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The demise of bloodletting

DP Thomas
Retired Haematologist, London, UK

ABSTRACT Bloodletting was a practice favoured by doctors and barber-surgeons for many centuries, and is now, perhaps surprisingly, still employed for a few specific indications. The effectiveness of bloodletting for treating diseases such as pneumonia was convincingly challenged in the mid-nineteenth century, but medical conservatism ensured the practice continued well into the twentieth century. As late as 1942, a famous medical textbook considered bloodletting appropriate treatment for pneumonia.

Correspondence to DP Thomas
The Old Barn
North Green
Kirtlington Oxford
OX5 3JZ, UK

e-mail
duncanthomas@btinternet.com

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THE HISTORY OF BLOODLETTING

Bloodletting, the taking of blood from a patient with therapeutic intent, was a practice carried out over millennia.[1] Ancient Greek vases depict a physician performing bloodletting, and Hippocrates and Galen both recommended the practice. The rationale for bloodletting, in so far as it had any, was based on the ancient belief of the existence of four humours, namely blood, phlegm, black bile and yellow bile, and that an imbalance of any of these could lead to illness. Various instruments were used to remove blood from the superficial veins, from simple syringes or lancets, to spring-loaded lancets, fleams (Figure 1) and multi-bladed scarificators. The amount of blood removed depended on the condition of the patient, as well as the practice of the doctor, and varied from relatively small amounts to litres of blood over several days.

FIGURE 1 A brass-handled three-bladed fleam, with original leather case, early nineteenth century. Image from author's collection.

FIGURE 2 A seventeenth century Flemish painting by Jan Horemans showing a barber-surgeon with his young assistant bleeding a woman, while the attending physician examines her urine. Image courtesy of the Wellcome Library, London.

Galen (129–200) believed that blood was the dominant humour, and therefore an excess of this humour was treated by bloodletting and purging. The dominance of Galen's theories in the ancient world was such that his teachings prevailed for many centuries, as did the practice of bloodletting. By medieval times, bloodletting was usually carried out by a barber-surgeon; the red and white of the barber's pole is a reminder of their earlier role, with the red standing for blood, white for bandages or tourniquet and the pole itself for the stick grasped by the patient to assist in dilating the arm veins. In a well-known painting (Figure 2), the Flemish artist Jan Horemans (1682–1759) depicted a barber-surgeon bleeding a female patient, with his young assistant collecting the blood in a bowl (an example can be seen in Figure 3) while an accompanying physician examines the patient's urine. This was a commonplace scene that would have changed little over the centuries. When one of the world's leading medical journals, *The Lancet*, was founded in the 1820s, its title reflected the

FIGURE 3 A bleeding bowl. Image courtesy of the Museum of the Royal College of Surgeons of Edinburgh

fact that a lancet was considered an indispensable item of medical equipment for doctors (Figure 4). Today, apart from a few specific indications, such as haemochromatosis and polycythaemia, bloodletting is regarded as an obsolete treatment, long discarded. But just when did the practice finally come to an end? While cynics might say modern hospital phlebotomists withdrawing blood for laboratory testing have taken over the role, the time-honoured practice of supposedly therapeutic bloodletting was in fact carried out well into the twentieth century.

FIGURE 4 A set of lancets with tortoise shell handles and a silver carrying case, c.1820. Image courtesy of Dr Alastair Mowat.

The fervour with which physicians in earlier times carried out bloodletting seems extraordinary today. Guy Patin (1601–1672), Dean of the Paris Medical Faculty, bled his wife 12 times for a 'fluxion' of the chest, his son 20 times for a continuing fever, and himself seven times for a 'cold in the head'.[2] Charles II (1630–1685) was bled following a stroke, and General George Washington (1732–1799), suffering from a severe throat infection, was bled four times in a matter of a few hours. The amount of blood taken from him has been variously estimated at between five and nine pints.[3] Strong man though he was, even his constitution could not withstand the misguided efforts of his physicians, and it seems likely such treatment hastened his end.[3] Benjamin Rush (1746–1813), a distinguished American physician and signer of the Declaration of Independence, was convinced that bleeding his patients was the best treatment. An Edinburgh graduate, he was undoubtedly influenced during his time in Scotland by the teachings of the great physician William Cullen (1710–1790), who used bloodletting to deplete the nervous energy, imbalance of which, he believed, caused disease. During the yellow fever epidemic in Philadelphia in 1793 Rush bled and purged his patients. The following passage illustrates the depth of his convictions regarding the value of this treatment:

> I began by drawing a small quantity at a time. The appearance of the blood, and its effects upon the system satisfied me of its safety and efficacy. Never before did I experience such sublime joy as I now felt in contemplating the success of my remedies. It repaid me for all the toils and studies of my life. The conquest of this formidable disease... was the triumph of a principle of medicine.[4]

Rush's approach is a salutary reminder of the dangers of sincerely held beliefs in the value of traditional methods, and highlights the need for a critical, evidence-based assessment of all forms of treatment. Even at that time there were critics of Rush's methods. One of his main opponents was the Englishman William Cobbett (1763–1835), who during a stay in Philadelphia wrote the couplet: 'The times are ominous indeed when quack to quack cries purge and bleed'.[3] Cobbett was not alone in his scepticism: during his last illness, Lord Byron is reputed to have said to his physician that 'the lancet, as he well knows, had killed more people than the lance'.[5]

A consultant physician at the Norfolk and Norwich Hospital, describing his experience of bloodletting in 1879 provides an intriguing insight into mid-Victorian practices:

> In my early days, bleeding was very frequently resorted to in this hospital; and people were in the habit of coming to be bled at their own request, just as they now apply to have their teeth drawn, and it was thought to be good practice for the students.

> When I was in practice in the country, my surgery was visited on Sunday mornings, in spring and autumn, by a number of labouring people, who paid their shilling each to be bled; sometimes five or six were going at the same time, and I never knew any of them take harm from the loss of blood – indeed, they considered themselves all the better for it, and would have it done.[6]

Even though this physician agreed that bloodletting was less commonly employed than before, he claimed there was still a place for it in certain diseases: 'But there is one form of disease which is peculiarly under the influence of bleeding as a remedy, and if treated in its early stage or onset, is cured by it very speedily and satisfactorily… I allude to idiopathic pleurisy'.[6]

In his Gulstonian Lecture to the Royal College of Physicians, London in 1864, Dr WO Markham (1818–1891), a physician to St Mary's Hospital in London, made a plea for the judicious use of bloodletting in certain conditions, deploring that venesection was carried out less frequently than before. He claimed that 'bloodletting, rightly applied, is now, as it ever has been, a good remedy in disease'.[7] John Haddon, a physician from Hawick, wrote in 1915: 'Our grandfathers used to be bled every spring, and I have heard… tell of the row of patients waiting to be bled. Languid and lazy before being bled, they felt as if their youth were renewed by the bleeding.'[8]

