

## JAMES YOUNG SIMPSON AND THE "SUCTION-TRACTOR"

BY

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IN view of the increasingly frequent and widespread use of various types of vacuum extractor during recent years, it seems appropriate to acknowledge the priority of James Young Simpson in the effective application of a vacuum to the presenting part of the foetus for the purpose of affixing a traction device to aid delivery.

Simpson, the seventh child of a baker, was born in Bathgate, West Lothian, on 7th June, 1811. He showed early in life an insatiable desire for knowledge, and, apart from his many

contributions to medicine, was a keen student of archaeology, which became his favourite recreation. Whilst he is probably best remembered for his discovery of the anaesthetic properties of chloroform, and their application to obstetrics, he made many other contributions to medicine. He wrote papers on hospital design, mesmerism, homoeopathy, and acupressure. His archaeological interests were reflected in papers on "Medical Officers in the Roman Armies" and "Lepers and Leper Houses", and he was regarded as an authority on sculptured stones (Macaulay, n.d.).

He possessed rare qualities of heart as well as an exceptional intellect (Ian Grindlay Simpson, 1947) and showed a profound sympathy with all who suffered. This was demonstrated particularly in his assiduous search for a method of bringing relief of pain to the woman in labour. After he had experimented with mesmerism and with ether, his search reached a triumphant conclusion on the evening of 4th November, 1847, when after inhaling "perchloride of formyle", he crashed to the floor of his dining-room at 52 Queen Street, Edinburgh, accompanied by his assistants Matthews Duncan and Keith, and by his wife's niece, Miss Agnes Petrie, who, as she fell, exclaimed repeatedly, "I'm an angel, I'm an angel" (Ian Grindlay Simpson, 1947). This was the lady who later, having got into the habit of sniffing chloroform to relieve insomnia, married a clergyman. Her husband had to break this habit as his first task after marriage (T. B. Simpson, 1947).

In 1911, Sir Alexander R. Simpson, celebrating the centenary of the birth of his distinguished uncle and predecessor in the chair of midwifery in the University of Edinburgh, referred to him as "Facile princeps on any topic". He quotes Sir Henry Littlejohn (1907) who observed that "His casual remarks (like those of John Hunter) on any department of medical science, opened up lines of investigation



FIG. 1

James Young Simpson as a young man (c. 1840).

fresh and invigorating. Nihil tetigit quod non ornavit." Mrs. M. F. Barbour (1897) stated that difficulties only fed the fire that burned in his breast. His faculty for using all situations in the furtherance of the work in which he was engaged is shown by the story of his occupying his time, when kept waiting for a ferry-boat, in chloroforming the eels in a pool.

Simpson was not the first to suggest the use of an air-tractor to assist delivery. James Yonge (1646–1721), who was surgeon to the Naval Hospital at Plymouth, and Mayor of that city in 1694, recorded a case of prolonged labour where "a cupping glass fixt to the scalp with an air pump failed to draw out the head. In this extremity, I directed my son to open the child's head. This was soon and easily done and delivery completed" (Yonge, 1706–1707).



FIG. 2

James Yonge, Mayor of Plymouth, 1694.

The next reference to the principle came from Saemann of Jena (1794) whose brief paper reads "I saw in a dream an air pump wherewith one can seize the head of an infant without injury to mother or child. The pump was made of brass and had a covering of rubber with ventilators" (probably devices with which to induce a vacuum). "This is a dream which might come true." There is no evidence that the dream, in fact, did so until Simpson's time.

Neil Arnott (1788–1874) was born in Arbroath, and educated at Aberdeen Grammar School, Marischal College, Aberdeen and St. George's Hospital, London. He was a man whose breadth of interest and intellectual curiosity rivalled those of Simpson himself, and in his obituary notice in the *Lancet* (1874) Chaucer's phrase "Gladly wolde he lerne and gladly teche" was appropriately applied to him. A second obituary in the *Proceedings of the Royal Society* (1876–77) described his life-long interest in natural objects. He entered the East

