

ARTICLE VI.—*On certain Positions of the Head as a Cause of Syncope.* By J. SMITH, M.D., F.R.C.S., Surgeon-Dentist to the Royal Infirmary, etc.

(Read before the Medico-Chirurgical Society, 5th July 1865.)

SYNCOPE as a result of pressure on the internal carotids is a physiological experiment long familiar to medical men. I can find no allusion, however, to the possibility of producing pressure on the vessels of the neck with such a result, merely by certain positions in which the head may be placed.

The occurrence of cerebral symptoms on the occlusion or obstruction of any of the larger arteries leading to the brain has been recorded by various authorities. Dupuytren¹ relates several cases where death occurred from cerebral affections attributed to tying the carotid. Twelve² out of the fatal cases in Dr Norris's table died of symptoms referable to the brain, and which were apparently such as to suggest atrophic softening due to the operation. Kuhl³ of Leipzig describes convulsions and other cerebral symptoms following in a case where he tied both carotids, within twenty-seven days. But, without further allusion to the ultimate or more remote effects, we find the immediate result of arresting the circulation through the carotids—if this occur in both at once—to be syncope.

John Bell,⁴ after quoting Valsalva, Van Swieten, Pechlinus, Lower, Drelincurtius, and others, as experimenting on animals by impeding the cervical circulation, makes the following remarks regarding the human subject:—"The carotid arteries, says Valverde, being tied up or anyhow obstructed, the person grows stupid and falls presently into a profound sleep." Again, after referring with somewhat of a sneer to some cases in which pressure on the carotids was alleged to have been remedially employed by producing stupor, he adds, "If what Dr Parry says be true, that in lean people—in women at least—we can, by reclining the head back, compress the carotids entirely against the forepart of the neck with the finger and thumb, why then need we have fear of hæmorrhages of the nose, wounds about the jaw, cutting the parotid gland, or operations about the tonsils or tongue?"

What I would here advance, however, is, that by simply bending the head backwards, we can, without pressure of the finger and thumb, diminish or impede the circulation in all cases, not only through the internal carotids, but through the vertebral arteries; and, further, that in some persons, by widely opening the mouth and thereby bringing the angle of the lower jaw nearer the cervical

¹ Lesions of the Vascular System: Sydenham Society: pp. 53, 56.

² American Journal of Medical Sciences, vol. xiv. p. 22; and Holmes' Surgery, vol. iii. p. 498.

³ Chelius' Surgery.

⁴ Anatomy of the Human Body, p. 89.

vertebræ, while the head is in the position just described, such effect may be increased owing to the parts within and behind the angle of the jaw compressing, in certain cases, the internal carotids against the muscles anterior to the spine. The corollary being, that by such causes of disturbance of the circulation in the vertebrae and internal carotids, syncope may be produced.

In order to fortify any conclusion I might venture to draw from my own anatomical knowledge of the parts concerned, I submitted my views on the matter to Mr Turner of the University here, and I have the satisfaction to know that, on examining in the recent subject as well as in dry preparations, the relation of parts at the base of the skull, and the changes of position produced by the movements mentioned, he coincides with the opinion I am inclined to entertain.

On examining the arteries of the neck *in situ*, the readiness with which the circulation through the vertebrae as well as the internal carotids, could possibly be in this way interfered with, appears obvious. The internal carotid enters the foramen in the petrous portion of the temporal bone at a point in the base of the skull scarcely anterior to a line drawn transversely in front of the articulating processes of the occipital bone. The carotid foramen is about half an inch nearer the median line than the internal boundary of the glenoid cavity. The artery consequently lies immediately within the posterior border of the ascending ramus of the lower jaw. Before entering the skull it rests upon the transverse process of the atlas, having the thickness of the rectus capitis anticus muscle interposed between it and that vertebra, and, among other structures, it has lying in front of it a portion of the parotid gland. This gland, with these other structures, occupies a deep recess between the posterior edge of the ramus of the lower jaw and the anterior margin of the mastoid process and sterno-mastoid muscle. This,¹ the pterygo-pharyngeal space, undergoes considerable variations in size, produced, firstly, by the position of the head; secondly, by the movements of the lower jaw. On the chin being made to approximate the sternum, the ramus of the jaw glides backwards over the sterno-mastoid muscle, almost obliterating the space inferiorly. In this manner its contents become compressed, and as these include the internal carotids, the circulation through these vessels is impeded.

Now it has been shown² that arteries *in situ* normally exist in a state of tension. For example, the head being on a level with the body, a portion of the right common carotid artery of a man, when exposed in its natural position, was found to measure $1\frac{1}{16}$ inch. When carefully isolated and accurately divided after removal, it measured only $1\frac{1}{16}$ inch, the tension on the right carotid being thus represented by 3-10ths of an inch. A limit, however, is set

¹ Ledwich's Anatomy, p. 249.