While bloodletting had been standard treatment for centuries, by the early eighteenth century there were some physicians who opposed excessive bloodletting. One of the best known physicians in London, John Radcliffe (1652–1714), preferred to apply blisters.[9] His preference for the *vis medicatrix naturae* and opposition to bloodletting may well have enhanced his reputation. He left his considerable fortune to Oxford University where his name is commemorated by several buildings, including the main teaching hospital. In France, François Broussais (1771–1838) believed that nature had no healing power and disease had to be aborted by active measures. To this end, he applied leeches over the whole body, and was a fervent advocate of bloodletting. However, during the second half of the nineteenth century scepticism grew of the value of bloodletting. Broussais' views were challenged by Pierre Louis (1787–1872), often considered the founder of medical statistics. Louis took a strong stand in favour of facts and figures, as opposed to 'sterile' theorising,[10,11] and concluded that for most patients there was no convincing evidence supporting bloodletting. This approach was reinforced by John Hughes Bennett (1812–1875), whose views on bloodletting and its lack of efficacy triggered a great controversy on the topic in Edinburgh. In an impressive statistical analysis of survival rates following pneumonia in European and American hospitals, he concluded that bloodletting did not improve survival.[12,13] The work of Hughes Bennett, like that of Louis before him, was distinguished by a careful epidemiological approach, with results based on group comparisons. While this approach would not meet modern standards for controlled clinical trials (they simply compared mortality rates retrospectively in different wards or hospitals), detailed records of their patients enabled them to assess survival rates. For example, in a series of 105 consecutive cases of simple, uncomplicated pneumonia treated by him without bloodletting over 18 years at Edinburgh Royal Infirmary, Hughes Bennett reported no deaths in his patients as a result of pneumonia.[12,13] These results were in marked contrast to his detailed analysis of patients at the same hospital 'when upwards of one-third of all patients affected with pneumonia died who entered during a period of ten years when bleeding and an antiphlogistic treatment was universally practised'. Hughes Bennett concluded that 'supporting and restoring (not stimulating) the nutritive powers of the system, and avoiding all weakening remedies (low diet, bleeding, tartar emetic, narcotics, etc.) ought to constitute the practice in pneumonia'.[12,13]

This iconoclastic approach led to the famous bloodletting dispute of the 1850s. The traditional view of its value was upheld by William Pulteney Alison (1790–1859), recently retired from the Chair of Physic at Edinburgh University.[14] Hughes Bennett, a generation younger than Alison, and recently returned from studying in Paris and Berlin, strongly believed in the value of pathology and the microscopic study of disease. His whole approach, including the use of statistics, was based on a more scientific study of disease. One of the theories prevalent in the mid-nineteenth century was that a change had occurred in the nature of inflammatory diseases in the sthenic type of patient as compared to those who were asthenic. The argument was made that prior to the introduction of rail travel and cramped city living, patients were more robust, and their symptoms demanded depletive or antiphlogistic therapy, such as bloodletting.[15] As the century progressed, and with it more modern conditions, patients became more asthenic with diminished energy, and were less able to withstand bloodletting. They therefore needed nourishment, such as with beef tea and alcohol. The claim was that the effect of town life, as opposed to country living, had led to a change in the constitution of the human body, and hence the need to alter the type of treatment. In addition, much of this dispute centred on the confusion attending the concept of inflammation – was inflammation a disease or a symptom of disease? The distinction between septic and aseptic inflammation was not appreciated at the time. Bloodletting was the chief remedy against inflammation in the so-called antiphlogistic regimen indicated for sthenic patients, whereas it was considered inadvisable in asthenic patients.[15,16]

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TOO MUCH OR TOO LITTLE?

From today's perspective, perhaps the most surprising aspect of the pioneering work of Louis and Hughes Bennett was how slow the medical profession was to accept their strong evidence, especially in relation to the treatment of pneumonia. Hughes Bennett was attempting to introduce a more scientific approach to identifying and treating disease, involving both laboratory observations and statistical analysis of results. However, this approach came into conflict with that of more traditional clinicians who continued to rely on their own experience, based solely on clinical observation. Despite growing scepticism of the treatment, the controversy about bloodletting continued throughout the latter half of the nineteenth century, and indeed well into the twentieth. In 1895 the Professor of Surgery at Cambridge, Sir George Humphrey (1820–1896) at a meeting of the Oxford Medical Society, claimed that bloodletting 'went suddenly and it now scarcely occurs to the practitioner as a means of treatment'. But he also went on to say 'either the over-use in the past must have been wrong or the total disuse in the present be so. Probably both, for the human constitution cannot have been so altered in that period as to justify the change.' He concluded that 'the opinion is gaining ground that in some cases venesection may be resorted to with advantage'.[17] Similarly, Louis had also concluded there were useful effects of bloodletting, but only for severe cases.[10] However, Humphry's comment that bloodletting at the end of the nineteenth century 'scarcely occurs' was somewhat premature, even in Scotland. In a letter to the editor of the *British Medical Journal* in 1915, a consulting surgeon at the Edinburgh Royal Infirmary wrote: 'I am convinced that general bloodletting is the remedy for those cases of traumatic bronchitis (due to poison gas) and it should be given a further and fuller trial'.[18]

