

## INTRODUCTORY NOTES

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*I have no idea when I first obtained a photocopy of this paper but it has been in my possession for many years as a valuable personal source of information about the influence James Blundell had on the early history of blood transfusion. This well written and authoritative article provides an excellent overview of James Blundell's life and work, as well as listing and summarising the first blood transfusions performed by him. It includes references to the people who influenced him in his early career, his disagreements at Guy's Hospital and an excellent description of the different equipment he devised.*

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## **THE INFLUENCE OF JAMES BLUNDELL ON THE DEVELOPMENT OF BLOOD TRANSFUSION**

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From the Medical Department of Jefferson Medical College Hospital  
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The transfusion of blood fell into disrepute and practical oblivion after the decree of the French Chamber of Deputies in 1668.<sup>1</sup> This ban and the entailed punishment discouraged investigation on this subject and for almost a century and a half, only a few derogatory comments appear in text books and scarcely half a dozen cases are reported in the literature.

Hemorrhage and particularly that occurring post partum, appalled the obstetrician and surgeon. The treatment of this tragic complication was more a matter of despair than therapy. Death by a cause so obvious suggested the return of the blood into the circulation and James Blundell, a London obstetrician, encouraged by the experiments of Dr. Leacock of the Barbadoes<sup>2</sup> investigated the transfusion of blood "with a view of keeping this valuable operation before the profession and in the hope of adding somewhat to the body of facts."<sup>2</sup>

James Blundell was born in 1790. He was the nephew of the "Merciless Doctor" Haighton, the vivisectionist, physiologist, pupil of John Hunter, and Sir Astley Cooper's rival for lectureship in the Great Windmill Street school.<sup>3</sup> Beginning his studies in medicine under his uncle, he numbered among his preceptors Cooper, Cholmeley<sup>12</sup>, Munro, the Duncans and Hume. In his twenty-third year he received his medical degree from the University of Edinburgh, presenting, as his graduation

thesis, a study of the differences in the senses of hearing and music “De sensu quo melos sensitur.”<sup>4</sup> A year later he became active in obstetrical teaching with Dr. Haighton and upon the death of this uncle nine years later, succeeded to the chair of physiology and obstetrics at the combined schools of St. Thomas and Guy’s Hospital. His lectures attracted the largest obstetrical classes in all London.<sup>9</sup> These lectures in Midwifery were published in the *Lancet* during the legal controversy between its editor and Sir Astley Cooper. The sharp censure which Blundell received for so endorsing an adversary of Guy’s Hospital caused a breach in his relations with the institution he had served for twenty-four years. These lectures were subsequently published in book form in Washington, D. C. and his “Obstetrics” was probably one of the few medical books, printed here at that time.<sup>5</sup>

In 1819 Blundell elucidated some controversial points on the generation in mammals<sup>2</sup>; in 1821 he conducted a series of careful experiments on rabbits and concluded:

From these experiments the author is inclined to infer presumptively that moderate opening into the human peritoneum will not necessarily nor more generally prove fatal from inflammation or otherwise, and further that certain viscera or parts of viscera not essential to the welfare of our structure may be removed from the belly without necessarily or even generally producing death.<sup>2</sup>

In these investigations he removed the kidney, spleen and pieces of the urinary bladder, and encouraged by these results he advocated bolder abdominal surgery. The *Lancet* in critically reviewing this book conceded the possibility and necessity of opening the abdominal cavity and perhaps removing an ovary but asks “What benefit can we ever expect from removing the spleen?”<sup>6</sup> Blundell removed a cancerous uterus vaginally in a Mrs. Moulden which was possibly the first operation of its kind in Great Britain (Ref. 2, fly leaf). A year later the autopsy of this patient was done by Thomas Hodgkin and the specimen is now in the Museum of the Royal College of Physicians of London.<sup>7</sup>

It was during this period of his life that Blundell became interested in the neglected operation of the transfusion of blood, a subject with which his name will probably be connected as long as this procedure is practiced.



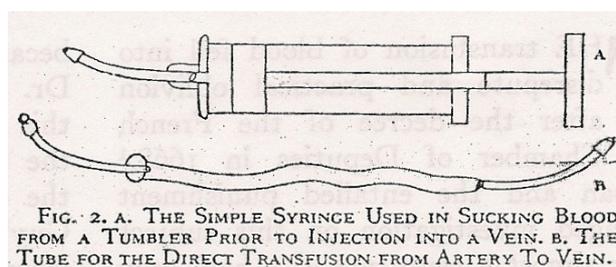
FIG. 1. JAMES BLUNDELL (1790-1877).