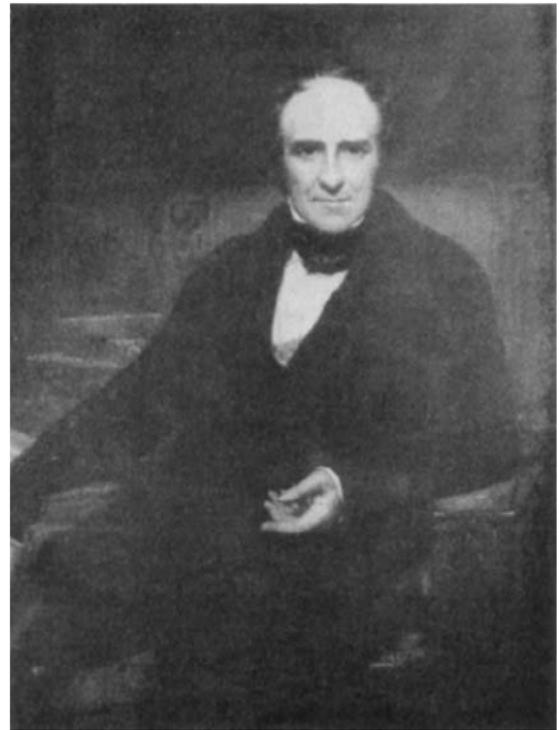


FIG. 3

Neil Arnott (1788–1874).

India Company as a surgeon and undertook several voyages to China 1807–1811. During this time, he was in charge of Indian crews, and took an interest in ventilation, warmth, clothing, food and exercise. In 1832, he invented a water-bed, and in 1855, a smokeless grate. Towards the end of his life he was working on the development of a chair-bed to prevent sea-sickness and in the year of his death (1874) on a floating breakwater, possibly a precursor of the Mulberry harbour of 1944. In 1829, he published the first edition of his *Elements of Physics or Natural Philosophy* in which he advocated the use of a pneumatic tractor. This, he suggested, should be a circular piece of leather or other soft substance, which could be extended by solid rings or radii. Such a tractor, he continued, “seems peculiarly adapted to a purpose of obstetric surgery, viz., as a substitute for steel forceps in the hands of men who are deficient in manual dexterity, whether from inexperience or natural ineptitude”. In addition, he suggested that the pneumatic tractor might “assist in raising depressed portions of fractured skull”. This method was hinted at much earlier by Ambrose Paré whose work, translated by Thomas Johnson (1665) reads “If the bones do not spring back of themselves, you must apply a cupping glass with a great flame, with all command the patient to force his breath up as powerfully as he can, keeping his mouth and nose shut”.

The idea of an air tractor had occurred to Simpson as early as 1836 (Duns, 1873). Robert Patterson, in a letter of 7th April, 1849, recalls how he and Simpson “In passing along the street together in 1836 happened to come upon a group of boys lifting large stones with round pieces of leather wetted commonly called suckers”. Simpson then suggested the use of a similar instrument in medical practice. He was, however, aware of Arnott’s work which he acknowledged in his paper on the “Suction Tractor” (1849a) as well as that of Paré (Johnson, 1665) and of Hildanus (1632) who wrote “Depressed fracture of the skull in infants with soft bones may be brought up with a leather sucker”.

It seems that the suction tractor was one of the many ideas which occupied Simpson’s fertile brain for several years, until in December, 1848,

a year after his discovery of chloroform, he wrote “I have been up for three nights working as I am here. When I get home, I will enclose in this two tractors. The instrument is now nearly perfect. I showed it last Wednesday to the Medico-Chirurgical Society. The experiments went off beautifully. I fixed a small tractor to the palm of my hand and lifted up with it an iron weight of 26 pounds. It could lift double. Dr. Margulies of St. Petersburg Court, doubted if it would really answer in practice. Well, I took him and others down a few days ago to the hospital to see a baddish case and fixed the tractor on. The operation was successful. The Russian danced with joy, crying, ‘C’est superbe, superbe, c’est immortalité à vous’.”

The paper referred to in the above letter, recorded in the *Proceedings of the Edinburgh Obstetric Society*, for 20th December, 1848, appeared in the *Monthly Journal of Medical*



FIG. 4  
The suction-tractor (1849).



FIG. 5  
The suction-tractor with induced vacuum.

