheric air. The *ascending vena cava* contained a little uncoagulated blood, and air. The *coronary* veins and *right ventricle* were empty of blood, but contained air. The *pulmonary artery* and its minute ramifications contained a very little frothy blood, quite insufficient to separate their walls, which were collapsed; while again, the *pulmonary veins*, from their commencement to the left auricle, were in a state of distension on the left side, and in a state of partial distension on the right, from a commixture of dark-coloured blood in a fluid state, and atmospheric air. The substance of the *lungs* was distinctly emphysematous. The left *cavities* of the heart were found perfectly empty of blood, but in a state of partial distension like the other cavities of this organ, from the presence of air. The *coronary arteries* were empty of blood, but contained globules of air. The texture of the heart was paler in colour than natural.

On opening the *abdomen* I found the *vena cava* and the larger venous trunks to a greater or less degree distended with air, and containing very little blood, and that in a fluid state. On

cutting into the *liver* under the surface of water, after a manner similar to that followed in all the preceding and subsequent experiments, air was observed to escape from the *hepatic veins*; and on treating the *spleen* and *kidney* in a similar way, like results were obtained. The *pancreas*, and the *coronary veins* of the stomach presented also the same results. The abdominal *aorta*, on being carefully insulated for three inches in extent by ligatures applied above and below, and also to its branches, and then placed under the surface of water, gave vent on being opened to several globules of air.

The *femoral* and *popliteal* and the *brachial* arteries, upon being similarly treated were observed to contain air.

All the *viscera* of the *thorax* and *abdomen*, with the exception of a few slight adhesions observed between the *pleura* of the lung and that covering the *pericardium*, and some patches of coagulable lymph, not recently effused, found over the right side of the heart, were perfectly healthy. The liver, *pancreas*, spleen, and stomach, were paler in colour than natural; the stomach was empty, and the gall-bladder was distended with bile.

The *muscles*, with the exception already given, were natural both in colour and texture.

That the air found in the blood-vessels in the foregoing case was not effused as a result of the putrefactive process, appears, not only from the circumstance of the shortness of the interval and other circumstances that elapsed from the death of the individual to the examination of the body, but from the consideration also, of that air having been found commixed after a frothy manner with the blood in the vessels, an appearance which is not compatible with simple decomposition, though the converse of this, (the air and blood remaining wholly unmixed after violent death) has been occasionally observed.

Having remarked in turning over the records of cases bearing on the subject of the present communication,* the very scanty and unsatisfactory amount of the details of the necroscopic appearances which the narrative of almost all of these cases presents,†

* For an able analysis of these cases, which supplies the place of any historical summary that I might have offered here, I beg to refer to the American Cyclop. of Pract. Med. and Surg. Part iii. p. 263, Philadelphia, January 1834, Art. Air, by Dr Warren of Harvard University, as well as to the recent work by the same author, "Surg. Obs. on Tumours," p. 259—301; to some valuable editorial remarks on these cases in the 48th Vol. of this Journal, p. 554, and to Dr Cormack's Prize Thesis, p. 21, Edinburgh, 1837. Dr. Cormack has contributed to our knowledge of this subject by giving the details of several additional experiments which he performed on the lower animals.

† As exceptions, I may mention the case of M. Beauchene, which occurred in the Hôpital St Antoine, Paris, in 1818, and some of the details of which are given in Magendie's Journ. de Physiol. Tom. i. p. 192, and Dupuytren's case narrated in the Archiv. Gen. de Méd. Tom. v. p. 430. Paris, 1824.

I have been induced to communicate an account of the appearances observed, and the results of some careful experiments on the state of the blood-vessels made, in the present instance, soon after death. And I shall now subjoin, as suggested by the consideration of this and other cases, such remarks as appear to be fair deductions from the data we now possess, in connection with a subject, the entry of air into the veins, which, whether considered in reference to its bearings on practical surgery, or in relation to suicide, to physiological or to pathological investigation, may be regarded, certainly, as one of unusual interest.

The Cause or Causes of the entrance of Air.