The breach between Blundell and his Contemporaries at Guy’s Hospital widened and in 1838, while on a visit to the continent, a successor was appointed without consulting him. This break in precedent deprived Blundell of the usual emolument received in the transfer of a Chair; he became incensed, severed all relations with the

hospital, removed the remainder of his museum and library and drove away in his 'Yellowish Chariot' never to return.<sup>8</sup>

Soon afterward he retired from active practice probably influenced by a fortune of 550,000 pounds sterling which he had accumulated in practice and in bequests.<sup>9</sup> The remainder of his leisurely bachelorhood was devoted to the classics and in collecting a library which at the time of his death in 1877 numbered over three hundred rare volumes on Midwifery and Diseases Peculiar to Women.<sup>10</sup>

When Blundell devoted his attention to the neglected operation of blood transfusion he found practically a virgin field with little but guesswork and disastrous results prejudicing the minds of the physicians against this procedure. Most of the previous thought on the transfusion question was dominated by the pre-Harveian physiology of the blood. Ideas were still prevalent that the blood was "alive". John Hunter wrote in 1817, "One of the great proofs that the blood possesses life depends upon the circumstances affecting its coagulation. If the blood had not the living principle it would be in respect to the body as an extraneous substance."<sup>11</sup> "The inclinations follow ordinarily the constitution of our blood and the inequalities which one meets with in the minds of men are owing to the diversity of their blood" writes Lamy quoted by a confrere of Blundell.<sup>13</sup> Reflecting on these prevalent notions and believing that the technical details of the operation of transfusion were responsible for the failures, Blundell decided "As it seemed doubtful whether the blood would remain fit for the animal functions after the passage through the instrument, the following experiments were constructed with a view to ascertain the point submitted to recommend a rejected operation to the experimental investigation it seemed to deserve."<sup>14</sup>



The investigations were performed upon dogs and constitute one of the first systematic and extensive experiments upon transfusion of blood. The methods were, first, the direct connection between artery and vein by the use of the time-honored cannula (Fig. 2B); then a plain syringe (Fig. 2A) in which the blood was first run into a tumbler and then sucked up into the barrel of the instrument and thus injected into the vein of the recipient; and finally the modifications of the syringe which will be described in their places. Having become satisfied that the blood would not be vitiated by the simple manipulation of putting it into a container, Blundell constructed an apparatus which he believed would facilitate transfusion; the principle of which is reflected in many of our modern appliances (Fig. 3).

The whole apparatus is mounted perpendicularly on an upright post and the floor on which this rests is poised with lead in order that the operator may not be embarrassed by the instability of the instrument. The joints are air tight. The syringe ... is made of brass. Its capacity is eleven drams; small in order that the blood may not be thrown into the vessels too rapidly nor retained too long, and of a determinate size in order that the operator may measure the quantity of blood which he injects. The tube which discharges should be made of very pliant leather and that which admits the blood may be of the flexible metal used for catheters.<sup>14</sup> (Fig. 3)

These experiments established that the blood lost none of its life-giving properties by passage through a syringe; that arterial blood was equally beneficial despite the artery of source; that venous blood may be successfully used though

perhaps arterial is preferable; that air injected into the veins even to twenty cubic centimeters is not lethal; that an animal may be saved from death by hemorrhage by the transfusion of a much smaller quantity than that which is lost; that blood should not be injected too rapidly and that the blood of one genus of animal cannot be indifferently substituted in large quantities with impunity and, therefore, if the operation be performed upon the human body human blood should be employed until 'some other blood be found which is equally congenial to the vessels.'<sup>2</sup>