Sir William Osler (1849–1919) listed several indications for bloodletting in his famous textbook *Principles and Practice of Medicine*. In the first edition in 1892, Osler wrote:

> During the first five decades of this century the profession bled too much, but during the last decades we have certainly bled too little. Pneumonia is one of the diseases in which a timely venesection may save life. To be of service it should be done early… the abstraction of from twenty to thirty ounces of blood is in every way beneficial.[19]

Ten years later, he was still advocating the removal of blood as part of the treatment of pneumonia: 'To bleed at the very onset in robust, healthy individuals in whom the disease sets in with great intensity and high fever is, I believe, a good practice'.[20] Perhaps even more surprising to modern eyes is the following advice as late as the 1930 edition of his textbook:

> Before Louis's iconoclastic paper on bleeding in pneumonia it would have been regarded as almost criminal to treat a patient without venesection. We employ it much more than we did a few years ago, but more often late in the disease than early. To bleed at the very onset in robust healthy individuals… is good practice. Late in the course marked dilatation of the right heart is the common indication. The quantity of blood removed must be decided by the effect; small amounts are often sufficient.[21]

In the same edition are the following comments: for emphysema, '[P]atients who come into the hospital in a state of urgent dyspnoea and lividity with great engorgement of the veins should be bled freely…'. And for sun-stroke: '[I]n the cases with intense asphyxia, and in which death may take place in a few minutes, free bleeding should be practised.' As his latest biographer Michael Bliss commented, Osler had a 'blind spot' on the supposed value of bloodletting.[22] But what is even more remarkable is that, 23 years after Osler's death, and 50 years after the first edition, the fourteenth edition of his textbook (1942) had not changed the advice about bleeding patients with pneumonia.[23] While this was at a time before the general availability of penicillin, sulpha drugs were available. It seems reasonable to conclude that if, as late as the 1940s, a leading textbook of medicine recommended bloodletting for pneumonia, the practice was not abolished until well into the twentieth century.

At a meeting held in London at the Royal Society of Medicine in April 1927 on the subject of venesection, it was agreed that the procedure should not be employed on chronic anaemias and low blood pressure, especially in the elderly.[24] The indications upon which most of the group appeared to agree were polycythaemia and certain cases of high blood pressure among the chronic group, and acute conditions associated with lividity and right heart dilatation. It was also agreed that it was beneficial in sunstroke. At this meeting, the distinguished physician Sir William Hale-White (1857–1949) commented that if the discussion had taken place 'eighty or ninety years previously several hundred people would have been bled in the afternoon in London, since every person who looked after his health in those days was bled every spring and autumn'.[24] Hale-White reminded the audience that in 1840 a doctor was charged with malpractice for failing to bleed a patient with pneumonia, but subsequently there had been a great change in the frequency of bloodletting. Another speaker at this meeting, a well-known physician, Sir William Wilcox, considered venesection indicated in five classes of cases: right-sided dilation of the heart; convulsions; heatstroke polycythaemia; and violent asphyxia from drowning or hanging. Even in relatively modern times, therefore, the indications for bloodletting were considered a suitable topic for discussion at a medical meeting in London.

In correspondence following the report of this meeting, the physiologist RJS McDowall made the point, as an experimentalist, that following venesection 'contraction of the peripheral vessels to keep up the arterial pressure... brought about a profound fall of venous pressure which is relatively lasting and which must be of enormous value in relieving the right side of the heart.[25] F Parkes Weber, another well-known physician, in a letter to the editor, commented that his father, when in Bonn, Germany, around 1850, was asked to show Sir James Young Simpson (1811–1870) around his clinic. Simpson claimed that venesection for the treatment of pneumonia had been completely abandoned in Edinburgh. When he asked what would happen if a patient in Bonn died without being bled, he was told that the assistant who had attended the case would be waylaid and unmercifully beaten.[26] Simpson was Professor of Obstetrics in Edinburgh University, and his comment may well have been accurate for the obstetricians, but was manifestly not true for some of the physicians. Sir George Humphrey, a surgeon, made a similar claim in the 1890s that venesection had been virtually abandoned.[17] Perhaps venesection was abandoned earlier among surgeons and obstetricians than by physicians.