*Sciences* (1849) under the title "On a Suction Tractor; or New Mechanical Power, as a substitute for Forceps in Tedious Labours" (Simpson, 1849a). In this he refers to the suction discs of limpets and cuttle-fish as well as "the common sucker used by the schoolboy to lift stones". He had adapted the same principle so as to obtain a grip on the presenting portion of the foetal head in a case of prolonged labour. A common metallic vaginal speculum was fitted with a piston and its broader trumpet-shaped end covered with leather and greased with lard. This end was then applied to the foetal scalp, the piston withdrawn so as to exhaust air from the system, and the child's head successfully delivered.

In a later paper read to the Medico-Chirurgical Society of Edinburgh on 7th February, 1849, he reported that he had tried a great variety of forms. The most effective "consisted of a slender short brass syringe (1½ or 2 inches long) worked by a double-valved piston, like a breast-pump, having attached to its lower extremity a cup of half an inch in depth, and 1½ inches broad at its edge. Over this inner cup was placed a second cup formed of vulcanized caoutchouc, and so deep as to overlap the edge of the inner by six or eight lines. The mouth of the inner cup was covered by a diaphragm of very open brass wire gauze, and over it a piece of thin sponge, flannel, or the like, was placed, with the view of preventing injury to the scalp, and not allowing it to be elongated and drawn up into the vacuous space in the manner which we see occurring with the skin in the common operation of cupping. The parts thus applied to the child's head consisted of caoutchouc and sponge" (Simpson, 1849d). In this paper, Simpson referred to the earlier work of Arnott, and indeed quoted extensively from it, but claimed that "he was not aware that anyone had applied practically this obstetric means before it was employed in the case detailed to the society". He also remarked on the use of tractors in the treatment of depressed fractures of the skull by Paré, Hildanus and others.

The earlier paper was quoted in full in the *London Medical Gazette* (1849) the editor stating "The merit of the discovery and its application to practical purpose rest with Dr.

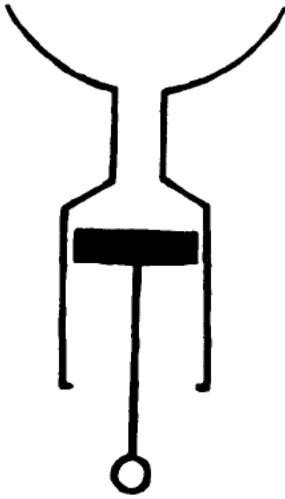


FIG. 6

John Haddy James (1788–1869).

Simpson". The editor of the sister-journal, the *London Journal of Medicine*, had reservations; his comment reads "We much fear that this proposed substitute for forceps may only lead to disappointment. We almost dread the infant's scalp being torn off or a parietal bone dragged out. Our fears may be visionary and certainly the communication of Professor Simpson is most deserving of attention. Before approving of the proposal, we must wait to see it fully tested in practice."

In the same issue of the *London Medical Gazette* in which Simpson's paper was quoted, James of Exeter reported that he had independently devised a suction instrument. John Haddy James was a man of great distinction in his time (1788 to 1869). He was surgeon to the Royal Devon and Exeter Hospital from 1816–1865. In 1828 he was Mayor of Exeter, and in 1832 he travelled to Worcester Infirmary to meet Charles Hastings and others, in order to found the Provincial Medical and Surgical Association



## Suggested 'Vacuum tractor'

JAMES 1849.

FIG. 7

(From *London Medical Gazette*, 1849.)

(Jones, 1953). His greatest contribution to surgery was a description of skeletal traction for the treatment of fractures (James, 1844). The primary purpose of his instrument was to remove the placenta, in cases where it was separated but retained. Although there is no record of his having actually constructed such an instrument, he suggested that it might have a wider usefulness. It could be applied "before the ear can be felt, and consequently before a short forceps can be applied". In many cases of defective uterine action, where forceps would be employed with reluctance, it might readily be employed. Finally "in many cases of disproportion too high for the forceps to be employed, it could bring the head within reach of the forceps" (James, 1849).

