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**Recovery from the passage of an iron bar
through the head**

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Mr President and Fellows of the Massachusetts Medical Society:

I have the pleasure of being able to present to you, to-day, the history and sequel of a case of severe injury of the head, followed by recovery, which, so far as I know, remains without a parallel in the annals of surgery. The case occurred nearly twenty years ago, in an obscure country town (Cavendish, Vt.), was attended and reported by an obscure country physician, and was received by the Metropolitan doctors with several grains of caution, insomuch that many utterly refused to believe that the man had risen, until they had thrust their fingers into the hole of his head, and even then they required of the Country Doctor attested statements, from clergymen and lawyers, before they could or would believe – many eminent surgeons regarding such an occurrence as a physiological impossibility; the appearances presented by the subject being variously explained away.

It is due to science, that a case so grave, and succeeded by such remarkable results, should not be lost sight of; that its subsequent history, termination, and pathological evidences, in detail, should have a permanent record. My desire to lay before the profession the sequel of this case, has not permitted me to remain altogether oblivious as to the whereabouts of my patient, and after tracing him in his wanderings over the greater part of this continent, I am able to present to you indubitable evidence that my report of the case, in the Boston Medical and Surgical Journal, was no fiction. You will find the report in Vol. 39, No. 20, page 389, of the Journal; also a subsequent report, with comments, by Prof. Henry J. Bigelow, in the American Journal of Medical Sciences for July, 1850.

The accident occurred in Cavendish, Vt., on the line of the Rutland & Burlington Railroad, at that time being built, on the 13th of September, 1848, and was occasioned by the premature explosion of a blast, when this iron, known

to blasters as a tamping iron, and which I now show you, was shot through the face and head.

The subject of it was Phin. P. Gage, a perfectly healthy, strong and active young man, twenty-five years of age, nervobilious temperament, five feet six inches in height, average weight one hundred and fifty pounds, possessing an iron will as well as an iron frame; muscular system unusually well developed – having scarcely had a day's illness from his childhood to the date of this injury. Gage was foreman of a gang of men employed in excavating rock, for the road way. The circumstances were briefly as follows:-

He was engaged in charging a hold drilled in the rock, for the purpose of blasting, sitting at the time upon a shelf of rock above the hole. His men were engaged in the pit, a few feet behind him, loading rock upon a platform car, with a derrick. The powder and fuse had been adjusted in the hole, and he was in the act of 'tamping it in', as it is called, previous to pouring in the sand. While doing this, his attention was attracted by his men in the pit behind him. Averting his head and looking over his right shoulder, at the same instant dropping the iron upon the charge, it struck fire upon the rock, and the explosion followed, which projected the iron obliquely upwards, in a line of its axis, passing completely through his head, and high into the air, falling to the ground several rods behind him, where it was afterwards picked up by his men, smeared with blood and brain. The missile entered by its pointed end, the left side of the face, immediately anterior to the angle of the lower jaw, and passing obliquely upwards, and obliquely backwards, emerged in the median line, at the back part of the frontal bone, near the coronal suture. The wound thus occasioned will be demonstrated and fully described to you hereafter. The iron which thus traversed the head, is known with blasters as a 'tamping iron', is round and rendered comparatively smooth by use, and is three feet seven inches in length, one and one-fourth inches in its largest diameter, and weighs thirteen and one-fourth pounds. The end which entered first is pointed, the taper being about twelve inches long, and the diameter of the point one-fourth of an inch.

The patient was thrown back by the explosion, and gave a few convulsive motions of the extremities, but spoke in a few minutes. His men (with whom he was a great favourite) took him in their arms and carried him to the road, only a few rods distant, and put him into an ox cart, in which he rode, supported in a sitting posture, fully three-quarters of a mile to his hotel. He got out of the cart himself, with a little assistance from his men, and an hour afterwards (with what I could aid him by taking hold of his left arm) walked up a long flight of stairs, and got upon the bed in the room where he was dressed. He seemed perfectly conscious, but was becoming exhausted from the haemorrhage, which, by this time, was quite profuse, the blood pouring from the lacerated sinus in the top of his head, and also finding its way into the stomach, which ejected it as often as every fifteen or twenty minutes. He bore his sufferings with firmness, and directed my attention to the hole in his cheek, saying 'the iron entered there and passed through my head.' Pulse at this time was 60, soft and regular. He