In instituting an inquiry into the mode in which air may, during a surgical operation, or in a case resembling the present, enter a divided blood-vessel, I would submit the following observations.

The admission of air must depend, *first*, upon the patulous state of the wounded vessel being maintained, which in the case of a vein is,—in consequence of the want of rigidity in its coats, and hence its great tendency to collapse,—effected either by the adhesion of its thin and pliant walls to the contiguous tenses textures, as is observed to take place in certain positions of parts of the body, or by its being kept from collapsing, by its situation in respect to larger veins, for example, one of the *thyroid* veins entering transversely the *internal jugular*;—or again, by its being adherent to or imbedded in the texture of a firm tumour,—conditions which severally thus afford a strong amount of tension and support to the opened vessel. And, *secondly*, the active requisites for the entrance of air into either arteries or veins appear to be the inhaling power of these vessels, which in the case of arteries consists in the maintenance of the pulsatory and accelerating movement, which is conducive to the progress of the blood or air on which their walls react,—and in the case of veins, the inhaling or traction power of the heart, and the resilience of the lungs. Both of these conditions are produced by the dilatation of the walls of the chest consequent upon each inspiration; and as an additional influence available in determining the flow of blood or entry of air into the heart, may be added the elasticity, or a certain amount of physical *reaction*, (the *derivation of Haller*,) exerted by that organ during its diastole. *

The traction power which, to a limited extent, the heart and chest are during ordinary inspiration capable of exerting over the motion of the blood in the venous trunks, has been not only much overrated by recent authors, but has been erroneously regarded

* See Bostock's *Physiology*, 1828, Vol. i. pp. 412, 413.

as an active suction power, and a property of active dilatation. Admitting the existence of this power, its greatest amount during natural inspiration was found by Hales to be too limited to raise a fluid even one inch through any kind of tube, and in large animals, as the horse, to the height of six inches only. During convulsed, disturbed, or laborious breathing, however, or that performed by all the accessory agents of respiration, this power is so much increased as to be equal to that of raising a column of blood exceeding twelve inches in height. (Arnott's *Physics*, p. 573. London, 1833.) It is manifest that the condition of respiration now specified would operate most efficiently during severe surgical operations, or in the wounds occasionally inflicted in the throat, either with the intention of homicide or suicide; and that therefore we have a cause fully adequate to produce the entry of the large volume of air, the presence of which proves fatal in such cases as the present.

Another reason besides that which I have assigned for the vessels remaining patulous when divided, has been sought for in that morbid condition occasionally found, viz. a state of rigidity, or a preternaturally thickened state in the coats of the veins. But in a very large proportion of cases that have occurred no such condition has been found. It cannot, indeed, be denied, that when the veins are in an enlarged and indurated state, their coats when cut must be prevented from collapsing, and so evidently favour much the entry of air; but in the conclusion I have arrived at, I am supported, I find, by the authority of Berard (*Archiv. Gén. de Med.* Tome xxiii. p. 172,) in ascribing "the phenomena chiefly to the anatomical peculiarities of the vessels, independent of disease."

In the case before us, it would appear that, owing to the complete division of the coats of many large veins in the neck, and to the consequent intimate adhesion of their thin walls to the dense sheath of the cervical vessels, and the attachment of that sheath to the tense *deep cervical fascia*, assisted by the state of full extension of the head and limbs, these vessels were kept in a constrained and patulous state; and thus we may see, from the observations already made, how air, exclusively of blood, would pass along them into the heart with such rapidity and force, as to cause immediate death. That death is dependent in a considerable degree on *force* being in operation at the time, is proved, both from the narratives of many surgical cases on record, where the *rapid* entrance of even a small quantity of air proved immediately fatal, and from the early experiments of Harderus and others* and the more recent experiments of Nysten, † Bretton-

* Morgagni de Sed. et Caus. Morb. Epist. v. Sect. 21.