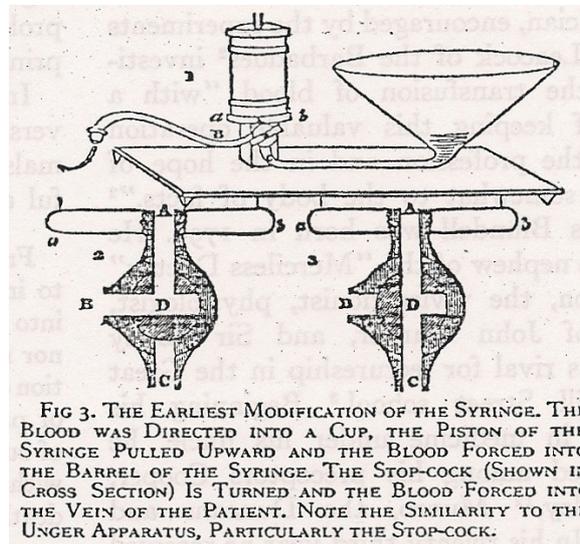


FIG 3. THE EARLIEST MODIFICATION OF THE SYRINGE. THE BLOOD WAS DIRECTED INTO A CUP, THE PISTON OF THE SYRINGE PULLED UPWARD AND THE BLOOD FORCED INTO THE BARREL OF THE SYRINGE. THE STOP-COCK (SHOWN IN CROSS SECTION) IS TURNED AND THE BLOOD FORCED INTO THE VEIN OF THE PATIENT. NOTE THE SIMILARITY TO THE UNGER APPARATUS, PARTICULARLY THE STOP-COCK.

Blundell reported in the Medical-Chirurgical Transactions of 1818 his first attempt of transfusion in man. This patient suffered obstinate vomiting and weakness caused by "scirrhus of the pylorus" as demonstrated at autopsy. Following the injection of 12 ounces of blood by the syringe (probably the one in Fig. 3), the man felt better, but died after fifty six hours. Blundell was not discouraged and states: "The case gives additional strength to the opinion that human blood although transmitted through the syringe may still retain a positive fitness for animal purposes."<sup>15</sup>

He had an idea that "Death from bleeding (like that of hanging or submersion) may also for a time be apparent ... it is not impossible that transfusion may be of service within a given time even after breathing has stopped." He attempted to prove this in Case Number 2, and a young woman dead for five or six minutes of "Placental haemorrhage" was transfused by the syringe with 16 ounces of blood without recovery.<sup>2</sup>

Case Number 3, a woman with very severe haemorrhage during childbirth was transfused with 4 oz. of blood by the syringe before respiration ceased but "being unable to secure more blood, she expired."<sup>2</sup>

Case Number 4, a woman ill with puerperal fever was transfused by the syringe with 6 ounces of blood. "No decisive effect of any kind was produced by the operation and the lady died of fever without suffering any extraordinary symptoms."<sup>2</sup>

Case Number 5, Dr. Doubleday assisted Blundell in injecting, with 14 ounces of blood, a woman dying of uterine haemorrhage. She is reported to have said after 6 ounces had been transfused: "I feel as strong as a bull." She recovered.<sup>16</sup>

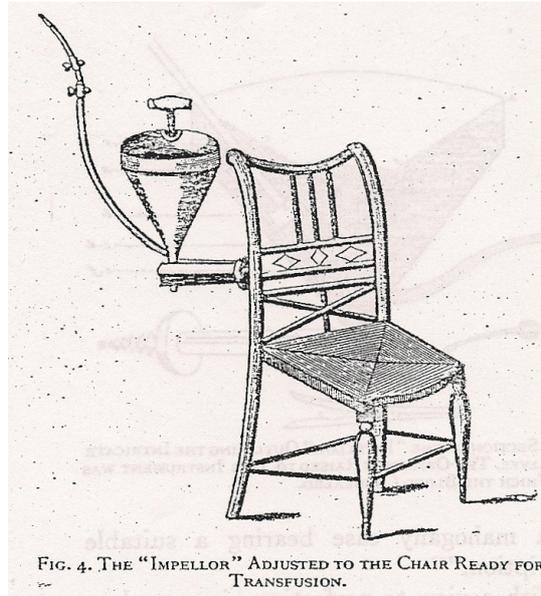
Case Number 6, a patient of Dr. Waller who, 'bleeding post partum, was transfused by the syringe with 4 ounces of blood and recovered.<sup>17</sup> This result was questioned. It was maintained that the quantity of blood was insufficient to restore a patient, but Blundell argued that as no other therapy, had been effective the prompt result must have been due to the transfusion.<sup>18</sup>

The influence of Blundell as an investigator and teacher caused this new operation to be taken up by the profession; particularly the obstetricians. Mr Waller, the London midwife, offered as the obstetrical prize to his students "A handsome set