In the next issue of the *London Medical Gazette* appeared a letter addressed to Simpson from James Mitchell (1849) who had attended Simpson's lecture class of 1847-48. In this he claimed to be "the discoverer of the application

of the principle in such instruments . . . You stated that you had attempted to apply a leather sucker to the foetal head, and failed to get it to adhere. I made my own design known to you, in the answer to question three at the end of term examination, in speaking of the rotation from occipito-posterior position to occipito-anterior position. On another sheet, I made a rough sketch of the instrument."

Simpson, in his reply, claimed that he had never even looked at the examination paper in question, which was corrected by Matthews Duncan, his assistant (Simpson, 1849b). Duncan (1849) denied having found any such description in Mitchell's paper, and reproached the Editor "by publishing Dr. Mitchell's statements (refused by other journals) you have given them a notoriety they do not deserve".

Later in the same year, 1849, Simpson recorded that he had thought and talked of making an air tractor for many years, but "in December, 1848, after observing the artificial French leech, I thought that an exhausting cylinder on the same principle would answer the purpose" (Simpson, 1849c). This may well have been the instrument devised by Guidicelli (1847a) which incorporated a suction apparatus and a dart to pierce the skin, and which its author claimed was cheaper than ordinary leeches and "free from disadvantages" (Guidicelli, 1847b).

In the *London Medical Gazette* (1849) he stated "I have now employed it repeatedly both in cephalic and pelvic presentations, and both when the head was already high above the brim and already sunk into the pelvic cavity" (Simpson, 1849c). Simpson lived for another 21 years, until 1870, but I have been unable to trace any further reference to the suction tractor in his writings. In 1855, however, Priestly and Storer, editing *The Obstetric Memoirs and Contributions of Sir James Young Simpson* recorded both his earliest tractor, adapted from a vaginal speculum, and his ultimate more successful model. It seems, however, that the principle was gradually abandoned by Simpson, only to be taken up by a succession of designers until the most successful instrument designed up to the present, that of Malmström (1955), which is now so extensively used all over the world.

Why did Simpson abandon this promising

method? Even such a tireless innovator as Simpson must have had his hands full in those years towards the mid-century. Despite the encouraging observations of Priestly and Storer (1855) "When we consider the rude form of the early forceps, we have reason to hope that the tractor may at some future time be so far improved as to be easily applied and used", he met with much opposition. The Editor of the *London Journal of Medicine*, whose critical fears have already been quoted, wrote in another editorial of "the new obstetric instrument described by Simpson, which when further improved might prove useful in many cases where the short forceps are ordinarily used. We cannot help feeling, however, that 'bad workmen always have bad tools' and that good practitioners will do more and with less fuss and difficulty with their old-fashioned short forceps than with all the new appliances". In addition, Simpson was engaged in the development of the obstetric forceps and it was on 10th May, 1848, only seven months before his first paper on the suction tractor, that he described his long forceps to the Edinburgh Obstetric Society (Simpson, 1849e).

In the light of present-day experience it seems probable that Simpson's instrument had two major defects. The cup destined to be applied to the scalp was fixed rigidly to the vacuum syringe, and this must have led (a) to difficulty in the application of the instrument to any presenting part not already well down on the perineum and (b) to a limitation of the direction of traction. Secondly, the flexibility of the cup meant that the adhesion of the scalp was less satisfactory than that obtained with a rigid cup and particularly with the recurved cup of the Malmström apparatus. These difficulties have to a large extent been overcome in the modern instruments of Couzigou (1947) and Malmström (1955) and it is to this that in large measure they owe their greater success. None the less, we cannot do better than to remember Simpson's last published words in this connexion: "I believe that the construction of the air tractor is still very far from being so perfect as it will yet be rendered" (Simpson, 1849c). It seems probable that these words still hold true today despite the many advances that have been made.

As our experience of vacuum extraction and its application to various problems of obstetrics

increases it is salutary to remember that 114 years ago, Simpson had already described many of the valuable advantages which these instruments have to offer us today including the management of cases of disordered uterine action, of arrested breech presentation and of persistent occipito-posterior position, when it "would be simpler and safer than any of the other methods proposed" (Simpson, 1849c).

In the words of R. W. Johnstone (1947) "His name was writ in chloroform, but he was first and last an obstetrician", and in this field as in many others we who have succeeded him can look back on his work with pride.

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