† P. H. Nysten, Rech. de Physiol. et de Chimie Pathol. Paris, 1811. Sect. 1. Art. 1. Exp. iv.

neau, Magendie, * Dupuytren, † Wing, ‡ and Dr Cormack. § From these experiments it appears, that when great *force* is used in blowing, death takes place with the greatest conceivable rapidity, and in such cases similar appearances to those found in the case before us,—particularly the appearance of a little frothy blood in the pulmonary artery,—presented themselves; while in other instances, where no great force in the introduction of a limited quantity of air was had recourse to, the animals operated on recovered.

It further appears, that, in order that the air admitted should exercise a fatal effect, it should enter *in large quantity*. || It is established from the observations of Dupuytren, ¶ and of those practitioners who have been in the habit, in cases of cholera, &c. of practising the introduction of saline injections into the veins, as well as from the direct experiments of Camerarius and others, ** of Nysten, †† Magendie, ‡‡ Blundell, §§ Wing, ||| Dr Cormack, ¶¶ and others, that when the quantity of air is small, it makes the round of the circulation, as appears from its being in such cases found after the lapse of a short time in every minute artery and vein throughout the body, and after a longer interval is found to have wholly disappeared, either by the process of absorption, *** or become so intimately commixed with the blood, as to be rendered incapable of causing any impediment to the circulation.

Symptoms.

The symptoms which immediately supervene upon the admission of air into the blood-vessels, announce that the amount of blood circulating in the encephalon is very suddenly diminished. For, first of all, when the quantity of air admitted is small, then syncope only and the symptoms of diminished natural

* Journ. de Physiol. Expér. Tom. i. p. 191.

† Archives Gén. de Med. Tom. v. p. 436.

‡ "Boston Med. and Surg. Jour., as quoted in the *Lançette Française*, Mars et Mai 1835."

§ Prize Thesis, Edin. 1837, pp. 13, 25.

|| And not to the amount of a single bubble only, which quantity, Bichat asserts, if introduced into a vein, occasions immediate death. See *Recherches Physiol. sur la Vie et la Mort*, Paris, 1800, pp. 263, et seq. 4th edit. by Magendie, Paris, 1822.

¶ Archiv. Gén. de Med. v. 436. Paris, 1824.

** Morgagni, Epist. v. Sect. 21.

†† Nysten, op. cit. p. 26.

‡‡ Magendie, op. cit. pp. 194, 198.

§§ Experiments on the Injection of Air into the Veins, Lond. Med. Chir. Trans. ix. 90; and Appendix to Ashwell's Treatise on Parturition. London, 1828.

||| Op. jam cit.

¶¶ Op. cit. p. 26, et seq.

*** Dr Christison, in the 35th volume of this Journal, pp. 98, 99, 102, 103.

flow of blood to the head are apparent, and that too in less than a minute's time. The individual experiences faintness, and other symptoms of uneasiness; his face becomes pale, and his eyes are fixed; next, he cannot distinguish objects, his head falls back, and he loses sensibility; his breathing becomes heavy and difficult, and the movements of the chest are feeble; and he is seized with general trembling, and his whole body is covered with a cold sweat. The contractions of the heart are at first hurried; the organ beats violently and irregularly; its action next becomes feeble and fluttering, and the pulse extremely small and weak, very quick, hard, and irregular. At this crisis the unassisted powers of nature may prevail, the heart regaining strength to propel the volume of air; or by the aid of stimulants and restoratives, by bleeding and artificial respiration, employed at the proper juncture, the functions of the system may, as in ordinary syncope, be restored.

In the second place, when restorative measures are of no avail, and the heart does not recover its action, or the air is admitted into that organ in large quantity, and has entered it with rapidity and force, then, after the appearance of some or all of the symptoms of oppression now mentioned, the respiration becomes laboured and stertorous; some violent efforts at inspiration are made; the body and limbs are strongly convulsed; in a few seconds more these violent convulsions are observed to recur; and, without the loss of more blood, often attended with the loss of less, than is drawn at an ordinary venesection, death closes the scene.

Theory.