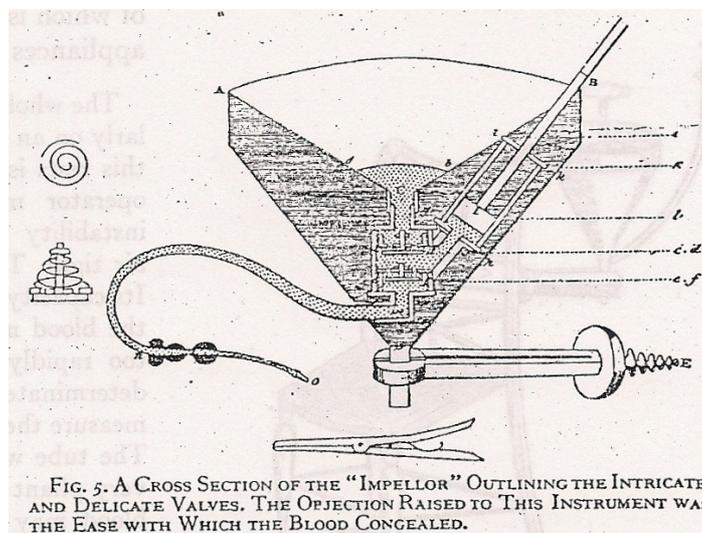
of transfusion instruments contained in a mahogany case bearing a suitable inscription."<sup>19</sup>

With a view to perfecting his procedure, Blundell introduced a new instrument (Fig. 4) in 1824:

When in consequence of the want of arterial blood it becomes necessary to transfuse the venous, a different method of operating must be adopted and in the present state of our knowledge I would recommend in such cases the employment of the Impellor.



This singular instrument was attached to a chair by a screw. The inner cup was filled with water, "milk warm" (96°) in such a manner as to exclude air. A vein was then laid bare on the forearm of the patient, incised and the tubule introduced. No ligatures were used, the tubule being held in place by the assistant. The donor seated himself in the chair; the arm was opened by a lancet as in venesection and the blood directed into the cup. By "long strokes with short and sharp movements" the blood is impelled into the vein of the recipient. (Figs. 4, 5).<sup>2, 5</sup>



Case Number 7, a young man dead for three or four minutes of haemorrhage from "bursting of an artery" was transfused by the "Impellor" with 16 ounces of human blood without resurrection.<sup>2</sup>

Case Number 8, a woman with haemorrhage following the delivery of the placenta was successfully transfused with 12 ounces of blood and recovered. The "Impellor" was used in this operation and Dr. Blundell applied 12 leeches to the arm in anticipation of inflammation which did not occur.<sup>6</sup>

During this period a number of unsuccessful cases of transfusion were reported by various surgeons. It appeared that blood transfusion was again to go into discard. Fearing that the report of these untoward results would give an erroneous impression he suggested at the meeting of the Medical Society that no more adverse cases be published until "a complete body of evidence upon the subject be obtained."<sup>20</sup> This proposition was rejected as an attempt to hide the true status of the operation.

These various instruments had obvious disadvantages. The reactions from transfusion were often quite serious and not knowing the chemistry of haemagglutination these effects were often attributed to the instrument. Although Blundell apparently abandoned the syringe methods he remarks:

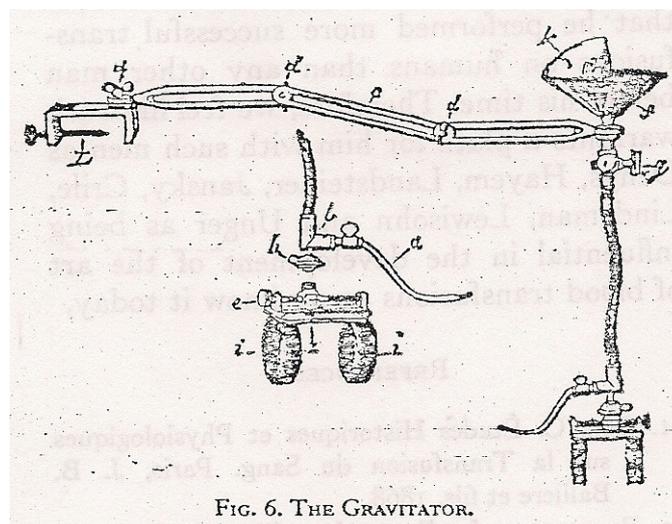
I may be permitted to state my own persuasion to be that transfusion by the syringe is a very feasible and useful operation and that after undergoing the usual ordeal of neglect, opposition and ridicule it may hereafter be admitted to general practice.<sup>2</sup>