recognized me at once, and said 'he hoped he was not much hurt.' His person, and the bed on which he lay, was one gore of blood. Assisted by my friend Dr. Williams, who was first called to the patient in my absence, we proceeded to examine and dress his wound. From the appearance of the wound in the top of the head, the fragments of bone being lifted up, the brain protruding from the opening and hanging in shreds upon the hair, it was evident that the opening in the skull was occasioned by some force acting from below, upward, having very much the shape of an inverted funnel, the edges of the scalp everted and the frontal bone extensively fractured, leaving the irregular oblong opening in the skull of two by three and one-half inches. The globe of the left eye was protruded from its orbit by one-half its diameter, and the left side of the face was more prominent than the right side. The pulsations of the brain were distinctly seen and felt.

The scalp was shaven, the coagula removed, with three small triangular pieces of frontal bone, and in searching to ascertain if there were foreign bodies in the brain, I passed the index finger of the right hand into the opening its entire length, in the direction of the wound in the cheek, which received the left index finger in like manner, the introduction of the finger into the brain being scarcely felt. Aside from the triangular pieces already alluded to as removed, there were two other pieces detached from the frontal bone, the anterior being two and one-half by two inches, and the posterior one and one-half by two inches in size, leaving the antero-posterior diameter of the opening in the skull fully three and one-half inches.

This examination, and the appearance of the iron which was found some rods distant smeared with blood and brain, together with the testimony of the workmen and of the patient himself, who was sufficiently conscious to say that the iron 'struck his head and passed through', was considered at the time as sufficiently conclusive, not only of the nature of the accident, but the manner in which it occurred.

[section omitted]

On the 25th (of November) he was taken, in a close carriage, a distance of thirty miles, to Lebanon N.H., his home, where I saw him the succeeding week, and found him going on well. He continued to improve steadily, until on Jan. 1, 1849, the opening on the top of his head was entirely closed, and the brain shut out from view, though every pulsation could be distinctly seen and felt. Gage passed the succeeding winter months in his own house and vicinity, improving in flesh and strength, and in the following April returned to Cavendish, bringing his 'iron' with him.

He visited me at that time, and presented something like the following appearances. General appearance good; stands quite erect, with his head inclined slightly towards the right side; his gait in walking is steady; his movements rapid and easily executed. The left side of his face is wider than the right side, the left malar bone being more prominent than its fellow. There is a linear cicatrix near

the angle of the lower jaw, an inch in length. Ptosis of the left eyelid; the globe considerably more prominent than its fellow, but not as large as when I last saw him. Can adduct and depress the globe, but cannot move it in other directions; vision lost. A linear cicatrix, length two and one-half inches, from the nasal protuberance to the anterior edge of the raised fragment of the frontal bone, is quite unsightly. Upon the top of the head and covered with hair, is a large unequal depression and elevation – a quadrangular fragment of bone, which was entirely detached from the frontal, and extending low upon the forehead, being still raised and quite prominent. Behind this is a deep depression, two inches by one and one-half inches wide, beneath which the pulsations of the brain can be perceived. Partial paralysis of left side of face. His physical health is good, and I am inclined to say that he has recovered. Has no pain in head, but says it has a queer feeling which he is not able to describe. Applied for his situation as foreman, but is undecided whether to work or travel. His contractors, who regarded him as the most efficient and capable foreman in their employ previous to his injury, considered the change in his mind so marked that they could not give him his place again. The equilibrium or balance, so to speak, between his intellectual faculties and animal propensities, seems to have been destroyed. He is fitful, irreverent, indulging at times in the grossest profanity (which was not previously his custom), manifesting but little deference for his fellows, impatient of restraint or advice when it conflicts with his desires, at times pertinaciously obstinate, yet capricious and vacillating, devising many plans of future operation, which are no sooner arranged than they are abandoned in turn for others appearing more feasible. A child in his intellectual capacity and manifestations, he has the animal passions of a strong man. Previous to his injury, though untrained in the schools, he possessed a well-balanced mind, and was looked upon by those who knew him as a shrewd, smart business man, very energetic and persistent in executing all his plans of operation. In this regard his mind was radically changed, so decidedly that his friends and acquaintances said he was 'no longer Gage'.