In tracing the *modus operandi* of the presence of air in the veins producing the foregoing train of symptoms and effects, although I may premise that we know with certainty but little, yet we are justified in assenting to the well-founded general belief, strongly maintained by Nysten * and Magendie, † and supported by the late Sir John Leslie, that when the cavities of the heart become suddenly and violently distended with air, this organ cannot freely exercise its functions, but encounters much difficulty in contracting on such a powerful and elastic resistance. It cannot, however, be granted, that death is produced by the heart being prevented from propelling the blood which it contains, into the lungs, as Nysten argues; for both the blood and the air, we have seen, are propelled, and in cases where, from the quantity of air that has entered, a fatal result has ensued, not only has the heart been found empty, but the pulmonary vessels and the arteries of the system have at all parts contained air.

* Op. cit. p. 27.

† Ibid. cit. p. 191.

In the next place, death cannot result from another alleged cause ; viz. the loss of contractile power, or irritability in the heart, consequent on an over-distension of its walls, or as the result of the fatigue and exhaustion which this organ endures in its repeated powerful efforts to expel the successive large quantities of air which it receives. For although analogy shows, and dissection proves, by the pale colour which the heart exhibits, and by the coronary arteries and veins containing air only, that this agent operates most powerfully, yet this appears to be an insufficient reason in accounting for the instantaneously overpowering and often fatal effects which succeed the entrance of the air into the venous system. In proof of the correctness of this conclusion, I remark, that we are in the habit of observing, in cases similar to that of the Honourable Colonel Townsend, detailed by Dr Cheyne,* as well as in cases of resuscitation after the body of an individual has been five minutes or even three quarters of an hour under water,† and in experiments on animals, that the contractions of the heart may be with impunity suspended ‡ for a longer interval than often precedes death from the entrance of the air. An interesting and important fact ascertained by Drs Cormack and T. R. Scott,§ may likewise be adduced as proof against the common idea regarding the stoppage to the heart's action which follows the entrance of air into the veins, being occasioned by a loss of its contractile power from overaction. This is, that “ in a horse about seventeen hands high, and in pretty good condition, where death occurred in three minutes from the commencement of the introduction of air into the left jugular vein, (and which introduction of air lasted one minute,) the contractions of the heart continued very forcible long after it had been cut out of the body.”

But it might probably be urged with greater propriety by those who seek to realize the old maxim, “ cor, primum vivens, ultimum moriens,” that the complete stoppage of the sanguiferous supply to the texture of the heart along the coronary arteries, is the real cause of death, seeing that Sir A. Cooper's recent experiments go to prove that the withdrawal even for a minute and a half of the supply of blood to the *mesocephalon*, and the spinal marrow above the origin of the *phrenic* nerve, by compression of the *vertebral* and *carotid* arteries, is fatal. The notion must be allowed to be fair and reasonable, that the function of the heart may be similarly arrested, by the withdrawal, differently effected, of the sanguiferous supply to its texture. Such is indeed the effect which we may be prepared most fully to expect to follow

* See the English Malady, Lond. 1734, p. 307.

† *Détail des succès de l'établissement que la Ville de Paris a faite en faveur des personnes noyées.* Paris, 1773, quoted by Dr Good. See also the Reports of the Royal Humane Society.

‡ See Dr Goodwyn on “ the Connexion of Life with Respiration.” London, 1788, Pp. 82, 83.

§ *Op. cit.* pp. 10, 12.

immediately upon the stoppage of the circulation in the primary muscular fibres of this organ, arrested as that supply of blood through the coronary arteries would almost momentarily be, by the failure of the usual current of blood from the lungs and left ventricle, and by the gaseous substitute for it which would then be forced through the aortal aperture. Yet, being aware that this temporary failure of the circulation is not adequate to explain the circumstance of the rapidity of death being always in the exact ratio of the *suddenness* and *violence* with which the heart is distended with air, (as the considerations already offered respecting the suspension of the heart's action may have served to shew,) we are constrained to look more narrowly into the probable cause of death, and inquire, if, in such a case, the encephalon and spinal cord receive any supply of blood at all; and now finding that impossible, and next comparing the phenomena which supervene on the admission of air,* with those symptoms and results which characterize several anormal states, wherein a similar derivation of blood from the head occurs, we accordingly at once recognize the analogy, and may thence be led to adopt as, at least, probable, such a view of the cause of death as follows.