Braxton Hicks after attempting to transfuse with Blundell's funnel and syringe (probably meaning the "Impellor") remarks:

The coagulation of blood was the greatest trouble which interfered with the performance of the operation. The instrument had to be washed out two or three times owing to coagulation during the check in the supply from fainting of the blood-giver, but I believe no clot was injected into the vein.<sup>21</sup>

In 1828 a fourth method was devised and introduced with this comment:

In the present state of our knowledge respecting the operation although it has not been clearly shown to have proved fatal in any one instance, yet not to mention possible though unknown risks, inflammation of an arm has certainly been produced by it on one or two occasions and therefore, it seems right as the operation now stands to confine transfusions to the first class of cases only, namely, those in which there seems to be no hope unless blood can be thrown into the veins. The object of the gravitator [Figs. 6, 7] is to help in this last extremity.<sup>22</sup>



Case Number 9, the life of a boy dying from secondary haemorrhage following amputation of the leg, was saved by the gravitator.<sup>7</sup>

Case Number 10, a successful transfusion after 8 ounces of blood were injected during a period of three hours in a patient with uterine hemorrhage.<sup>23</sup>

Our search of the literature reveals that James Blundell performed the operation of blood transfusion 10 times. His biographers, Wilks and Bettany<sup>8</sup> record 11 but they include the case of hydrophobia which was transfused with water (Magendie operation). Landois<sup>24</sup> records 9 for Blundell and 9 for Drinkard.<sup>5</sup> Of the 10 authentic cases detailed above 5 were successful and 5 failed. When we recount that 2 of these patients were already dead and a third dying of cancer, we find 5 of the 8 cases successful.

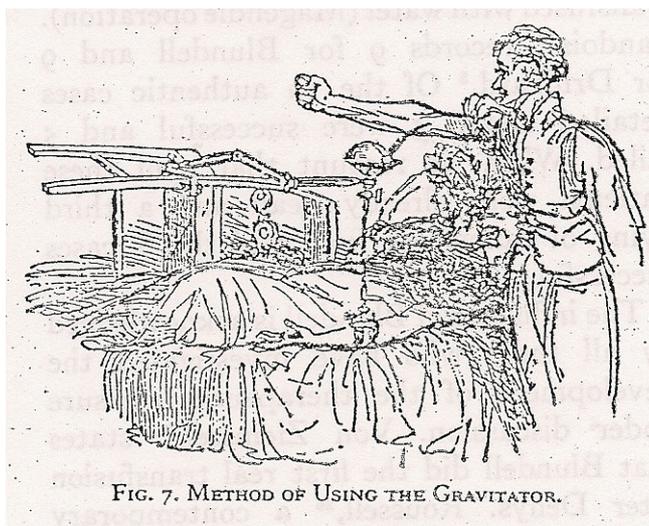


FIG. 7. METHOD OF USING THE GRAVITATOR.

The influence of Blundell is acknowledged by all those who have investigated the development of the therapeutic measure under discussion. Von Ziemssen<sup>25</sup> states that Blundell did the first real transfusion after Denys. Roussel,<sup>26</sup> a contemporary of Blundell writes, "Since the labours of Blundell, transfusion has never been lost sight of in England or other countries." In the United States when the demand for the introduction of an apparatus for blood transfusion was felt the New Orleans Medical and Surgical Society lauded the work of Blundell and favored the importation of his instrument (the syringe).

The statement of a recent authority,<sup>28</sup> that James Blundell neither advanced the knowledge nor improved the technique of blood transfusion, is to ignore the fact that he was one of the first to scientifically investigate this subject; that he devised instruments which find their modern expression in the syringe and its modifications, the cylinder and modified blood methods; that he was one of the first to establish the principle that only blood of the same species should be used; that blood lost none of its life-giving properties by passing through an instrument; that blood from any artery was satisfactory; that venous blood was as satisfactory as arterial; that blood should not be injected too quickly; that air should be excluded from the apparatus; that the injection of air up to 20 c.c. was not necessarily fatal; that he was the first to develop adequate means for measuring the amount of blood; that it was not only unnecessary but undesirable to transfuse the same amount of blood as had been lost; that he took up this work after a period of nearly one hundred and fifty years of disuse and that he performed more successful transfusions on humans than any other man before his time. Therefore, we feel his work warrants a place for him with such men as Denys, Hayem, Landsteiner, Jansky, Crile, Lindeman, Lewisohn and Unger as being influential in the development of the art of blood transfusions as we know it today.

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