² Savory "On the Shape of Transverse Wounds of Bloodvessels," pp. 10, 11.

to this extensibility of arteries, for the calibre of the canal is found to diminish in proportion to its elongation. Bearing these facts in mind, it will be recollected that besides the cervical vertebræ admitting of more antero-posterior movement, especially extension, than any other part of the spinal column, the skull itself can also be to a very free extent raised or depressed upon the occipito-atlantoid articulation. In this way, then, on the head being thrown back, the internal carotids become elongated, and are stretched over the face of the rectus anticus; and if while in this position there be superadded to the already diminished calibre of the vessel such depression of the lower jaw as makes its angle approach nearer the spinal column, we have the parts connected with and lying behind the ascending ramus encroaching upon the pterygo-pharyngeal space, and by pressing upon the already tense artery, still further impeding, and in some cases it may be arresting, the flow of blood.

¹The result of compressing both vertebral arteries might be anticipated to be more energetic than in the case of the carotids. In the vertebrals, any occluding effect likely to be produced by position of the head would appear liable to occur at that tortuous part of their course where they pass between the axis and atlas, and between the atlas and occipital bone; the artery, in this instance, being not only compressed, but as it were what is termed "kneed" across the edges of the bony structures among which it threads its way. The vertebral would thus appear to differ from the carotid in the mode of its obstruction, flexion of the vessel here aiding its occlusion. Extreme flexion has, as is well known, been pointed out² as capable of impeding the current of blood, through an arterial trunk, to an extent requiring special provision, in the vicinity of joints, for the vessel's safety—such as the diverticular channels always connected with arteries situated in such localities. In this manner the vertebrals would become shut up, as an elastic tube does on being abruptly bent, and, as has been already said, on the same principle as holds in the case of stopping the pulse at the wrist or ankle-joints by forcibly bending the knee or elbow; a principle on which the cure of aneurism has been suggested and carried out, and on which a considerable amount has been written by such authorities as Ernest Hart, Nunn, Moore, etc.

The occurrence of such tendency to faintness as might be produced in the manner above described, is in itself perhaps of no great moment, but it becomes of some importance when it is considered as a complication likely to arise, for instance during the administration of chloroform. Here every difficulty and every risk in an occurrence of the kind is to an immense degree increased, and recovery rendered more precarious. In some minor operations such risks are all the more liable to occur. Added to the sitting

¹ See Sir Astley Cooper—Guy's Hospital Reports, vol. i. pp. 450, 654.

² Nunn, "Observations and Notes on the Arteries of the Limbs," p. 23.

posture, during which, notwithstanding its danger, most such operations under chloroform are performed, we have in those of dental surgery that combined reclination of the head, with depression of the lower jaw, forming a circumstance not to be lost sight of. We know that in dental operations practitioners are familiar with instances where syncope occurs altogether apart from chloroform, and without any assignable cause whatever,—such as the infliction of pain or even the feeling of timidity. Among several cases coming under my own observation, I may here mention one, which indeed first directed my attention to the subject of this paper. On the morning of 8th May 1865, a strongly-built young man applied at the Dental Dispensary here, and required to have his upper incisors examined. He was not to have extraction or any painful operation performed, so there was no cause for apprehension, and he certainly exhibited no signs of timidity. He was seated on a high-backed chair, with his head bent as far backwards as possible in order to facilitate the examination of his upper teeth. I was engaged in this occupation when I observed his breathing to be embarrassed, and on looking at him found he was insensible. I attempted to lay back the chair with him on it, but found, from a screen standing behind it, that there was not room for this; his head was during this time hanging back, and on my supporting it, he came round again, looking somewhat confused. I asked him what was the matter, and if I had been hurting him. He replied, “No, sir; but it was jist something that cam owre my een.” Such cases are not uncommon in the practice of dentists, and their explanation in all probability lies in what is here assumed as a cause hitherto overlooked,—namely, the position of the patient’s head and lower jaw at the time such syncope occurs.¹

If, then, we can by attention to such points obviate, in however small a degree, the predisposition to syncope during operations of the kind, especially when performed under anæsthesia, it becomes a matter not only of interest physiologically, but of some importance towards ensuring the patient’s safety.

Lastly, I need not suggest, that should the hypothesis here advanced be accepted as correct, it might explain still more important phenomena than mere cases of fainting as above described. The occurrence of death during intoxication, and even of death during sleep, might, without exceeding the bounds of possibility be in some cases accounted for on similar principles,—namely, to obstructed circulation through the cervical arteries resulting from the position of the head.

¹ Since the occurrence of this case I have had my attention drawn to several others of the same kind.