The cessation of the heart's action must operate injuriously, first, on the maintenance of the function in those organs which require an unceasing and unintermitted supply of blood. As the encephalon receives about one-eighth of the blood of the entire body, the prejudicial effects of a very slight want of balance in the proper amount of which, are so frequently presented to our view in the phenomenon of syncope, and as the encephalon, and that part of the spinal cord, so essential to circulation and respiration, above the origin of the phrenic nerve, are supplied with blood almost exclusively, along the vertebral and carotid arteries; it is easy to understand how these parts of the nervous system are, by the distension of their vessels with an elastic fluid, wholly deprived of their supply of blood. And if the heart's action at the same time be not maintained sufficiently long, first, to circulate all the air it contains, and then to recommence the discharge of its appropriate fluid,—a result equivalent to the complete division by the knife, of that essential part of the nervous system must follow,—namely, the instantaneous cessation of all the automatic movements of the system. †

* All the phenomena, before described, exhibit very sure proofs that the amount of blood circulating in the encephalon and higher cervical region of the spinal cord is very suddenly diminished. The violent convulsions particularly which have been observed always to precede death, imply a condition which obviously follows the sudden diminution of the supply of blood to the brain, in whatever manner that sudden diminution be effected.—See also Abercrombie on the Brain and Spinal Cord, 1828, p. 312.

† Bichat indeed produced immediate results and *post mortem* appearances in animals similar to those arising from the accident under consideration, by propel-

This view seems the more probable, from considering the interesting experiments already adverted to, and which I had recently the favour of witnessing Sir A. Cooper perform. In all these experiments the manual compression for the period of a minute and a-half of the vertebral and carotid arteries in rabbits was followed by death, preceded always by violent convulsions, similar exactly to those which have been observed to occur on depriving the parts of the cerebro-spinal axis, on which these vessels ramify, of their supply of blood, through means of the admission of air, either casually on the operating table, or intentionally in experiments on animals.

Finally, then, the phenomena which have been detailed, and the remarks made, afford proof, that, although the heart is the organ primarily and directly affected, the encephalon and its adjacent portion of the spinal cord, are the parts ultimately and indirectly influenced, and being arrested in their presiding functions, thus produce the fatal result.

Concluding Remarks.

The foregoing case of suicide is interesting and valuable, in a variety of points of view deserving of brief notice here, both in its medico-legal bearings, and as compared with other instances of death from the entrance of air into the circulation.

1. It differs little from cases of suicide generally, in which, according to Osiander* and other writers, the weapon is always dropped from the hand before death.

2. It differs from cases of cut-throat, generally, in the circumstance, *first*, that more than one incision were made, and *secondly*, that both hands were employed for this purpose. The latter circumstance seemed more than probable, from regarding attentively the appearance of the edges of the wounds, since the peculiarity of direction and depth in an incision, made in this way, bears always a corresponding relation to the hand which has been used in inflicting it. But, if taken in connexion with two other cases on record, one detailed by Osiander, † and parallel in both particulars, just specified, to that under notice, the other narrated by Dr Gairdner ‡ and corresponding to the present case in respect of several incisions having been made, we shall be guarded against forming erroneous deductions as to any other case which may present such peculiarities, not being a case of suicide.

ling air upon the brain through one of the carotid arteries. (Op. cit. p. 270.) Again, cases of sudden death are mentioned by Morgagni, (Op. cit. § 19, § 24.) and other authors who have written on gaseous apoplexy, in which air was found in the vessels of the brain.

* F. B. Osiander, über den Selbstmord, Hannover, 1813. s. 156.

† Op. et loc. cit.

‡ Case of Attempt at Suicide, in the xvi. Volume of this Journal, p. 353.