His mother, a most excellent lady, now seventy years of age, informs me that Phineas was accustomed to entertain his little nephews and nieces with the most fabulous recitals of his wonderful feats and hair-breadth escapes, without any foundation except in his fancy. He conceived a great fondness for pets and souvenirs, especially for children, horses and dogs – only exceeded by his attachment for his tamping iron, which was his constant companion during the remainder of his life. He took to travelling, and visited Boston, most of the larger New England towns, and New York, remaining awhile in the latter place at Barnum's, with his iron. In 1851 he engaged with Mr Jonathan Currier, of Hanover, New Hampshire, to work in his livery stable. He remained there, without interruption from ill health, for nearly or quite a year and a half.

In August, 1852, nearly four years after his injury, he turned his back upon New England, never to return. He engaged with a man who was going to Chili, in South America, to establish a line of coaches at Valparaiso. He remained in

Chili until July, 1860, nearly eight years, in the vicinity of Valparaiso and Santiago, occupied in caring for horses, and often driving a coach heavily laden and drawn by six horses. In 1859 and '60 his health began to fail, and in the beginning of the latter year he had a long illness, the precise nature of which, I have never been able to learn. Not recovering fully, he decided to try a change of climate, and in June, 1860, left Valparaiso for San Francisco, where his mother and sister resided. The former writes that 'he arrived in San Francisco on or about July 1st, in a feeble condition, having failed very much since he left New Hampshire. He suffered much from seasickness on his passage out from Boston to Chili. Had many ill turns while in Valparaiso, especially during the last year, and suffered much from hardship and exposure.'

After leaving South America I lost all trace of him, and had well nigh abandoned all expectation of ever hearing from him again. As good fortune would have it, however, in July, 1866, I was able to learn the address of his mother and very soon commenced a correspondence with her and her excellent son-in-law, D. D. Shattuck, Esq., a leading merchant in San Francisco. From them I learned that Gage was dead – that after he arrived in San Francisco his health improved, and being anxious to work, he engaged with a farmer at Santa Clara, but did not remain there long. In February, 1861, while sitting at dinner, he fell in a fit, and soon after had two or three fits in succession. He had no premonition of these attacks, or any subsequent ill feeling. 'Had been ploughing the day before he had the first attack; got better in a few days, and continued to work in *various places*;' 'could not do much, *changing often*, and always finding something which did not suit him in every place he tried.' On the 18th of May, 1861, three days before his death he left Santa Clara and went home to his mother. At 5 o'clock, A.M., on the 20th, he had a severe convulsion. The family physician was called in, and bled him. The convulsions were repeated frequently during the succeeding day and night, and he expired at 10, P.M., May 21, 1861 – twelve years, six months and eight days after the date of his injury. These convulsions were unquestionably epileptic. It is regretted that an autopsy could not have been had, so that the precise condition of the encephalon at the time of his death might have been known. In consideration of this important omission, the mother and friends, waiving the claims of personal and private affection, with a magnanimity more than praiseworthy, at my request have cheerfully placed this skull (which I now show you) in my hands, for the benefit of science.*

I desire here to express gratefully my obligations, and those of the Profession, to D. D. Shattuck, Esq., brother-in-law of the deceased; to Dr. Coon, Mayor of San Francisco, and to Dr. J. D. B. Stillman, for their kind cooperation in executing my plans for obtaining the head and tamping iron, and for their

* The skull and iron have been deposited, by the writer, in the Museum of the Medical Department of Harvard University, in Boston.

fidelity in personally superintending the opening of the grave and forwarding what we so much desired to see.

The missile entered, as previously stated, immediately anterior and external to the angle of the inferior maxillary bone, proceeding obliquely upwards in the line of its axis, passed under the junction of the superior maxillary and malar bones, comminuting the posterior wall of the antrum, entered the base of the skull at a point, the centre of which is one and one-fourth inches to the left of the median line, in the junction of the lesser wing of the sphenoid with the orbital process of the frontal bone – comminuting and removing the entire lesser wing, with one-half of the greater wing of the sphenoid bone – also fracturing and carrying away a large portion of the orbital process of the frontal bone, leaving an opening in the base of the cranium, after the natural effects at repair by the deposit of new bone, of one inch in its lateral, by two inches in its antero-posterior diameters, with a line of fracture or fissure leading anteriorly through the orbital place of the frontal bone, the anterior fossa, and deflecting laterally, towards the median line, divides the left frontal sinus, at the supra-orbital notch, and ascends the forehead along the left margin of the ridge, for the attachment of the falx major. Inferiorly the line of separation begins at the infra-orbital foramen and malar process of the supra-maxillary from the body of the bone, terminating at a point upon the superior maxillary opposite the last molar tooth. – The bones implicated in its passage were the superior maxillary, malar, sphenoid, and frontal. The iron, as you will perceive, entered the left cerebrum at the fissure of sylvius, possibly puncturing the cornu of the left lateral ventricle, and in its passage and exit must have produced serious lesion of the brain substance – the anterior and middle lobes of the cerebrum – disintegrating and pulpifying it, drawing out a considerable quantity of it at the opening in the top of the head, and lacerating unquestionably the upper aspect of the falx major and the superior longitudinal sinus. As the iron emerged from the head, it comminuted the central portion of the frontal bone, leaving an irregular oblong opening in the bone of three and one-half inches in its antero-posterior, by two inches in its lateral diameter. Two of these fragments, as you will see from the specimens before you, were re-united.