LEECHES

The application of leeches (*Hirudo medicinalis*) has a history at least as long as bloodletting. Their use was particularly favoured in the nineteenth century, to the extent that several million leeches were employed in Paris hospitals every year. As late as the 1950s in at least one London teaching hospital, leeches were kept in the hospital pharmacy and used occasionally. As a houseman to a cardiologist there in 1955, I was instructed to apply leeches to a patient with pericarditis. My chief at the time thought it appropriate to maintain some of the old customs, and he believed leeches were effective in relieving the pain of pericarditis. I was reluctant to challenge him, even though I had spent a previous summer as a medical student working with Archie Cochrane (1909–1988), who had inspired me with the spirit of healthy scepticism towards some current clinical practices. Cochrane's approach eventually developed into the modern concept of evidence-based medicine, celebrated today by the many Cochrane centres established around the world. He would certainly have been bemused had he known one of his students was instructed to apply leeches in 1955. However, leeches have had something of a renaissance in recent years, being used in micro- and plastic surgery for removal of localised collections of blood, as opposed to any systemic effect. For example, they are used to treat venous congestion if it occurs in plastic surgery flaps or on reattached digits. It is relatively easy to restore arterial blood flow, but more difficult to establish venous drainage, and congestion can easily jeopardize a successful outcome. The application of a leech to the affected part can have a beneficial effect by removing congested venous blood.

MODERN BLOOD TRANSFUSION

The general decline in bloodletting had certainly become established by World War I, which ironically heralded the era of modern blood transfusion. Although there had been many attempts over the centuries to treat patients by transfusing blood from animals to man and man to man, it was only after the identification of blood groups early in the twentieth century,[27,28] and the discovery of the effectiveness of citrate as an anticoagulant,[29] that blood transfusion became a practical and reliable treatment. The life-saving value of blood transfusion was amply demonstrated during this war, and the experience was instrumental in persuading surgeons of its value for blood loss following acute trauma.[30,31] Sir Geoffrey Keynes (1887–1982), a pioneer of blood transfusion following his experience as a surgeon on the Western Front in World War I, published the first British textbook on blood transfusion in 1922.[32] By the 1920s doctors were more likely to transfuse blood than bleed their patients.

CONCLUSION

In the days when doctors had little in the way of effective treatment, and there was a need to be seen to be doing something to treat the patient, the placebo effect of bloodletting should not be underestimated. This is probably also true for other practices long discarded by mainstream Western medicine, such as blisters and purging. However, when such an astute clinical observer as William Osler believed that venesection was helpful in some patients it would perhaps be unwise to assume the reputed benefits were simply the result of a placebo effect. Even Louis, while deprecating the widespread practice of bloodletting, concluded there were useful effects, but only for narrow and specific indications.[10] An editorial in the *British Medical Journal* in 1871 made a plea for a 'fair trial for bloodletting as a remedy';[33] it would be impossible today to carry out a controlled clinical trial to settle the issue.

It is difficult to state definitively when bloodletting for conditions such as pneumonia finally ceased in Western medicine, and the practice still persists in some North African countries today.[1] While the indications are that the practice continued sporadically in the West until the 1940s, the arrival of antibiotics for the treatment of pneumonia would have ended the need for any such non-specific treatment. By then, the modern era of evidence-based medicine was dawning, and bloodletting had been consigned to the dustbin of discarded treatments. In years to come it is a safe prediction that some, if not many, of our current practices will be looked on with similar disbelief, so perhaps we should not be too critical of our medical predecessors.

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