3. The preceding observation explains satisfactorily, what in the practical examination of similar cases to those adverted to, calls usually from medical practitioners for especial regard; viz. the extreme *irregularity of form* in the incisions, a condition which has been, by Sir Everard Home,* regarded as a presumption always against suicide. † For we now see how, if a body be discovered on a road or in a retired spot, under circumstances leading to the apprehension of some suspected individual, and the marks usually assumed as those of suicide be found wanting on it, while others of a quite opposite character present themselves, medical testimony may (in ignorance of the facts alluded to) give countenance and support,—and that too, far wide of the truth,—towards establishing the validity of the charge which may be presented against the individual, solely on collateral and indirect evidence. And thus farther proof is afforded of a fact which criminal law so often serves to display, how an inadequate amount of knowledge,—like an insufficient *post mortem* inspection,—may render, in the progress of a serious trial, the results of the examination of medical witnesses matter of such momentous importance.

4. The uncommon situation of the wounds in this case is explicable on the circumstance of the partial acquaintance of the individual with the anatomy of the neck.

5. The unusual amount of important parts here divided, in wounds limited superficially, but made after repeated introductions of the cutting instrument,—is perhaps worthy of remark.

6. The circumstance, that notwithstanding the very deep and extensive incisions made with the view of opening the carotid artery, the anatomical relations of that vessel are such, that it alone, of all the contents of the cervical sheath of vessels, escaped injury, is probably an unique occurrence.

7. The heart, as in M. Beauchene's case, was perfectly empty of blood, and contained air alone; other cases of death from this accident having usually presented in this organ, commixed with the air, some blood, either in a fluid, ‡ or else in a frothy state. The lungs, as in Beauchene's, Dupuytren's § and a few other cases on record, were emphysematous,—a condition not ascribable apparently

* Dr Gordon Smith's *For. Med.* 1824, p. 305.

† I have given, (See Plate, Fig. 3.) from a subject brought this season into my Practical Anatomy Rooms, a comparative sketch of the *regularity of form* of a wound inflicted by another person, and which caused death in a few minutes. A woman plunged into the left side of the neck of her husband, in a direction downwards and forwards, between the angle of the jaw, and the anterior margin of the *sterno-mastoid* muscle, one of the pointed straight knives used for cutting leather. She thereby divided the posterior two-thirds of the internal carotid artery, the anterior part of the internal jugular vein, and the pneumogastric nerve. The incision in the skin was only three-fourths of an inch in length; its long axis lay in a transverse direction, and its edges were perfectly smooth and regular. In this case the state of the veins was not ascertained.

‡ Dupuytren, *Archiv. Gén.* v. 433.

§ *Ibid.*

to any degree of violence in the employment of artificial respiration in this, or probably in any case, excepting in that of M. Roux. * There was no injection of the capillaries of the stomach, or other organs; on the contrary, these were found, as already stated, paler in colour than natural.

8. The rigidity of the muscles was complete in this case one hour and a-half after death. This circumstance may probably appear worthy of mention, since, although the period of the approach of the rigidity of the body is observed to differ in different individuals, yet the opinion has been advanced by our first medical jurists, that "the rigidity of the muscles does not generally come on for some hours after death," † and "it has been laid down as a general rule, that the more sudden the death, the longer is cadaveric stiffness from taking place, and that this rigidity occurs only after the vital heat of the body is gone." ‡ But in the present instance the case was otherwise, the vital heat of the body having been evident to the senses after the commencement of the rigidity. In connexion with which fact may be mentioned, the opinion of Professor Louis, § who says, "it commences at the moment of death, even before the diminution of the natural heat;" and the evidence of Professor Traill, || that he has "known rigidity begin before death takes place, and it sometimes takes place immediately, and differently in different individuals and diseases."

*Edinburgh, 10, Shandwick Place,
November 20, 1837.*

* Journ. Univ. et Hebdom. xi. 165. Paris, 1833.

† Evidence of Professor Christison in the Report of the Trial of Robert Reid for murder, published by authority, Edin. 1835, pp. 24, 26.

‡ Paris and Fonblanque's Med. Jurisp. Vol. iii. p. 24. § Lettre iv.

|| Report of the Trial of Robert Reid, published by authority, pp. 27, 28.

Fig. 1.



Fig. 2.



Fig. 3.