Remarks

I. No attempt will be made by me to cite analogous cases, as after ransacking the literature of surgery in quest of such, I learn that all, or nearly all, soon came to a fatal result. Hence I conclude to leave that task to those who have more taste for it. This case is chiefly interesting to me, as serving to show the wonderful resources of the system in enduring the shock and in overcoming the effects of so frightful a lesion, and as a beautiful display of the recuperative powers of nature. It has been said, and perhaps justly, that ‘the leading feature of this case is its improbability’ (Bigelow.) This may be so, but I trust, after what has been shown to you today, that the most skeptical among you have been convinced of its

actual occurrence – that it was no ‘Yankee invention’, as a distinguished Professor of Surgery in a distant city was pleased to call it. Moreover, it would seem, when we take into account all the *favoring circumstances*, that we may not only regard partial recovery as possible, but exceedingly probable. These I will name briefly.

1st. The subject was the man for the case. His physique, will, and capacity of endurance, could scarcely be excelled.

2d. The shape of the missile – being pointed, round and comparatively smooth, not leaving behind it prolonged concussion or compression.

3d. The point of entrance outside of the superior maxillary bone – the bolt did little injury until it reached the floor of the cranium, when, at the same time that it did irreparable mischief, it opened up its way of escape, as without this opening in the base of the skull, for drainage, recovery would have been impossible.

4th. The portion of the brain traversed, was, for several reasons, the best fitted of any part of the cerebral substance to sustain the injury.

II. This case has been cited as one of complete recovery, it being often said that a very considerable portion of the left cerebrum was lost, without any impairment in the intellect. I think you have been shown that the subsequent history and progress of the case only warrant us in saying that, physically, the recovery was quite complete during the four years immediately succeeding the injury, but we learn from the sequel that ultimately the patient probably succumbed to progressive disease of the brain. Mentally the recovery certainly was only partial, his intellectual faculties being decidedly impaired, but not totally lost; nothing like dementia, but they were enfeebled in their manifestations, his mental operations being perfect in kind, but not in degree or quantity. This may perhaps be satisfactorily accounted for in the fact that while the anterior and a part of the middle lobes of the left cerebrum must have been destroyed as to function, its function suspended, its fellow was left intact, and conducted its operations singly and feebly.

III. Little has been said in the foregoing account as the treatment or conduct of this case, this being regarded as quite unnecessary. The initiatory treatment, received from the iron, though it might not be well received in this presence, you will permit me to say, was decidedly antiphlogistic, a very large amount of blood having been lost. May we not infer that this prepared the system for the trying ordeal through which it was about to pass? The recovery is attributed chiefly to *vis vitæ*, *vis conservatrix*, or, if you like it better, to the *vis medicatrix naturæ*, of which this case is a striking exemplification.

I desire to call your attention, in passing, to two critical periods in the progress of the case, when what was done undoubtedly changed the tendency to a fatal result. The first was on the fourteenth day, when the large abscess, which probably communicated with the left lateral ventricle, was opened, followed by a marked improvement in all the symptoms. The second was on the sixty-fourth day, at which he was bled sixteen ounces.

I indulge the hope, that surely but *little* if anything was done to retard the progress of the case, or to interfere with the natural recuperative powers. Nature is certainly greater than art. Some one has wisely said, that vain is learning without wit. So we may say, vain is art without nature. For what surgeon, the most skilful, with all the blandishments of his art, has the world ever known, who could presume to take one of his fellows who has had so formidable a missile hurled through his brain, with a crash, and bring him, without the aid of this *vis conservatrix*, so that, on the fifty-sixth day thereafter, he would have been walking in the streets again? I can only say, in conclusion, with good old Ambrose Paré, I dressed him, God healed him.